NCJ

# NATIONAL CONTEST JOURNAL

$4

November/December 2003

Volume 31 Number 6

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## Special Issue—IARU HF Championship

- IC-746PRO and IC-756PROII—Head-to-Head!
- The Mother of All Antenna Switches
- SO2R—The Easy Way
- Proposed IARU Rule Change


Top Photo: The W1AW/3 team, left to right: **K8NZ, N3GJ, K3UA, K3LR, K8AZ, N3RA, K8MR, W9ZRX, W9RE** and **N9RV**.

Bottom Photo: Some of the 53 operators of the **SNØHQ team** at the after-contest meeting.

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***The National Contest Journal***
***Volume 31 Number 6 November/December 2003***

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# TABLE OF CONTENTS



## *NCJ* Advertising Index

# Editorial

Carl Luetzelschwab, K9LA

### This Issue

This issue is devoted to the IARU HF World Championship contest held last July. We have four stories of HQ operations and a story on the WRTC-style operating in this year's contest. I've seen comments from several others noting that the participation in this contest, especially from outside of Europe, is growing. I hope the stories in this issue contribute to keeping that trend going. As a side note, the results and write-up of this year's IARU HF World Championship are tentatively scheduled to appear in the February 2004 issue of *QST*.

Rounding out the general interest features are Kevin, K4PG, with his account of a not-so-perfect Field Day (everyone probably has a story of "contests gone bad"), and some photos of contest stations.

The technical features include an easy way to convert to SO2R by John, K3HBX, Antenna Interactions Part 3 by Eric, K3NA, the design and implementation of a massive antenna switch by Ken, K6LA, a review of the much-welcomed tropospheric opening in the CQ VHF contest by our VHF/UHF Contesting columnist Jon, NØJK, and comments from a contesting perspective on the IC-746PRO versus the IC-756PROII from George, K5KG.

We also have our regular columnists contributing their writings, along with the results of the July 2003 NAQP RTTY contest.

### Comments on K3NA's *Antenna Interactions* Series

I received an e-mail from Dan, AC6LA, in reference to K3NA's *Antenna Interactions* series. An excerpt from Dan's e-mail follows:

*One of the examples included in Part II of the article is a stack of two 20m Yagis, mounted at heights of 50 and 100 feet and separately rotatable. The initial configuration has both Yagis pointed towards Europe, compass bearing 46° from the Washington, DC area. Then the upper Yagi is rotated counterclockwise and the sky hemisphere pattern is captured at intervals along the way. The final position of the upper Yagi is 90° counterclockwise from the lower, compass bearing 316° towards Japan.*

*I thought this example was very interesting and I exchanged several emails with Eric concerning a follow-up. My idea was to twist the stack as Eric had done and show the results in a variety of different ways including 2D plots, 3D plots, and* VOACAP *area coverage maps.*

The full version of Dan's e-mail, along with his results, can be seen in the BONUS CONTENT section on the *NCJ* Web site **www.ncjweb.com**.

By the way, Dan is the author of *MultiNEC*, which was reviewed by Pete, N4ZR, in the September/October 2003 *NCJ*.

### Errata

After the Table of Contents listing of the article *How Much is A dB?* in the September/October 2003 issue, we had OE5CWL listed as OE5CW. Oops –we missed the L. It should be OE5CWL/OE6CWL. NCJ

# SO2R—The Easy Way

J. V. Evans, N3HBX
jvevans@his.com

As a relative newcomer to contesting, I have tended to take the "easy" route of entering only single-band contests. This provides the opportunity of getting some sleep after the band has closed! As such, the advantages of arranging the station for single-operator/two-radio (SO2R) operation did not seem particularly worthwhile. However, when Mark Bailey, KD4D, began guest operating at my station, he wanted the benefit of two radios, and contributed useful ideas about how the station could be reconfigured to provide this capability in a way that would require the least amount of "homebrew" equipment. This provided the spur to rebuild the station.

The first step was to add a second radio, which had access to a separate set of Yagi antennas from the main radio. However, it proved impossible to achieve adequate isolation between the two radios, and there was a real danger that this second radio could be damaged by RF power from the first radio/amplifier combination. Some useful SO2R operation was achieved by setting the second radio to listen only on one of several Beverages, as these were connected via a "front-end-saver" box. This was clearly not the best of arrangements, and so a quest was begun for a way to get true SO2R capability using, for the most part, commercially available components. This article describes the resulting setup, which has now been used successfully in a number of contests.

## Overview

Much has been written about SO2R.[1,2] There have also been presentations made at the Dayton Contest Forum, and the reader will find access to some of these at K8ND's Web page.[3] My approach was dictated by a strong desire to keep it simple, and not reinvent the wheel!

Figure 1 shows the overall scheme for the control of the two radios. Central to this is the use of the Array Solutions (WXØB) SO2R switch box.[4] This equipment comes in the form of a switch box that is connected to the radios and computer, and a separate control box placed in front of the operator. The switch box directs the mike input, keying input, and PTT to whichever of the two radios is to transmit. In a contest, this box is placed under computer control. The computer used at my station is an older 486 PC operating at 66 MHz clock speed. The contesting software we use is either *CT* or *TR-Log* operating under *DOS*. In the event one wishes to operate without the computer (e.g., during casual operation), the WXØB switch box can be placed under the control of the separate manual control box.

Receive audio from the two radios is fed to the WXØB switch box and then to the manual control box, where (under manual control) one can listen to either radio or have one radio in each ear. Under computer control the audio is

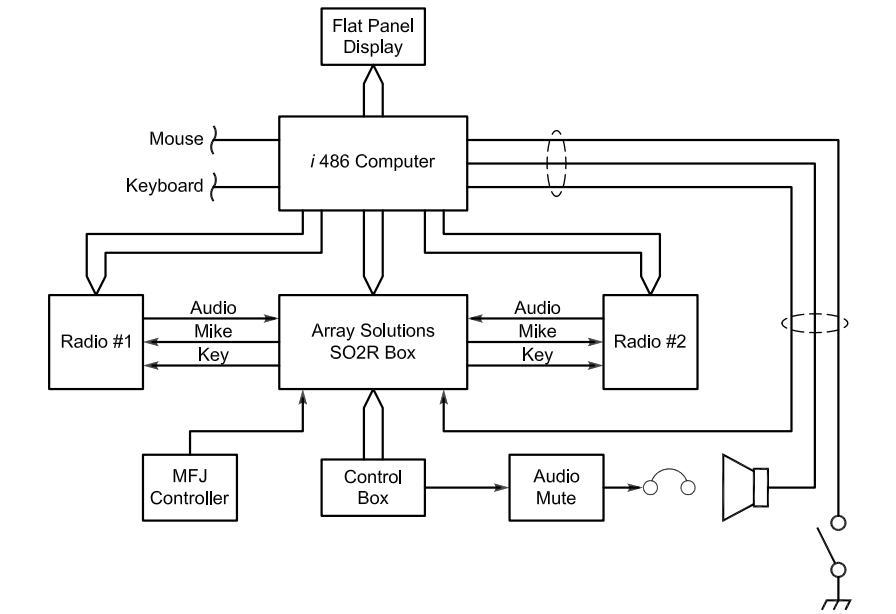
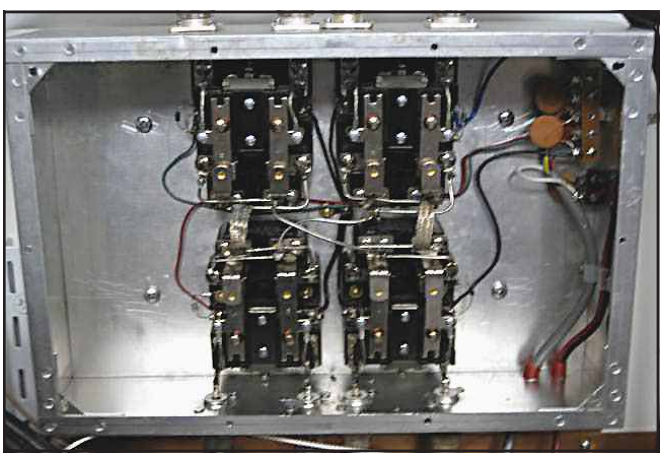



**Figure 1—The overall control scheme for SO2R operation at N3HBX.**

[1]Notes appear on page 6.



**The interior of the "output RF" switch box whose circuit was shown in Figure 4.**

**View of the HF operating position at N3HBX (off the picture to the left is the VHF/UHF operating position).**

switched from the "run" radio to the alternate ("multiplier") radio while CQing. If both radios are set to the same band (as in a single-band contest), then the isolation scheme (to be described) does not prevent the alternate radio from being overloaded and generating strong audio noise when the main radio is transmitting. To prevent this from reaching the headphones it was necessary to interpose a "mute" box that, if activated, employs a relay to disconnect the headphones. The PTT line calls this relay.

For sideband operation, an LZ Engineering digital voice processor (DVP) card[5] in one of the expansion slots, and operating under the control of *CT*, permits a number of "CQ" messages to be stored and played. A Heil headset and footswitch[6] are connected to the DVP card in the computer.

### Computer Connections

The WXØB switch box is placed under computer control via the computer's parallel port. The parallel port cable to the SO2R box carries PTT, CW out and radio #1/radio #2 select. There are also three lines to the CW paddle, which in *TR-Log* controls a built-in electronic keyer. As noted above, the SO2R box also routes the PTT (from the foot switch or computer function keys) and the mike input to the appropriate radio.

Control of the two radios (Yaesu FT1000MP and FT1000 Mk V) requires two free serial ports, and to provide these it was necessary to install a ByteRunner card (Model 400-Pro-9) that provides four serial ports[7] in a second expansion slot. Not shown in Figure 1 is the packet system. This has been in use for some time and employs an additional computer card (AEA Model PK-88 Packet Controller). Thus, in all, three ISA expansion slots are used. Anyone attempting to replicate these arrangements would find that ISA expansion slots are no longer offered in most PCs. Indeed, it appears that the 160 MHz first-generation Pentium computers were the last to include three ISA type slots. A further difficulty might be that the ISA ByteRunner and PK-88 packet cards are no longer manufactured. However, they appear to be available via surplus within the ham community, as individuals are upgrading to newer computer systems, and I have been able to buy spares for the ones I am using by advertising for them on the Web. Given a newer computer, one would probably opt to use the audio card to provide the DVP function, and buy a ByteRunner card that fits the new style expansion slots — if more serial ports are needed.

### Isolation Between Radios

The principal technical challenge in the quest for SO2R operation was achieving adequate isolation between the two radios and protecting each one from the other. Figure 2 shows how this was achieved. Each radio *listens* only via its RX input terminal. The main RX/TX SO239 antenna socket is connected to a coaxial relay that is normally open, and is closed only when the radio is keyed. In this way, no unwanted RF from the other radio/amplifier can enter either transceiver via its RX/TX terminal.

While in receive mode, the coax relay connects the selected transmit antenna first to a set of Dunestar (Model 600) multiband remote-switched band-pass filters.[8] This is controlled by a Top Ten Devices automatic band decoder box,[9] which, in turn, is driven from the radio's "band data" DIN connector. This provides *automatic* selection of the desired band-pass filter depending upon the band to which the radio is switched (this is one less thing to worry about in the heat of battle!).

Following the Dunestar filter is an RF

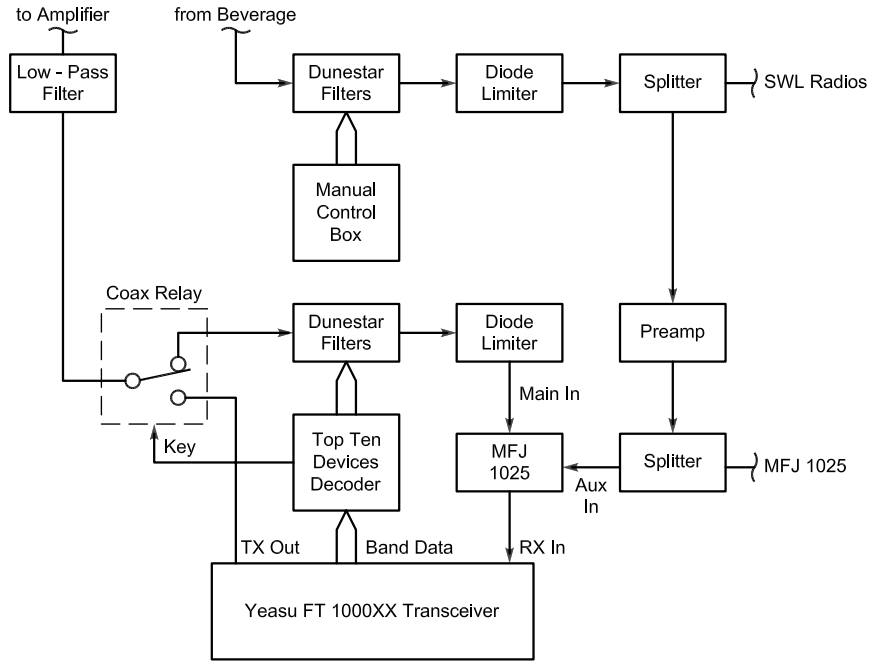



**Figure 2—The arrangement of the components used in the receive path to achieve isolation between the radios.**

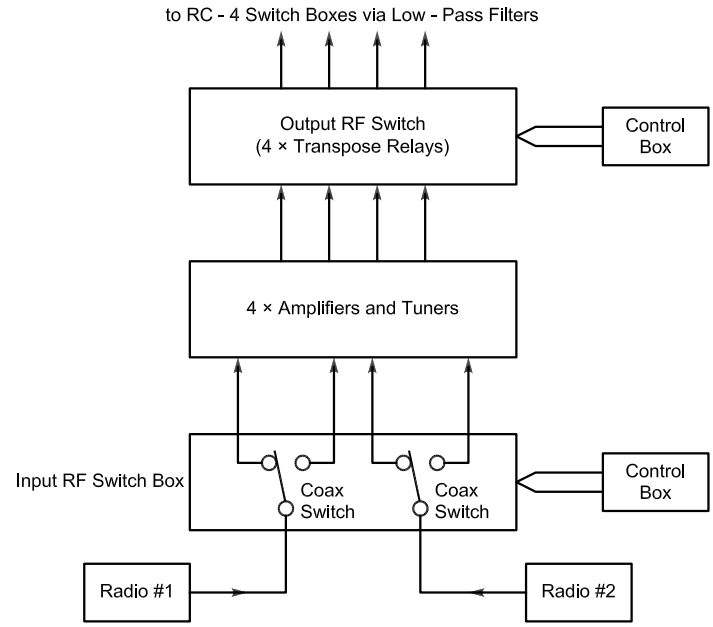



**Figure 3—The scheme used to drive any two of the four high-power amplifiers available at the Station.**

protection circuit consisting of a pair of back-to-back silicon switching diodes. These provide protection for the MFJ-1025 Noise Canceling Signal Enhancer that follows. The MFJ-1025 serves as a way of providing reception on either the transmit antenna and/or a Beverage antenna. Combining the two permits the cancellation of local noise, which is sometimes a problem at my station. In addition, selection of a Beverage for reception, instead of the transmit antenna, is usually the better choice on 160 or 80 meters. While the MFJ-1025 has its own built-in RF protection, this is not present when it is left unpowered as then there is a direct connection of the main antenna to the radio, hence the need for the external protection. When used in this fashion, the MFJ 1025 is not switched from receive to transmit whenever the radio is keyed, and therefore requires no PTT input.

It can be seen from Figure 2 that it would be easy to rearrange the components so that the Dunestar filters would be present in the signal path both for transmitting and receiving. I elected not to do this because one of the radios (the FT-1000 Mk V) could be operated at a power level that would exceed the rating of the filters. Moreover, I expected that the harmonic content of the transmitted signal would be governed more by the non-linearity of the amplifier than the spectral purity of the transceiver signal.

The station has access to four Beverage antennas via a remote selector switch. Signals from the one selected are first passed through a third set of Dunestar (Model 600) filters. Selection of one of these is under manual control. This permits one of the radios to listen (using a Beverage) on any band regardless of the band that the second radio is set to (we have not found a need for both radios to listen on Beverages at the same time, but that could be incorporated with another set of filters). Following the filter is another back-to-back diode RF protection box. An Advanced Research Receiver (Model P1 30/20 VD) 1-30 MHz preamp (reference 10) then boosts the signals to drive a broadband splitter. The splitter sends the signals to the auxiliary inputs of the two MFJ 1025 boxes (Figure 2).

The components in the receive chain described above must all be well grounded and in RF-tight enclosures to ensure no leakage of unwanted RF from the "run" radio gets into the other, or vice versa.

### Amplifier Arrangements

It has been my unfortunate experience that high power amplifiers represent one of the least reliable pieces of amateur hardware. Accordingly, each radio is provided with access to two high-power amplifiers as illustrated in Figure 3. This is achieved via a pair of coax relays mounted in an "input RF" box that are under the control of two switches in a small control box. Besides switching the RF, the control box also switches two miniature relays to send the PTT to the appropriate amplifier. The amplifiers used, at present, are two Alpha 87As, an ETO 91B and a Yaesu VL-1000. One of the virtues of this arrangement is that moving from band to band can be made quickly by dedicating each amplifier to a given band. For example, if the VL-1000 is used for 10 and 15 meters, the three vacuum tube amps can be tuned up prior to the contest for 20, 40 and 80 meters.

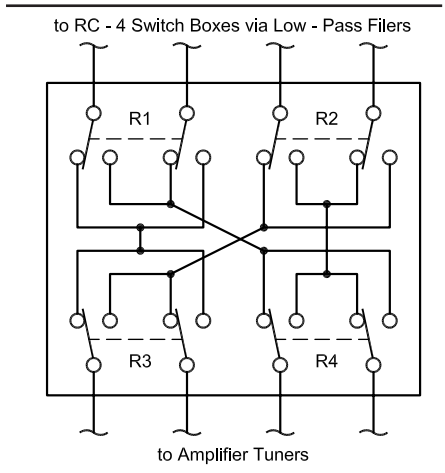



**Figure 4—The circuit for the "output RF" switch box. The relays are all shown in their un-energized state.**

The three vacuum-tube amplifiers are each followed by a low-pass filter, and then an antenna tuner (either MFJ-986 Differential-T Tuner, or Ten Tec 238A High Power Tuner). As an aside, it has been found that the MFJ 986 will not handle full power on 160 meters, and for a contest on that band the Ten Tec tuners must be substituted. However, the Ten Tec 238A tuner is less easy to adjust (the match point is not at all intuitively arrived at) and tends to be "touchy" on 10 meters. The VL-1000 has its own internal tuner and does not need an external one.

### Antenna Arrangements

For casual operating only the VL-1000 amplifier is normally turned on. This generated a requirement that this amplifier have access to any (of up to 16) transmitting antennas at the station. The simplest solution to this was to arrange for *all* the amplifiers to have the same capability. Accordingly, an "output RF" box was constructed containing four Potter and Brumfield double-pole relays acting to transpose their inputs and outputs (when called) as shown in Figure 4. This permits any of four input sockets to be connected to any of four output sockets. These relays are under the control of four switches in a separate (conveniently located) control box.

Each of the four cables coming from the "output RF" relay box is taken to an Ameritron RCS-4 switch control box that allows the selection of one of four antennas via a remote relay box on the tower. These are

- four Yagis on a 110-foot rotating tower
- four Yagis on an 80-foot Rohn SSTV tower
- four wire antennas hung from the 110-foot tower, and
- four wire antennas hung from the 80-foot tower.

When using this scheme it is first necessary to decide which antenna the "run" amplifier will employ, and make the necessary switch settings. This prevents the "multiplier" amplifier from accessing that antenna, or indeed any of the other three antennas that can be selected via that RCS-4 switch; yet, it does allow any of the remaining 12 to be used. In practice the "run" radio usually employs one of a pair of phased Yagis on the 110-foot tower, while the "multiplier" one uses one of the Yagis on the 80-foot tower. This allows the search for multipliers to be carried out not only on a different band, but also from a different direction.

### Layout and Construction

One of the requirements of the station layout is that everything be within easy reach. This is not readily achieved without some careful planning. While the radios (and the VL-1000 amplifier) are placed on the operating desks, two of the amplifiers, their associated tuners, and the antenna switch boxes, etc are all supported on shelves that are hung from the wall of the shack. This allows the operating desk to be pulled out to access the myriad of cables behind. Many other components (eg, the Dunestar filters and Top Ten control boxes) were mounted on a wood panel fixed to the wall. This reduced the amount of equipment that otherwise would have had to be placed on the shelves, and made for a cleaner, more permanent arrangement. Needless to say, the weight of the two amplifiers that are supported by one shelf required that it be very solidly attached to the wall! A fourth amplifier had to be placed under the computer desk. This is not an ideal place for it, and so it tends to be assigned to whichever band is likely to be least used.

### Problems

It would be nice to claim that the rebuild was carried out without running into any difficulty, but this was not the case. When first delivered, the Array Solutions SO2R control box would not reliably key one of the two radios (an older Yaesu FT-1000 then in use). Part of the problem proved to be intermittent in one of the supplied cables (which was replaced by the manufacturer at no cost) but the difficulty persisted. While the manufacturer tried to be helpful in addressing the problem, the eventual "cure" was to use the two "pull-down" transistors in the box that are intended to key the radios to control,

instead, two miniature 9-V relays; these then ground the key lines.

A second set of problems was encountered in getting the computer to play properly. These mostly involved correctly addressing the I/O ports and employing unused IRQs. Indeed, long after these difficulties were thought to have all been resolved it was found that the computer would hang up in a random fashion. This always occurred, however, while a CQ message was being played by the DVP. It was first thought that this was a case of RF getting into the computer, but no amount of ferrite chokes added to the various cables provided a cure. Eventually, changing one of the IRQ numbers used by *CT* solved the problem!

A third concern was that I needed to control the band selection of the VL-1000 amplifier *and* one Top-10 band decoder from the same radio. Paralleling the two cables together (in a junction box) provided a means of doing this, and I was happy to find that the band data signals available from the radio were adequate to drive the two devices.

### Conclusion

It is possible to reengineer one's station for SO2R operation using mostly "off the shelf" components. The largest amount of attention must be given to isolating the two radios from one another. This is probably more readily achieved for CW than sideband. The scheme described here provides a useful level of isolation (except for when both radios are on the same band). Whether or not it is worth the effort to go to SO2R is a matter of taste, economics and competitive instincts. From my own perspective, it offers little advantage for single-band, SSB operation, but clearly appears to have helped KD4D increase his scores and place high in several contests. As he described it to me, "*TR-Log's* two radio mode is very slick! You type ALT-D during a CQ, and if you hear a call sign on the second radio enter it on the keyboard. If the call is not a dupe, it will be displayed on the screen. You call this station with the second radio by hitting the Space bar. If the station does not come back to you, hit Escape and the first radio will send CQ. If the station does come back, then you enter the exchange and hit Return. This sends your exchange, logs the QSO and starts CQ being sent on the first radio. I can usually do this productively if the rate is under 100/hour."


### Acknowledgements

I would like to thank Mark Bailey, KD4D, for his advice and encouragement in carrying out this project.


### Notes

[1]Kennamer W. "Quick and Easy Two Radio Switching" May/June 2000 *NCJ*, p. 25.

[2]Wetzel M. "Single-Op Two Radio Station Automation at W9RE" January/February 1999 *NCJ*, pp.12-16.

[3]**home.columbus.rr.com/maas/radio/K8ND_SO2R.htm**

[4]**www.arraysolutions.com/Products**

[5]**systems.sysu.com/dvp**

[6]**www.heilsound.com**

[7]**www.byterunner.com**

[8]**www.qth.com/dunestar/model600.htm**

[9]**www.qth.com/topten/bdecoder.htm**

[10]**www.advancedreceiver.com** NCJ

# Correspondence

**Peter Chadwick, G3RZP**

### Interesting Point-Counterpoint Article in the July/August Issue

To my mind, the point that is missed by the 'anti-contesters' is that the problem isn't the contest per se, but the level of activity. What would happen if the same number of stations came on and ragchewed as come on for a contest? It would be bedlam!

So if we haven't enough spectrum to support everybody being on, you may well ask why we're always attempting to swell the number of hams? It does seem a little illogical, doesn't it?

One explanation is "use or lose" and this certainly applies to the UHF and microwave bands. But very few hams ever go on those bands anyway, especially newbies.

The argument that many people have only the weekends available for ham radio and contesters should accommodate that is an interesting concept – what time do the contesters have for ham radio? Same limitations apply.

It is fair, I think, to leave 10MHz, 18MHz, and 24MHz contest free, and to try some contest-free zones. The trouble is enforcement, and the ills that can follow enforcement - like how can you be sure that the guy in the contest-free zone really was the owner of that call, and not somebody trying to lose him points?

And I'm all in favor of contests over the "baby broadcaster" on 14275. Although like all broadcasters, that one doesn't listen for a clear channel – it just transmits. The joke was told a long time ago that the motto of broadcasters is actually "it is better to transmit than to receive!"

One final point is that part of Murphy's Law says that if you listen for some time before calling CQ (and even if you ask if the channel is in use) someone will appear and bitch at you for QRMing them. Also, if you've been running on that frequency for an hour or more and conditions change, you'll be accused of QRMing somebody – it was their frequency, after all!

Vy 73, Peter G3RZP NCJ

# The Mother of All Antenna Switches

Ken Widelitz, K6LA / VY2TT

In designing my dream shack for the PEI (Prince Edward Island) DX Lodge, one of my major concerns was how to handle antenna switching. I anticipated the station configuration would often be changed between single op, SO2R, Multi-Single, Multi-Two and Multi-Multi. The antenna switching had to be simple to use, easy and flexible to reconfigure, idiot-proof (lockouts for each antenna selected by each radio) and capable of supporting up to a four-radio Multi-Multi. Because there would be multiple antennas for most bands, automatic antenna selection was not a factor. Multiple antennas for most bands plus WARC and VHF capability made being able to select up to 12 antennas at each radio a requirement.

I decided the easiest way to handle the various configurations would be to have a separate antenna selection switch box for each radio. For SO2R, a single op could use two selection boxes. For multi-ops, the selection boxes could be moved a few feet to the next operating position.

Clearly, there was nothing off the shelf on the market to handle my requirements. I found a tech note on the Array Solutions Web site that showed how two SixPaks could be chained together to allow the selection of up to 12 antennas with two radios. (Figure 1). It seemed to me it shouldn't be too hard to couple two of the chained SixPaks to give me the "12 antennas in / 4 radios out" configuration that I wanted. Wrong! The problem was that neither chained pair would know what antennas were selected by the other, thereby preventing the lock-out function. Discussions with Jay Terleski, WXØB of Array Solutions, ensued. Jay came up with a design that

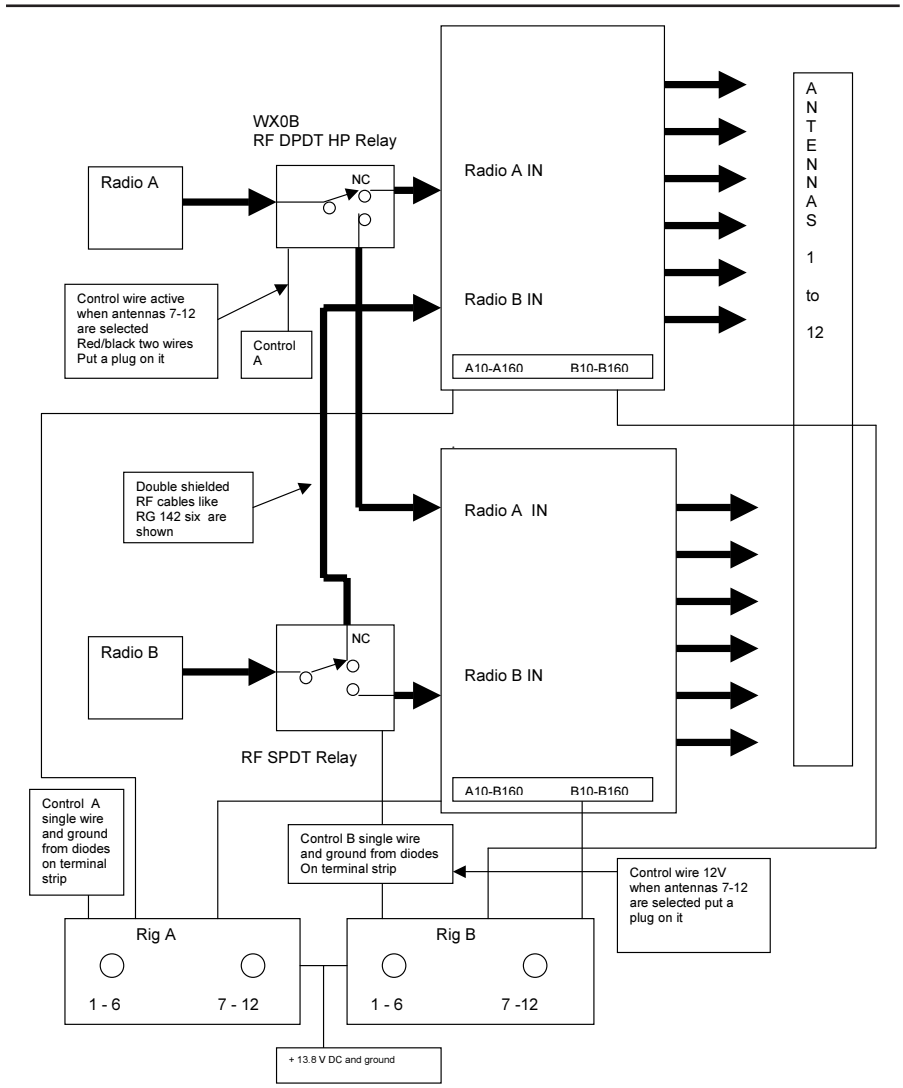



**Figure 1—Feeding more than 6 Antennas with the Array Solutions SixPaks**

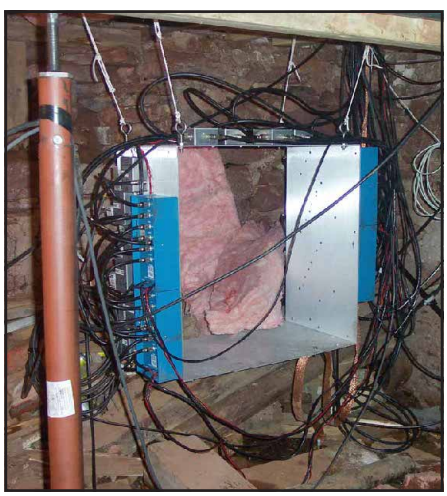


**FIgure 3—The switch mounted in the rafters**

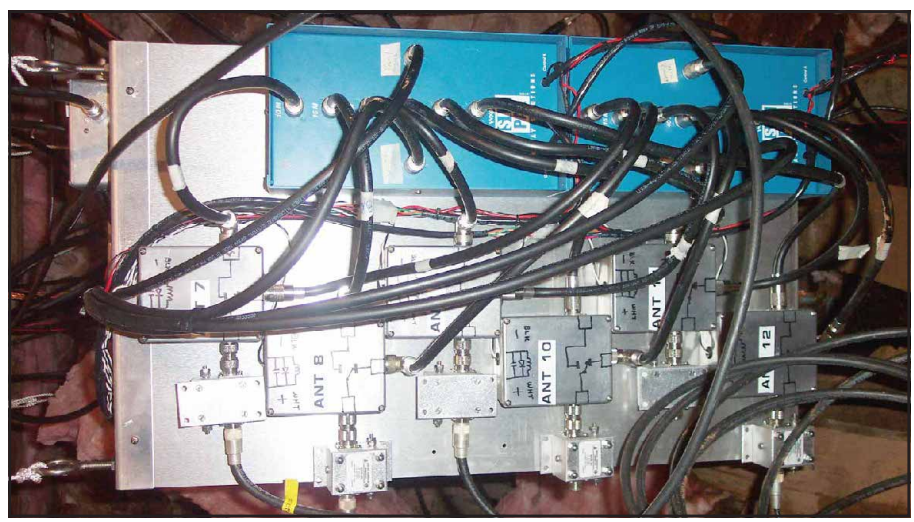



**Figure 4 —Close-up of the switch mounted in the rafters**

would include the lockout. (Figure 2).

I also wanted the switch to act as a bulkhead and central ground terminal for the station. PEI gets electrical storms, so surge suppression for antennas, rotators and control lines was on the spec list. I had considered a "through the wall of the shack" configuration for the bulkhead/switch. The problem was that it gets so cold and windy in PEI that the outside part of a traditional bulkhead could be heated enough from inside the shack during the day when outside temperatures rose that packed snow could melt and, when frozen at night, expand and cause connectors to crack.

The solution ultimately chosen was to hang the switch from the rafters in the basement below the shack. See Figures 3 and 4. All coax, rotator cables and control cables come in through three 4-inch PVC pipes, one in each of three basement walls. Having three entrances reduces cable run lengths, as they don't have to go around the house. The outside entrance of the PVC pipe is packed with steel wool to keep out critters. The basement, while not as warm as the rest of the house, isn't nearly as cold as outside the house. Any melted snow or other precipitation that gets through the PVC pipes drips harmlessly on the dirt floor and is channeled to a sump pump. The dirt floor also offered the opportunity to put the station ground right beneath the antenna switch. The four outputs from the switch plus the rotator and control cables enter the shack above through a small hole cut in the shack floor.

It became clear that this project was bigger than I anticipated, both in terms of the physical size of the switch and the cost. Jay had Bill, N5YA, lay out the components for the switch. It would have to be built on a very bulky 48-inch by 36-inch aluminum panel. Even to get it that small required staggering the surge suppressors for the feedlines, making it awkward to get to the connectors. I suggested a "hollow box" arrangement with the components on the outside and top and bottom feeds. That would allow easier access to connectors and the four sides could be taken apart and shipped separately. While my original design was changed somewhat, it turned out that the cabling was so complex and tight when assembled for testing that it was shipped as one unit in a wooden crate. See Figures 5 and 6.

One more problem arose. While Jay's design included a lockout, in a multi-op there was no way for one operator to

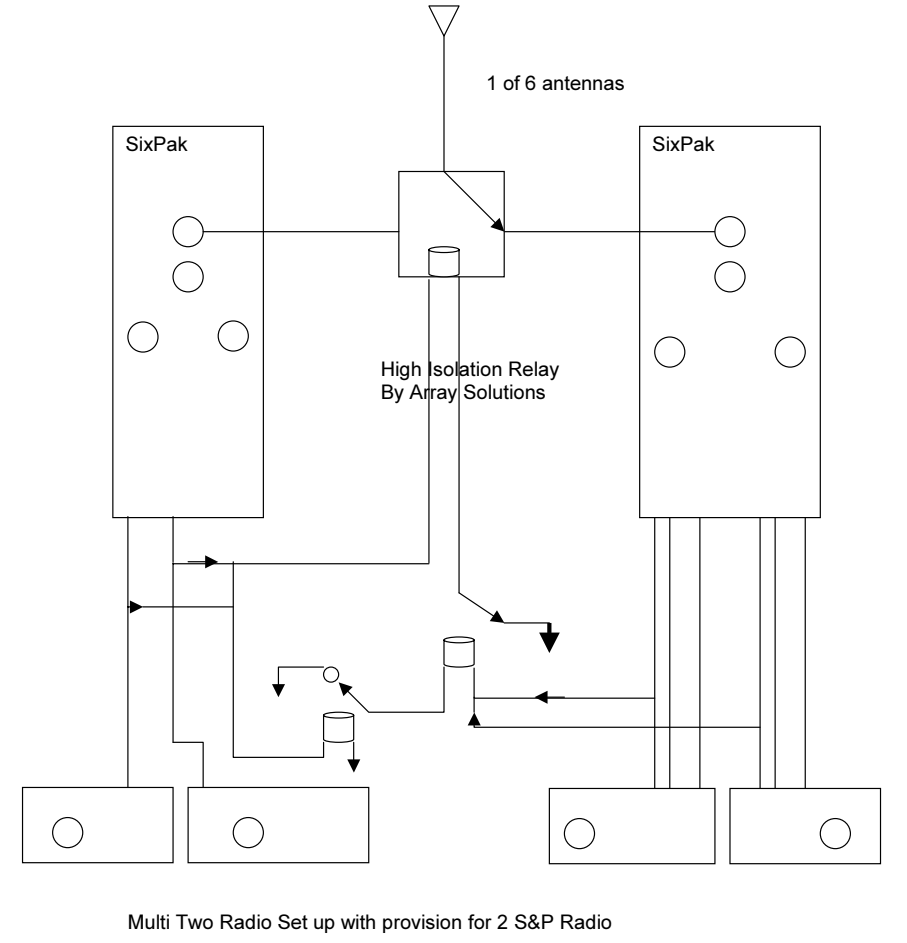



**Figure 2—Array Solutions Multi-Radio Set up for 4 Radios**

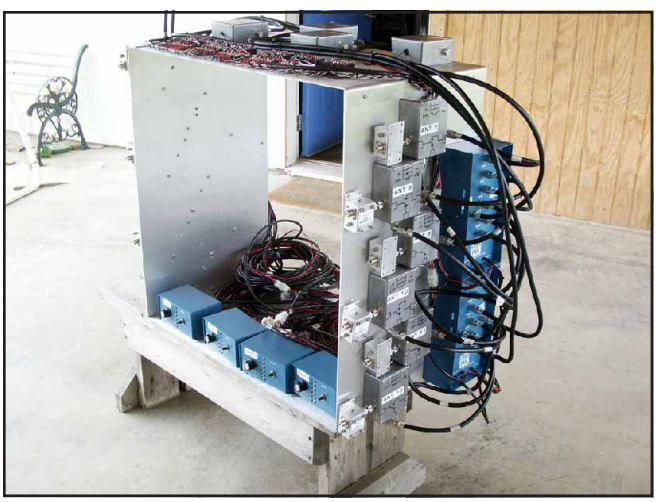


**Figure 5—The switch ready to ship before crating**

**Figure 6—The switch crated up for shipping**

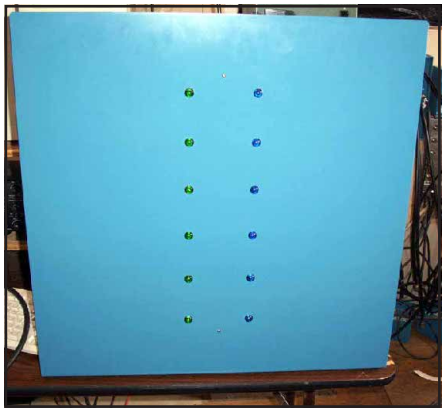


**Figure 7—The switch before all the labels are applied**

know what antennas were in use by other operators. The control boxes at each radio have 12 LEDs, but they only light the LED for the antenna in use by that radio. The solution was to build a large panel with 12 large bulbs that would indicate which antennas were in use. Prior to changing antennas, you just have to look up at the panel. See Figure 7 – the labels are not yet applied.

The downside to the project was that it went way over budget. The upside is that it works perfectly. Any of 12 antennas can be selected at any of 4 operating positions. There is no risk of selecting an antenna in use by another station. It is easy to use - just turn the knob to the antenna you want after checking the big panel. It is easy to reconfigure - just move the control box.

A postscript is a tribute to the extreme weather in PEI. Last July I went down to the basement and noticed the switch was very wet. The humidity in the basement was so high that the insulation installed in the basement ceiling was raining drops throughout the basement. I pulled the insulation away from above the switch and a dehumidifier was installed in the basement. At last check, the switch was dry and functioning well.

***Comments from Jay Terleski, WX0B***

Ken came to me with this idea of a great M/2 switch with two mult stations. First he wanted only one mult station but then changed it to two mult stations and 12 different antennas. No problem. I figured out what it would take, and promptly figured I had no time to build it. So I enlisted the help of Bill Simpson, N5YA, who is good at fabricating and building electronic devices. Here is a partial list of parts we needed for the switch.

| | |
|---|---|
| SixPak controllers | 4 |
| High power RF coaxial relay boxes | 16 |
| Small relays (lockouts) | 24 |
| UHF-83-1AP Right angle adapters | 24 |
| UHF-DM-1 M-M UHF Adapter | 16 |
| PL259 | 100+ |
| LMR400UF | 300ft |
| Connectors for Controllers | many |
| Diodes | 96 |
| Terminal strips | 16 |
| 303U surge suppressors | 12 |
| 349 rotator surge suppressor | 12 |
| Aluminum panels 1/8in 12x34, 18x32 | 5 |
| Big Display (custom plate, painting, wiring, labor, parts) | |

The LMR400 coaxial cable was used to make at least 50 coaxial assemblies, and we hand wired literally a thousand wire jumpers to make all the interconnections. All the jumpers had to have terminal lugs put on them. Bill built hundreds of connections to connectorize all interconnects between the SixPaks, relays, relay logic, etc., so that the unit could be disassembled and re-assembled at the site. As it turned out, the unit was so massive and complex that we were afraid that taking it apart would result in a disaster! So Bill and I crated the whole thing in a box that Bill built at his shop, and off it went to PEI.

Before we crated it we had to test it. We spent hours with dummy loads and capacitors making each possible RF path a 1.0:1 VSWR from the radio to each antenna, at 30 MHz. This was no easy task but it made the switch perfect in my mind. How can such a huge mass of relays, cables, and inductances in the relays work so well? Simple when you know what to do - yeah right! It was just a matter of tweaking each and every path. We're glad we did that since the unit worked the first time Ken plugged it in.

The large display was interesting to build and one that will be much appreciated by Ken's operators. It sure looks cool anyway.

The whole thing went over budget since we just didn't figure how much time it was going to take. I know that I put way too many hours into it and that Bill was totally sick and tired of it when it finally left. But we felt we accomplished something very unique for Ken.

Specifications of the switch are pretty simple.

5 kW CW in every radio to antenna path

1.0:1 VSWR from DC to 30 MHz

4 controllers with LED displays, large display to show all antennas being used

4x12 RF Matrix

Would we do it again? Sure, but it would be constructed a bit differently to make it easier to layout and build. The 3-dimensional cube is a good idea that Ken had. It makes it more compact, and I think we learned how to make it a little more efficiently

NCJ

# New CQ WW DX Contest Award – Memorial to N8SM

The K3LR multi-multi team operators decided to dedicate the W1AW/3 operation in the IARU HF contest last July in memory of fellow teammate Steve, N8SM. I had discussed the IARU HQ operation with Steve in June and he indicated that he might join the effort. As many of you already know, Steve was a fixture on 20 meters from K3LR for many years.

Starting with the 2003 CQ WW Contests, I am pleased to announce the sponsorship of the N8SM memorial award for the USA top combined (SSB + CW) multi-multi high score. The new award, sponsored by the K3LR multi-multi team, will memorialize the friendship and dedication that Steve brought to our sport of radio contesting.

**The CQ WW DX PHONE Crew at K3LR in 1996. L to r: N3BJ, N8SM, K8CX, N3RA, N9RV, K8GL, N9HZQ**

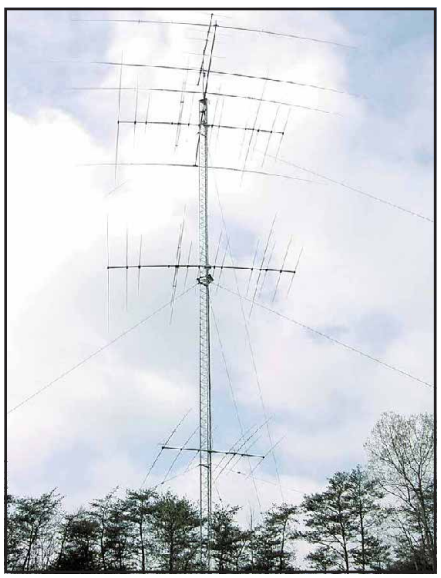
# NCJ Snapshot

## W4RM Multi-Two Contest Station in Virginia

There's a new single-tower multi-two contest station in town (in the town of Nokesville, Virginia, that is). It belongs to Bill, W4RM, and it's on the air and competing.

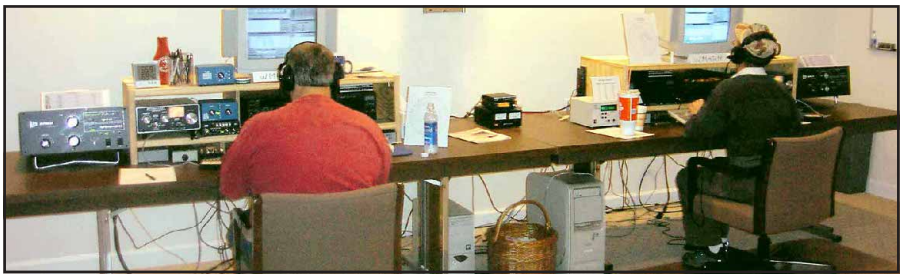
The tower is 110 feet of Rohn 55G. All the antennas are Force 12 designs, and right now the tower is loaded with the following:

EF-706: 7-element 6-meter Yagi at 125 feet
EF-180B: 80-meter rotatable dipole at 120 feet
MAG-340N: 3-element 40-meter Yagi at 112 feet
C31XR: tribander at 104 feet



**The W4RM multi-two tower.**

**Larry, K7SV (top), and Jack, W4NF (below), installing the 3-element Force 12 Yagi.**



**Jack, W4NF (left) and Ed, K5OF (right), during WPX Phone (using the WM4RM call sign).**

C31XR: tribander at 72 feet
WARC-7: 30, 17, 12-meter Yagi at 40 feet

The C31XRs are presently on side mounts, with ring rotors in the works. The WARC-7 beam will be replaced next year with a third C31XR and ring rotor. The station designs are identical, and use FT-1000MPs and Alpha 99 amps, with SixPak and StackMatch antenna switching.

*NCJ* says "welcome aboard" to W4RM—and good luck in the contests!

**Bill, W4RM, during WPX Phone.** NCJ

# Field Day 2003 Year of Murphy

Kevin Bunin, K4PG

I think Murphy caught up to us with a vengeance this year! After many years of mostly trouble free Field Days, Murphy appeared before, during and after Field Day in 2003.

Bob Patten, N4BP, and I have been doing Field Day at the Fiesta Key campground (mile Marker 70) as the Guano Reef Bashful Perverts (GRBP) for more than 30 years. We always have a new pervert or two join us from time to time. For the last two years, Grant Mitchell, N4GM, joined us. We are pretty successful at being prepared and we operate skillfully during Field Day. Our set-up is so simple; Murphy never really visits us except for an occasional blown fuse, until this year.

It started Friday night. Grant and Bob were going to copy the ARRL Field Day message. I had a previous engagement and was not able to copy it. Happily, Bob and Grant copied the message perfectly, but Grant's computer crashed and he lost everything on his computer! Bob thought this might be an omen, but I thought it was just an unfortunate accident.

Saturday morning I arrived at Bob's house. Bob and Grant jumped into Bob's pickup truck, which towed the Scamp trailer we operate from. All was packed and ready to go, or so we thought. More on this later. Two meters kept our vehicles in communication. Upon arrival at Fiesta Key campground we moved into our campsite and surveyed our equipment. Two antennas were to be erected. A 4BTV on the seawall replacing our ugly vertical (an antenna we had used for almost 30 years) and a 40 meter dipole held by a 40 foot push up mast lashed to the Chickee (thatched roof hut) near our campsite. There is nothing but 270 degrees of salt water to help our puny 5 W signal make its way across the US. At 2 PM. the antennas went up…the vertical was not a problem and was very fast and simple to erect. But the dipole is another story.

I started to operate the first shift on 20 meters. The door of the trailer flew open and Bob asked "Are you in the middle of a run?" I said, "Bob, we are QRP and the band is thick with signals. I am search and pounce right now." "Come out and help us with the dipole. The mast is too heavy and we need help to push it upright." Out I went. Up the mast went, down it went right into the Gulf of Mexico! We removed it and decided this time would be a super human effort to push it upright. Bob and I pushed and Grant guided the base from slipping sideways. We almost did it. Bob thought we should quit and let it down. I thought we should give it one more effort to get the mast upright. We pushed and it moved! It broke in half! Experienced old hands, as we are, we did not put the guys and the transmission line back on the ground toward the base clear of rocks and obstacles. They caught in the coral seawall and we pushed until the mast buckled.

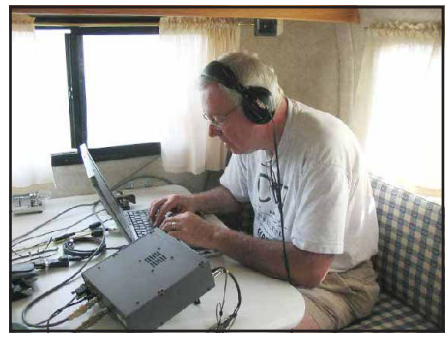
Out came the hacksaw. Grant removed the bad part and did get the mast up and lashed in place okay, although 10 feet shorter. Checking the antenna with the analyzer showed a short. After some time, we deduced the balun was shorted by seawater. The balun was removed and all was well. But the mast went up and down two times before the shorted balun was discovered. Boy, it looked good up there!

We would have a great 40 meter 5 W signal, if only the transmission line reached the K2! The K2 has two antenna connectors. We needed to reach the second connector. Fortunately we had another 50 feet of coax with PL259's on each end. But the usually always ready experienced old hands left the jar of barrel connectors at home. Bob had a switch box that did the trick (wrapped in a plastic bag to protect it from the weather).

### Business as Usual...Sort of

From this point on, Field Day proceeded as usual, almost. We decided to do four-hour shifts through the night. Grant relieved me, Bob relieved Grant, and I relieved Bob. I hit the sack at 4 AM. knowing 8 AM. is my next shift….sleep is needed badly. A shake on my shoulder and the words "you are up" woke me from a sound sleep. Boy! That was the shortest four hours ever! I peeked at the rig and it was Grant! Bob woke me by mistake after two hours of sleep. I reached up and shook Bob. Grant thought Bob was not feeling well

**The FD site**



**K4PG at the keyboard**

**Murphy strikes – fortunately K4PG walked away from this!**

and he is waking Kevin to take the shift. Then Bob jumped out of the rack and Grant went, "oh, oh!" Yes, it was very hard to get back to sleep!

Toward the last hours of Field Day, conditions deteriorated from our location and signals became scarce. We packed up after 25 hours of operation and headed out for dinner at a seafood restaurant in the middle Keys.

**Post Field Day "Excitement"**

Relaxed and headed for chow, Bob and Grant steadily moved north on US 1 getting closer to dinner. I stopped to fill the SUV with fuel. Bob and Grant got about three minutes ahead of me after getting tired of waiting for me. I got back on the road and we eventually made contact on 2 meters again and started our usual chit-chat about "stuff." Traffic was very heavy and stoppages were long. Just as traffic started to move at the 112-mile marker, the SUV in front of me made an emergency stop and started to fishtail, turning sideways. I hit my brakes and moved over to the shoulder to avoid him and avoid a rear end collision from the car behind me. Big mistake. The shoulder of the road was loose gravel and spin grass. I started to fishtail. When I steered back on to the pavement the wheels caught the pavement and, at 10 miles an hour, I rolled over!

My first thought was to get out, get out, get out! But I was trapped upside down with my head tilted on the inner roof liner and glass everywhere. I turned off the engine, unlocked the doors, which would not open. I tried the window and it would not open. Then I spotted my cell phone lying next to me. I called Grant. We had exchanged cell numbers as we left the campground, at my request, just in case we needed each other. Was that a foreshadowing of events to come?

I dialed Grant's number about five times until I got it right. Grant answered the phone and I said "Grant, tell Bob to stop, turn around and come back to get me. I rolled over my SUV and I am trapped upside down. I will need a ride when they get me out of here." There was a three-second pause. Grant asked "Who is this?" I told him it was me! He assured me they are on their way back to me.

By now bystanders are all yelling questions and instructions into the vehicle. Even the kids swimming in the Atlantic came by my window to look in. "He's moving!" one of them exclaimed. Where are their parents, I wondered? The rescue squad got me out. The EMTs examined me for injuries. Bob and Grant picked up all of my belongings and put them in Bob's pick up truck. We headed out, finally, three of us with our knees trapped against the dash and each other. We all agreed to skip dinner and head home.

Feeling guilty about holding everyone up and missing our Florida Keys seafood dinner, I thought I would pay the tolls on the return trip. I had a bunch of quarters and began to give them to Grant to pass to Bob to pay the tolls. But each time I gave Grant quarters, he dropped them. The quarters went to that place all quarters go when they do not want to be found! Okay, I thought. I drop quarters too. Next toll, again, Grant drops the quarters! They get away also. The next toll I handed directly to Bob with the precision of an operating room nurse, smacking them into his hand and making sure he closed his hand tightly around them. We must have been giddy because we were all laughing pretty hard by then!

I got home about 10:30 PM. and just about fell asleep standing up. I was jarred into awareness when, to add insult to injury, my wife informed me the lawn guy mowed my transmission line in half! I checked the antenna Monday evening. I removed one end and soldered on a new connector to other end. Re-connected everything and discovered I needed a barrel connector to complete the run! I should have the barrel connectors soon!

I should mention I walked away without as much as a scratch. The seat belt did its job. Thank goodness. We did achieve a "best score" ever for Field Day with better than 1K in contacts.

I can't wait until next year's Field Day!

NCJ

Wally Stefanov, LZ2CJ
wally@el-soft.com

# LZ9W

There was a time when almost every contester in the world who needed the LZ multiplier in a major CQ or ARRL contest would count on working LZ9A. But due to changes in Bulgaria after 1989 and other circumstances, LZ9A is no longer active.

Fortunately, though, there was a contester who, in the time of the LZ9A reign, dreamed a lot about building himself a good LZ contest station. A few years ago luck came to him at last. Krassy, LZ1ZD, was able to purchase an excellent location—a small hotel near the top of a 900-meter high (and very steep) hill.

Preliminary testing of the station, using a tribander and dipoles in 2000 CQWW, has shown that this place has a lot to offer. So, the building of serious antennas started afterwards. During the summer of 2001, monobanders per WA3FET's design were built and installed for each of the higher bands on separate towers. This was done by LZ1ZD and LZ4AX (Alex, LZ4AX, is now AA3AX and operating K3CR in contests). Just prior to CQWW CW 2001, an HB9CV antenna was put up for 40 meters. Eighty and 160 meters remained less than optimal with just simple dipoles. Due to this and the lack of enough equipment, LZ9W's results as a multi-single in the 2001 CQWW contests were average compared to European multi-single top scores.

In the spring of 2002 Ceco, LZ2FV, and I made the decision to build a competitive single-operator, all-band station at my countryside location (LZ8T). We almost started our project, but then our good friend and excellent contester Danny, LZ2UU, visited us (he was LZ0A or VP8/LZ2UU from LZ Antarctic Base each year between November and March). During his stay in Pleven, Danny suggested that instead of scattering our efforts and funds here and there, we should join forces to build a competitive multioperator station at LZ1ZD's hotel.

***The LZ9W Roster***

**Operators**
LZ1ANA, LZ1HD, LZ1NS, LZ1PM, LZ1ZD, LZ1UQ
LZ2CJ, LZ2HM, LZ2JE, LZ2FV, LZ2PO
LZ3CQ, LZ3FN
LZ5UV, LZ5VK

**Transceivers**
Three IC-735s (LZ2HM, LZ2UU, LZ2PO)
Two IC-746s (LZ1ZD, LZ2CJ)
IC-706 MKII (LZ2CJ)
TS-940 (LZ3CQ)
Two FT-900s (LZ1UQ, LZ2FV)
Two FT-847s (LZ3CQ, LZ5UV)
TR-7 (LZ5UV)

**Amplifiers**
ACOM 2000A (LZ2CJ)
Alpha 91b (LZ1HD)
Alpha 91b (loaned from LZ1JK, ACOM owner)
Two TL922s (LZ1ZD, LZ2PO)
Homemade single-band 40 meter (LZ1ZD)
Some more home brew single band amps are expected to be ready by the end of 2003

**Bandpass Filters**
Designed and made by Andy, LZ2HM and Vesko, LZ1HD

**Antennas: Main Station**
160 meters: inverted-V
80 meters: 2-element phased inverted-V array - switched East/West by relays (a new tower will be erected soon with a rotary 80-meter dipole)
40 meters: Rotary HB9CV and a sloping dipole
20 meters: WA3FET 6-element monobander; KT34A, dipole
15 meters: WA3FET 6-element monobander; dipole
10 meters: WA3FET 7-element monobander; dipole

**Antennas: Multiplier station**
160 and 80 meters: inverted-Vs
40 meters: vertical
20 meters: X7 Tribander
15 meters: 6-element home made log periodic monobander
10 meters: 6-element home made log periodic monobander

**LZ9W multi-multi in action.**

**Twenty-meter antenna (left), 80-meter antenna (middle), and 15-meter antenna (right).**

**Ten-meter Yagi (top) and KT34A (bottom).**

**Twenty-meter position (front), 15-meter position (back right), 10-meter position (back left).**

**HB9CV for 40-meters and the pool.**

To check the place out and to talk about Danny's idea with Krassy, we went to operate in the July 2002 IARU contest as LZ9W. It was a casual operation, with more time spent around the nice pool and bar of the hotel talking about our plans for the future than spending time operating the radios (been there, done that–*Ed*). Krassy accepted our suggestion with great enthusiasm and, after a very successful participation in WAE 2002 SSB, we started preparing seriously for the CQWW contests. In the second half of September a new contest shack was built.

One week prior to CQWW SSB 2002, we gathered at LZ9W and installed a 2-element phased inverted-V array for 80 meters, plus a tribander and dipoles for a multiplier station. I brought my ACOM 2000A amplifier and my IC-746 transceiver; LZ1JK loaned us his Alpha 91b. Krassy also had a TL922 amplifier for the multiplier station and a single-band amp for 40 meters. Thus it was finally possible to combine a nice location, good antennas, enough equipment, and of course, most importantly, good operators! Results came right away. According to claimed scores for CQWW SSB 2002, LZ9W will possibly be in the European Top-Six multi-single box in the final scores!

But as we used to say in Bulgaria, "appetite comes with eating" and we wanted to try multi-multi. We made it happen in 2003 WPX SSB and CW by setting up four separate operating places. We have found multi-multi to be great fun for all of us. We expect a Top-Six World placement in both parts of the 2003 WPX contest, and multi-multi is planned for the 2003 CQWW contests, too.

So, do you need Bulgaria on any band? Then look for the "new kids on the block" in the multi-multi category from Europe—the LZ9W Contest Team! You can be sure that we'll be happy to work you! NCJ

# Proposed Rule Changes for the IARU HF World Championship

**Ric Painter, WO4O**

*What rules need to be changed for the IARU HF World Championship?*

Add LOW POWER category.

Add QRP category.

Add Club/Team Competition.

*Why do the rules need to be changed?*

To increase participation. By adding new competition categories there will be added value to the contest. More participants will increase activity to competefor awards. One example: Did anybody notice the larger than normal number of HQ stations S&Ping due to low activity when they would normally be CQing to keep the rate up? Does anybody believe that the low activity is solely a result of poor propagation?

*How will this rule change affect the costs to administrate the contest?*

Costs will increase.

*How can added costs be offset?*

As administrator for the contest, the ARRL can sell memorabilia, such as pins,coffee mugs, t-shirts, etc. More competition categories equals more participants equals more "buyers" (of memorabilia) equals more money!

*Worse Case Scenario?*

If participation doesn't increase with these rule changes and/or increased costs for changing the rules are not offset, then change the rules back to what they were (i.e., less competition categories).

*Conclusion?*

Arguing that adding costs to add competition categories is prohibitive is not validwhen there is a viable solution. Once we identify the decision makers for rule changes and the policy and procedure for presenting a formal proposal, it is my intent to announce a more developed and detailed plan-of-action to make these changes.

Please address all responses to Ric WO4O at **wo4o@juno.com** NCJ

# 9A and S5 WRTC-Style in the IARU HF World Championship

**Hrvoje Horvat, 9A6XX**

*9A6XX tells the story of the four WRTC-style operations of 9A1P, 9A7P, 9A9D, and S56A.*

In the beginning of the year, 9A5AEI and I (9A6XX) planned an activity to operate WRTC-style during the IARU 2003 contest. Soon after, NØAX put out the idea of organizing scores by WRTC-style stations and that's where we got our idea of organizing at least three WRTC-style stations run by youngsters from our WWYC Club. Teams were selected just a month before the contest, and were based on previous friendships and a wish to meet for the first time. We invited IZ3ESV, DJ1YFK and YT7AW and later also S55A/S56A, as the old guys' team. Unfortunately YT7AW couldn't make it at the very last moment, but the rest of the guys were ready and four teams were arranged. The teams were 9A6NDX and IZ3ESV, 9A5AEI and DJ1YFK, 9A6XX and 9A6NPM, and S55A and S56A. They all were participating from within about a 40 km range – on the Istra peninsula in the northwest part of Croatia.

We arranged our first meeting on the Friday evening and the second meeting on the Saturday morning before the contest. On Friday we had a dinner in 9A6NDX's hometown, visited some local night spots, and then took a short nap at 2 AM. As DJ1YFK was arriving in the early morning, we had to be up around 5 AM to welcome him to the largest town, Pula, on the south end of the peninsula. The action started at 6 AM and right up until the contest started we only had time for a short coffee in Pula. We still had to set up the 9A1P/P station and finish the 9A7P/P setup. After the morning shopping and the conclusion that we are all very tired, we managed to arrive at the 9A1P location. That's where we all met for the first time. We finished everything up and went back to our HQ town of Pazin, which by then was only about an hour before the contest started. At the last moment 9A5AEI and DJ1YFK finished their station and all the stations started the contest at the same time.

The battle itself was more than just good. All the stations were within a few kilopoints throughout most of the afternoon. In the evening, while everybody was still running the high bands, 9A9D/P went down on the low bands and got enough ahead in points such that their lead lasted almost all night. But 9A1P/P caught up, so these two stations were the main battle until the very end – with only few points difference. In the end 9A9D/P won with 1263 QSOs and a few more multipliers than 9A1P/P. Generally we expected over 1500 QSOs but conditions were quite bad so the highest number was 1306, which was made by 9A1P/P. The highest multiplier number was made by S56A/P, mostly due to using the 160m band when no one else did.

After the contest, we all met for a barbeque at 9A7P/P's location, enjoying it until the very late night hours. Finally it was about time to sleep, because for most of us it was a weekend of 50-60 hours staying awake with only few minutes of sleep. It was, however, one good organizing experience and it sure was fun. We must do it again.

The only better fun than this is the real WRTC! You can see pictures of our WRTC-style stations at **www.wwyc.net/events/iaru2003**

NCJ

# W1AW/3 in the IARU HF World Championship

Tim Duffy, K3LR

*Read along as K3LR narrates the W1AW/3 story for this year's IARU HF World Championship. They operated as a Headquarters station in the High Power category.*

Wow! Fantastic operation! It was an honor to be the host flag ship station for W1AW this year. Here are our stations and personnel.

160 CW from K3LR with K3UA operating
160 Phone from W3GH with W3GH operating
80 CW from K3LR with K3LR operating
80 Phone from K3LR with W9ZRX operating
40 CW from K3LR with K8MR operating
40 Phone from K3LR with W9RE operating
20 CW from K3CR with LZ4AX operating
20 Phone from K3LR with N9RV, K8AZ and K8NZ operating
15 CW from K3CR with W2RQ operating
15 Phone from K3LR with K3UA and N3RA operating
10 CW from K3LR with N3GJ operating
10 Phone from K3LR with N3GJ operating

This was a very different contest for all of us. As an HQ multiplier, we really had no one to directly compete against. We felt our job was to make the ARRL HQ multiplier available to as many stations as possible. Even with poor conditions, we gave it our best!

We have a claimed score that is the 3rd highest W1AW portable IARU score (behind the Florida Contest Group and the K5NA operation). We also have the highest claimed multiplier of any previous W1AW portable operation.

The operators in the above list are All-Star Operators in their own right. They are members of the North Coast Contesters, the Mad River Radio Club, the Society of Midwest Contesters, or the Frankford Radio Club.

Thanks to W9ZRX for all of his multi-site networking skills. The log is perfect!

Thanks to Jim, WA3FET, for making sure the K3CR station was ready to go. His pit crew was N3EB, KB3FUM, KB3HUZ, K3YV, N3FZ, and W3FET.

73, Tim K3LR


**Left to right: K8NZ, N3GJ, K3UA, K3LR, K8AZ, N3RA, K8MR, W9ZRX, W9RE, N9RV**

**Team Leader W1AW/3**
**2003 IARU HF World Championship W1AW/3 Summary:**

| *Band* | *CW Qs* | *Phone Qs* | *Mults* |
|---|---|---|---|
| 160 | 190 | 27 | 26 |
| 80 | 291 | 336 | 49 |
| 40 | 900 | 958 | 75 |
| 20 | 1421 | 1779 | 108 |
| 15 | 789 | 727 | 83 |
| 10 | 144 | 157 | 18 |
| Total: | 3735 | 4084 | 359 |

Total Score = 8,548,867

NCJ

# SNØHQ in the IARU HF World Championship

Tom Barbachowski, SP5UAF

Over the last few years the IARU HF World Championship contest has changed its appearance. In many countries, the attention has focused on the scores of the HQ stations. The activities of the SNØHQ team are a perfect example of this trend.

The Polish HQ station participated for the first time in the 1994 IARU Contest. That year our station, under the 3ZØHQ call sign, placed 10th in the world with a score of 628,575 points (1777 Qs, 145 mults). In 1995 the Polish HQ station used the SPØHQ call sign and was awarded 7th place in the world with the score of 6,882,645 points (7305 Qs, 295 mults). Sadly, in the years 1996 through 1999, the Polish Amateur Radio Union was not represented in the IARU HF World Championship.

The situation improved in 2000 when many valuable people, with a lot of Amateur Radio experience, got involved. As a consequence, the strong SNØHQ team has crystallized.

In the last three years, the operations of SNØHQ have been well organized. This is backed-up by a detailed analysis of the scores from the previous years together with a constructive discussion about the future tactics.

The team members meet twice a year. At the meeting prior to the contest, the main issues are allocations of band/modes to the given locations and the final tactical arrangements. After the contest we meet to analyze our score, find the weak points and make arrangements to improve the team's future performance.

Recently, opinions have been expressed that the contest rules leave room for improvement. The SNØHQ team would strongly support positive changes, especially in regards to clearer regulations concerning the rules of entry. We feel that these changes would bring the true ham spirit back to the contest.

Our participation in the contest always gives us lots of valuable experience mixed with real Amateur Radio fun, and motivates our members in a positive way. In some ways we are contesting against ourselves in the art of true radio championship.

The operations of SNØHQ represent the commitment and devotion of the handful of passionate Polish contest operators. The location managers have given more than one hundred percent to ensure that their stations are perfectly prepared to keep up with the demands of the contest. The team's approach to the whole idea of the contest has given us a perfect opportunity to promote the spirit of contesting and Ham radio as a way of life. We are proud to be a part of this honorable hobby.

The following operators took part in the SNØHQ 2003 effort (53 persons total): SP2BZW, SP2FAX, SP2JKC, SP2WKB, SP3DWQ, SP3GEM, SP3HRN, SP3J, SP3RBR, SP3VT, SP4GFG, SP4R, SP4Z, SP5GRM, SP5HNK, SP5UAF, SP6A, SP6CZ, SP6DNS, SP6EKS, SP6GCU, SP6HEQ, SP6IXF, SP6MQO, SP6T, SP7GIQ, SP7MTF, SP7MTU, SP7NJX, SP7PS, SP7VC, SP8ATI, SP8BRQ, SP8FHK, SP8FUX, SP8NR, SP9NLH, SP9P, SQ2CFB, SQ3A, SQ4NR, SQ5IRO, SQ7EQC, SQ7FPD, SQ8JLA, SQ8JMU, SQ8JX, SQ9IET, SQ9SO, SQ9UM, DJØIF, PA3EYZ, and US5WDX.

**Antennas at the home of Kazik, SP2FAX**


**The SNØHQ team at the after-contest meeting. Not all the operators are pictured – many could not come.**

# GB5HQ Steps up to the Big League

Dave Lawley, G4BUO
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Plans for the RSGB HQ station GB5HQ in the 2003 IARU contest were laid in Helsinki at WRTC-2002. The UK team, referees and visitors all agreed that it was time we stepped up to the big leagues. For several years Chris Tran, GM3WOJ, had done a great job hosting GB5HQ from his multi-multi, GM7V, in the north of Scotland, but with limited operator availability GB5HQ could only be worked on a few band/mode slots.

On the plane coming back from WRTC, I drew up a wish list of contest stations around the UK that I thought could make a contribution to the RSGB headquarters station. As a member of the Society's HF Contests Committee I volunteered to coordinate GB5HQ in 2003. An Internet discussion group was set up, initially involving all the WRTC attendees and expanding as we recruited station hosts and operators. We soon learned of the work put in by W5XD to add an Internet server capability to *WriteLog*, and of the successful use of this in 2002 by the W1AW/5 stations located at several sites in Texas. We felt it was essential to use this technology to connect all the GB5HQ stations via the Internet so that log information could be shared in real-time, thereby maximising opportunities for passing multipliers.

With help from RSGB President G3PJT, an approach was made to the UK Radiocommunications Agency for permission to use the same callsign simultaneously on multiple band/mode slots from different locations. This had not been done before in the UK. The licensing authority gave permission, but did require a schedule of locations and contact numbers, together with shutdown procedures should any problems arise.

I had hoped to run GB5HQ from about half a dozen sites, using the multi-multi capability of stations such as GM7V and M6T, but this didn't prove possible. In the end only G3LZQ was able to host more than one band/mode slot. In addition, I made the decision early on to have a single station for topband that would alternate between phone and CW operation. In retrospect this mistake probably cost us at least a hundred QSOs. So in the end GB5HQ operated from ten different sites around the UK - see the table for details. Each station host was responsible for configuring his station and recruiting operators but the amount of preparation varied, with several hosts putting up special antennas for the contest. The 15m phone team operated Field-Day style – but they were not under Field Day rules so they had the luxury of mains electricity.

We scheduled several practice sessions in the weeks leading up to the con-

| *Band/Mode* | *Host and Location* | *Operators* |
|---|---|---|
| 10 m SSB | GW5NF – South Wales | GW5NF, G4FRE, G4VXE |
| 10 m CW | G3LZQ – Yorkshire | G3LZQ, G4BYG, G3AB, G3SJJ, G4OBK |
| 15 m SSB | Granta Contest Group – Cambridgeshire | G4AXX, G4KNO, G4EAG, G4JVG |
| 15 m CW | G3TXF – North Devon | G3TXF, G3SXW, G3WVG |
| 20 m SSB | Martlesham Radio Society – Suffolk | G4PIQ, G4BAH |
| 20 m CW | GM3WOJ – North Scotland | GM3WOJ, GMØGAV |
| 40 m SSB | Bristol Contest Group | 3XSV, G3TKF, MØMAT, G4FKA |
| 40 m CW | G4BWP – Suffolk | G4BWP, G5LP |
| 80 m SSB | Open University RS – Milton Keynes | G4BJM, G0MTN, MØBEW, MØCMK, MØAWI, M3TAY |
| 80 m CW | G3LZQ – Yorkshire | as 10m CW above |
| 160 m SSB/CW | GØIVZ – Cornwall | GØIVZ, G4TSH |
| Reserve | G4BUO – Kent | G4BUO |

**Ten meter four over four stack at G3LZQ's station. Dipole for 80 meters also used by GB5HQ and supported at the top of the mast extension.**

**Pair of 15 meter 4 element yagis at 75 feet erected just for the contest at G3TXF's contest station in Devon. L to R Nigel, G3TXF, Ian, G3WVG and Roger, G3SXW.**

**The 15 meter phone station was run field-day style from the small hut mounted on the trailer which supported a 3 element beam at 90 feet. L to R Simon G4EAG, Andy G4KNO, Junior op Tom, Mark G4AXX, Steve G4JVG**

**Five element twenty meter beam at GM3WOJ's station near Inverness**

**The Bristol contest group had to set up their antennas from scratch for the event. Here one of the team assembles the Cushcraft 40-2CD.**

test so that we could get familiar with *WriteLog* and the process of sharing QSOs across the Internet. The methods of connection varied: a few sites had the benefit of broadband access, one had a satellite connection, one used General Packet Radio Service (GPRS) with a mobile phone, but most of us had to rely on dial-up. In the actual event dial-up was adequate, but we had major problems with the GPRS software interfering with *WriteLog* (or vice versa) and we would not consider trying to use GPRS for this purpose again. Also on the technology front, the Web site **www.gb5hq.com** was set up by G4KIU and you can route QSL requests to manager G3TXF via this site.

As coordinator, I had decided that my role during the contest would be to search for multipliers and provide 'hot standby' in case any of the stations had problems – being connected to the server like all the others, I had a full view of the log. This came into play when the central server crashed which meant that G4PIQ had to stop running 20 meter phone for a while in order to sort out the problem. To our great relief, *WriteLog* recovered from this hiccup and no QSOs were lost. *WriteLog* was sending several hundred bytes over the net per QSO, and the catch-up process was time consuming, but at least it worked. However, with several sites having connection problems, the post-contest log merge process was very complicated.

From the start, we had realized that the German station DAØHQ was the one to beat, and this was our focus in the planning phase and, of course, during the contest itself. The Germans benefit from a great level of support from German amateurs, which despite our efforts we could not match in numbers of United Kindom QSOs. On the other hand we probably have an advantage being in zone 27 which has less activity than zone 28, and the figures on 3830 after the contest confirmed this: we had nearly 13k QSOs to their 19k, but our claimed score of 17.1M is not far behind DAØHQ's 17.8M. Perhaps the gap can be closed during the checking process, but in any case we learned a lot this year and will be back for another try in 2004, though sadly GM3WOJ who has been the mainstay of GB5HQ will have emigrated to New Zealand by then.

GB5HQ's first big-time outing in the Radiosport contest benefited from some great teamwork involving many of the best UK contesters, and I'd like to thank the whole team: G3AB G3LZQ G3SJJ G3SXW G3TKF G3TXF G3WVG G3XSV G4AXX G4BAH G4BJM G4BWP G4BYG G4EAG G4FKA G4FRE G4JVG G4KIU G4KNO G4OBK G4PIQ G4TSH G4VXE GØIVZ GØMTN G5LP GM3WOJ GMØGAV GW5NF MØAWI MØBEW MØCMK MØMAT M3TAY. NCJ

# Antenna Interactions–Part 3

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## When Good Aluminum Goes Bad

Part I introduced meta-tools that give a more comprehensive view and statistics about an antenna system's radiation pattern.[1] Part II applied those tools to twisted stacked Yagis which point in different directions, identifying some problem situations that contesters may encounter.[2] This part examines self-interactions within a stack and siting problems that may come up in the design of a contesting station.

*Note* — Many figures are not included in the paper edition of *NCJ*. All figures and a complete copy of this article, as well as animations and software tools, are available from the bonus section of the *NCJ* Web site: **www.ncjWeb.com**.

### Perspective

In an exchange of e-mail triggered by earlier parts in this series, Joe Johnson, K3RR, reminds all of us that antenna model output patterns cannot be taken literally. One can not run a *NEC* model, point to the main lobe, and say "If I build this system, I will get 14.3 dBi gain on 20 meters at this elevation and azimuth." In particular the *NEC* models assume a flat ground of uniform characteristics. The shape and electrical characteristics of the terrain around the station greatly influences the actual radiation patterns. At low elevation angles, a patch of earth a couple of miles away (even on relatively flat terrain) will influence the pattern of high antennas (150 to 200 feet elevation).

The Brian Beezley, K6STI, *TA* software[3] and Dean Straw, N6BV, *YT* software[4] packages offer a first level of insight into terrain effects on horizontally polarized antenna systems with a vertical plane of symmetry along the main beam (such as stacked Yagis). However, this software only examines radiation in that one vertical plane along the axis of the main beam. The software considers only the component of slope of the terrain along this one azimuth. For these two reasons these packages cannot currently be used to analyze the full sky hemisphere as has been done with *NEC4* in these articles. Nevertheless, within these limitations *TA* and *YT* have shown that terrain effects on patterns can be quite large: 10 dB and even more in some cases.

Properly designed models save considerable time and expense in designing or optimizing antenna systems for good patterns for the intended application. Real world terrain effects will modulate those patterns, sometimes substantially, but one is better off installing a good design, rather than a mediocre design, over any terrain. As tools like *TA* and *YT* get better, we may gain more insight about where within the available terrain the well-designed antenna system should be located to take advantage of terrain-induced enhancements and avoid terrain-induced impairments.

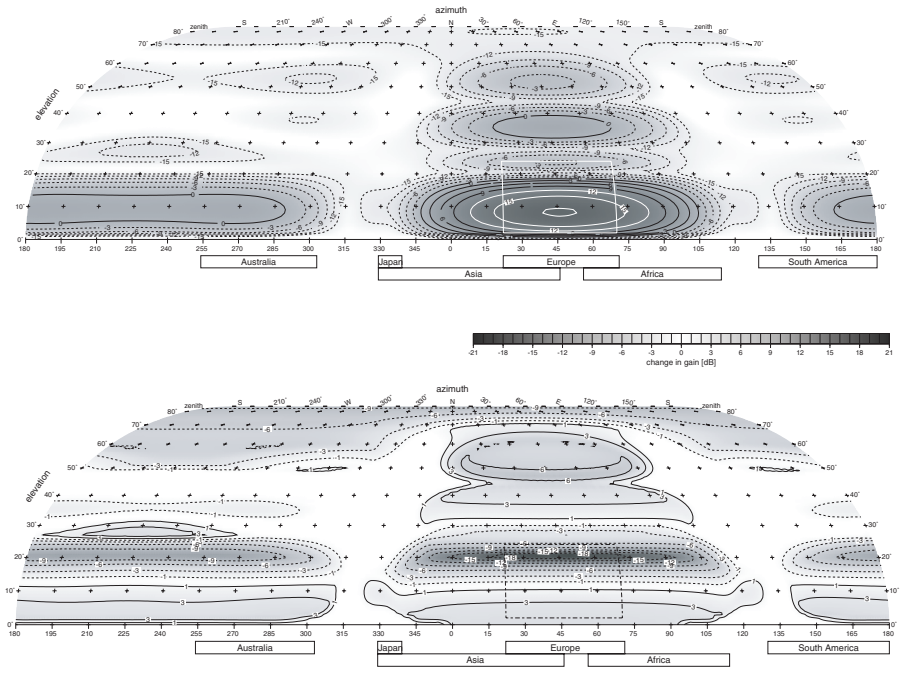


**Figure 1 — Top: Pattern of a stack of three 6-element OWA Yagis at 50, 100 and 150 foot heights. The bottom and middle antenna are fed in phase with equal currents. The top antenna has been forced to have zero current at the center of its driven element. Bottom: Difference in gain between the pattern of this system and the reference two-Yagi stack. The presence of the additional Yagi at 100 feet, even with zero current at the feed-point, introduces some variations in the pattern. There is no operationally significant change in the target zone, but parasitic interactions change the minor lobes by –6 to +4 dB.**

### Difference Meta-Tool

A visual comparison of sky hemisphere pattern maps, such as the animations used in Part 2, yields a qualitative grasp of changes. Spot checks of the raw data provide quantitative numbers for the changes at locations of interest – but digging through many MB of data quickly becomes tedious.

An additional meta-tool, *NOUDifference*, available on the *NCJ* Web site, subtracts the sky hemisphere patterns of two antennas and generates a sky hemisphere map of the resulting difference in gain. Where the second pattern exhibits lower gain, red or, in extreme cases, orange appears in addition to contour lines; for greater gain, green or turquoise appears. (Monochrome versions appear in the paper edition of the *NCJ;* all figures are available in full color on the Web site.) Within the target zones and untargeted region, the location and value of the largest increase and decrease in gain are summarized. The median changes in gain for each zone and the untargeted regions are also included in the statistics tables.

To avoid over-emphasizing changes in signals that are already relatively weak, *NOUDifference* excludes any differences that occur at levels below a floor of –15 dBi. (Remember, this is –15 dB relative to isotropic. For stacked Yagis

under examination here, these parts of the antenna pattern are 25 dB or more below the main beam's peak gain.) If a minor lobe at –20 dBi increases to –16 dBi, that 4 dB increase in gain is ignored by *NOUDifference*. Similarly, if a minor lobe at –10 dBi drops to –20 dBi, *NOUDifference* plots only the first 5 dB of that drop. As was pointed out in Part 1, deep pattern nulls are unlikely to be completely realized in actual construction. This approach reduces the likelihood that the viewer's eye will be drawn to large changes in parts of the sky with very weak signals, and similarly avoids skewing the pattern change statistics.

**Intrastack Interactions**

Two and three Yagi stack models used to date have excluded any unfed antennas. Let's examine a stack of three 20 meter Yagis at K4JA's location where only one or two of the antennas are fed. The antennas are identical 6-element OWA designs at 50, 100 and 150 feet. The target zone is Europe.

Figure 1 contains two maps. The top is the pattern when all three Yagis exist, but with the top antenna's feed- point current forced to zero.[5] Qualitatively this pattern remains quite clean and very similar to the reference pattern. The middle antenna's feed-point impedance has increased very slightly from 28 to 29Ω.

To give a better understanding of how to interpret a difference map, let's look at the lower part of the figure in some detail.

The difference statistics (included in the Web site version of the figure) for the Europe target zone show a median change of 0 dB; i.e., net minimal effect overall. At some locations in this part of the sky the lower elevation angles drop by 0.4 dB, not operationally significant. At the higher angles of this zone gain has increased by 0.9 dB – again of very minor operational significance.

Elsewhere around the sky, signals at 30-40° elevation angles in the forward direction increase by as much as 4 dB. While a contest operator in New England has little concern with this higher angle forward lobe, DX contesters elsewhere in the USA may wish to minimize these high angle forward lobes – the lobes that deliver other domestic contest signals into their receivers.

Similarly, the rear lobe of this stack has increased 3 dB over the reference pattern. The energy for these increased minor lobes has been provided by a broad reduction of as much as 6 dB in the lobe that points straight up to the zenith. On 20 meters, the zenith lobe is unlikely to deliver much interference to the operator as the ionosphere rarely exhibits very high elevation angle short skip propagation at this frequency.

From an operational perspective, compared to the reference, this system is the same towards Europe, with perhaps a bit more sensitivity to local, higher elevation signals. It is still a very clean system.

*Driving the Stack*

To achieve this particular result the top Yagi feed-point current must be forced to zero. This condition requires more than simply disconnecting the coax run for the top Yagi at the stack switch box. The stack feed system also must be designed to present an open circuit *at the center of the driven element*. The matching system (e.g., the gamma, hairpin, or T-match) ***and*** the balun ***and*** the coax to the stack switching system, as well as the switching system itself, must work together to deliver an open circuit condition at the center of the driven element. For example, a choke balun built from a 10-turn coil of coax 25 cm in diameter adds 7.85 meters to the length of the line between the matching system and the switchbox; this length of line must be included when calculating the impedance at the driven element.

What happens when the stack feed system fails to force zero current at the top Yagi feed-point – simply disconnecting the coax at the switch box, but not presenting an open circuit at the center of the top Yagi driven element? Depending on the impedance presented at the driven element, parasitic currents induced in the top Yagi by the lower antennas will be somewhat different than the open-circuit case.

For example, Figure 2 has the pattern (top) and difference from the reference case (bottom) with a short-circuited driven element. Surprisingly, the results are quite similar to the open-circuit scenario. Pattern changes within the European zone remain operationally insignificant. The rear lobe impact is the same. The increase in forward higher angle lobes is a few dB less than the open-circuit scenario. One could argue the short-circuit feed-point is a marginally better scenario than the open-circuit case.

*Twisting the Unused Antenna*

In an effort to mitigate the already small parasitic effects from the top Yagi, the antennas can be realigned to reduce coupling. In Figure 3, the top Yagi is twisted 90° off to the left. Figure 3's difference map demonstrates the twisted, short-circuited top Yagi no longer interacts with the two driven lower Yagis in any meaningful way. In Figure 4 the unused top Yagi feed-point is open circuited (zero current); parasitic interactions remain insignificant at ±1 dB, worst case.

The *NCJ* Web site contains an animation in which the unused, short-circuited top Yagi is incrementally twisted away in 10° azimuth steps until it points in the opposite direction, a scenario illustrated in Figure 5. Parasitic interactions in the Europe zone remain operationally insig-

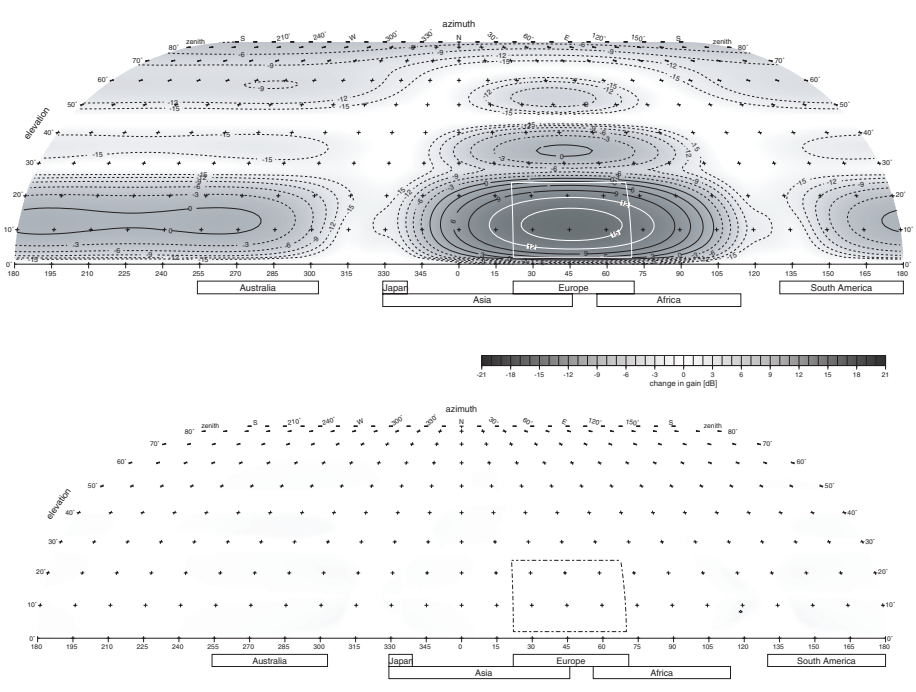


**Figure 3 — Same as Figure 2, except the unused, short-circuited top Yagi has been twisted 90° to the left. All parasitic interactions have been reduced to <=1 dB. Within the Europe target zone parasitic interactions are zero.**

nificant. The rear lobe is down about 4 dB. Other minor lobes at higher takeoff angles increase by as much as 6 dB.

*Bottom Only*

Figure 6 shows the pattern of the three-Yagi stack with only the bottom antenna driven. The middle and top antennas are forced to have zero current at their feed-points; e.g., an open-circuit feed-point impedance. The feed-point impedance of the bottom antenna changes less than 1Ω, compared to the reference case of a single Yagi (with no other antennas). Parasitic interactions, however, modify minor lobes by –9 to +7 dB. Within the Europe target zone, gain has decreased by a median amount of 1/2 dB, which isn't operationally significant. Gain is down 1.6 dB at the bottom corners of the target zone.

When the unused Yagi feed-points are short-circuited, parasitic impact on the pattern in the Europe target zone falls by more than half to insignificant levels. Minor lobes elsewhere are still affected by –10 to +7 dB. Again the rear low elevation angles increase by as much as 7 dB at some points. The deterioration of the rear lobe will not be welcomed by an East Coast contester trying to ignore the Western USA competitors off the back of his antenna. (Don't be distracted by the 6 dB drop in rear lobe pattern between 30 and 40° elevation angles. The reference antenna pattern was already a weak –8 to –15 dBi in this region.)

By now we are not surprised to see in Figure 8 that rotating the unused top and middle antenna 90° reduces parasitic interactions to negligible levels.

*Conclusions*

The contest station designer and operator of a stacked Yagi system should be aware of the following:

Disengaging the unused Yagi of a threeYagi stack with a feed system that presents either a short or open circuit at the center of the driven element does not introduce operationally significant impairments to the main beam of the remaining fed antenna(s).

Choosing short-circuit feed-point impedances on the unused antennas reduces the minor parasitic interactions with the main beam by half.

Other parasitic interactions with the minor lobes range from –10 to +7 dB. For the case in which only the top antenna is unused, these parasitic interactions may be cut in half by short-circuiting the top driven element feed-point.

All parasitic interactions can be minimized to no worse than ±1 dB by rotating the unused Yagi(s) 90° in azimuth with either a short or open circuit on unused feed-points.

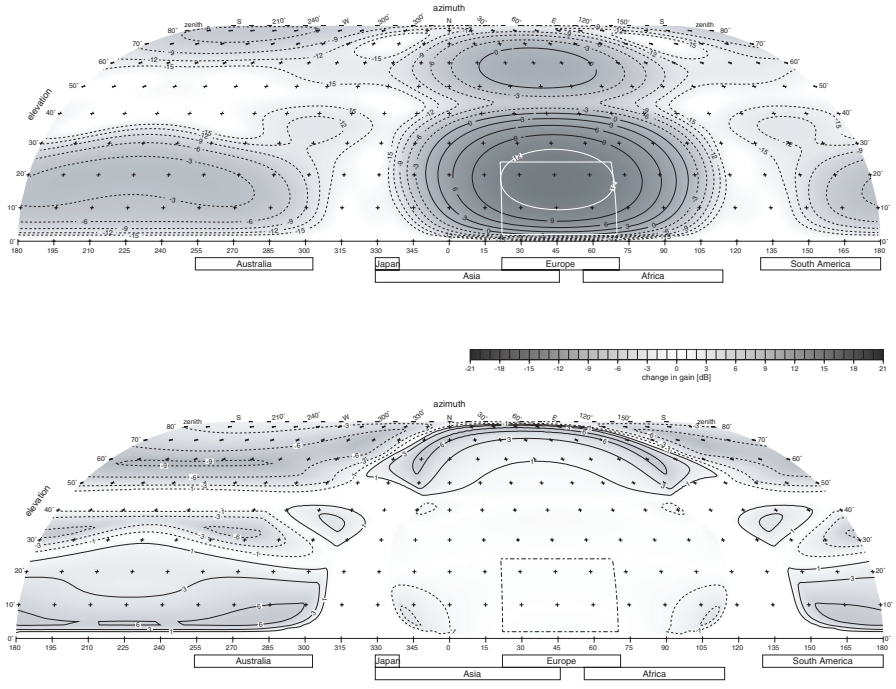


**Figure 6 — Top: Pattern of a stack of three 6-element OWA Yagis at 50, 100 and 150 foot heights. Only the bottom antenna is fed. The top and middle antennas have been forced to have zero current at the center of their driven elements. Bottom: Difference in gain between the pattern of this system and the reference single Yagi at 50 feet.**

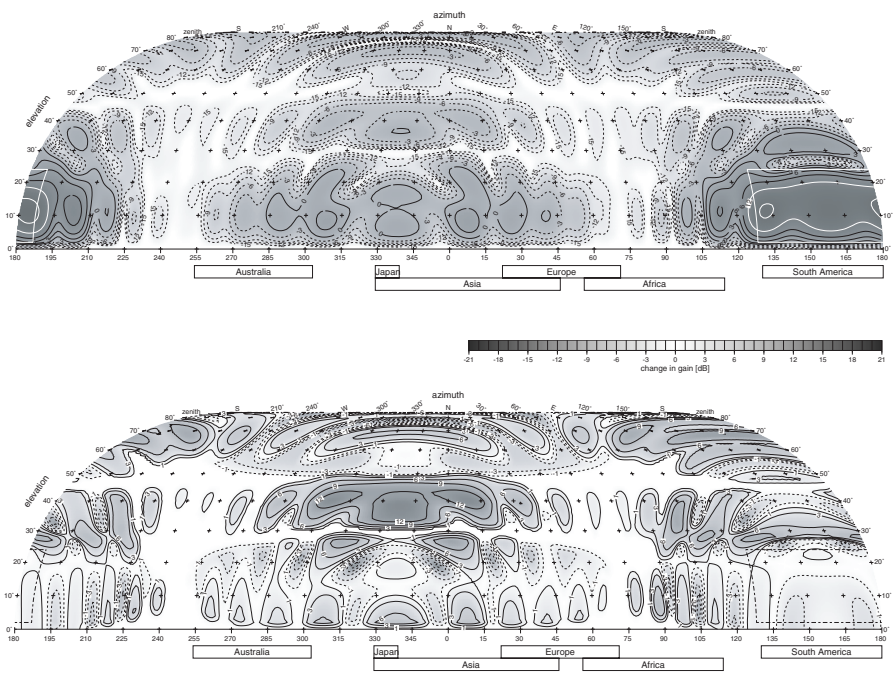


**Figure 9 — Same three-Yagi stack rotated to South America (160° azimuth). The middle and bottom Yagis are fed with equal current in phase. The top Yagi is open-circuited at the feed-point. In the foreground, 385 feet away, another tower supports two unused 20 meter Yagis with open-circuited feed-points. Despite the 5 1/2 λ separation between the antennas, substantial parasitic interactions occur.**

Presenting a short or open to the unused feed-point requires a stack switching and feed system design that takes into account the driven element matching system, balun and coax lines between the switchbox and the antennas.

Despite intrastack parasitic interactions, the radiation patterns remain clean. The main and minor lobes are smooth.

### Intrasite Interactions

Paul, K4JA, has graciously provided details of his extensive antenna farm to illustrate the meta-tools and explore stacked Yagi design issues. In Figure 9, K4JA's complete 20 meter antenna farm has been modeled. The three-stack of six element OWA Yagis that we have been examining in these articles has now been rotated to face South America. The South America target zone for a station in the Washington DC area has been set to contain elevations up to 24° for undisturbed conditions. In order to fill the target, only the bottom two antennas are fed (equal currents in phase); the top Yagi of the stack is unused and open-circuited at the feed-point. A quick glance at the figure shows a very messy pattern! Within the target zone, the main beam varies by more than ±4 dB from the reference case. Outside the target zone deviations of over ±14 dB exist on all the minor lobes. The rear lobe is especially bad, up over 9 dB at many points exposed to higher-angle short skip interference. At lower angles the rear shows 3 dBi gain just 12 dB below the main lobe.

### What's Wrong Here?

K4JA's station includes 2 more 20 meter Yagis on a tower 385 feet from the 20 meter stack, in the direction of South America. At the 130 foot height is the station's multiplier chasing antenna: another 6-element OWA Yagi on a 48 foot boom. At 91 feet a 5-element Yagi on a 36 foot boom is fixed on South America. In the model these two Yagis are unused, with their feed-point currents forced to zero (open circuit) and the multiplier antenna pointed to 340° azimuth, towards the 20 meter stack. Despite the 5 $^1/_2$ $\lambda$ separation between the 20 meter stack and the multiplier/South America Yagis, significant undesired parasitic interaction occurs when the stack is pointed to South America, producing this messy result.

Despite interaction between these antennas, the feed-point impedances of the two lower antennas in the stack have changed by only small amounts. The middle Yagi feed-point impedance increased by 1 $\Omega$ compared the reference case, and the low Yagi's impedance has increased by just 4 $\Omega$. Some people think a dramatic change in impedance is indicative of an interaction problem. While that can be true, here is one scenario in which antenna interactions are occurring with only a very slight impedance variation.

In Part 4, we will examine intrasite interactions more systematically, and discuss steps to minimize the impact of other antennas at the station.

### Notes

[1] E. Scace, K3NA; "Antenna Interactions – Part 1: Stop Squinting! Get the Big Picture", *National Contest Journal*, Jul/Aug 2003, pp 19-23.

[2] E. Scace, K3NA; "Antenna Interactions – Part 2: Twisting Stacks", *National Contest Journal*, Sep/Oct 2003, pp 3-8.

[3] *TA* is a *DOS*-based program. It's unclear if *TA* is still supported. Try Brian Beezley K6STI; 3532 Linda Vista; San Marcos CA 92069.

[4] Available with *ARRL Antenna Book 19th Edition*, Dean Straw, N6BV, editor, ARRL, Newington CT USA, 2000.

[5] A little trick is required here. If 0.00000 current is supplied on the EX card, *NEC* forces the current to be 1 A at 0° phase. One workaround is to specify a tiny current, e.g., $10^{-10}$ A, to *NEC*-4. Another is to break open the driven element geometry with a tiny gap. The difference in pattern was below 0.02 dB throughout the sky hemisphere between these two approaches. This difference is insignificant.

NCJ

# IC746PRO vs. IC756PROII — A Contester's Comparison

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This is a companion article to the one I wrote for the May/June 2002 issue of *NCJ* entitled *A Contester's View of the IC-756PROII*. Since that article was written, I have put considerable mileage on a pair of '756PROII's, and ICOM has introduced the IC-746PRO.

What I have provided in this article is a qualitative evaluation of my overall experience with the '756PROII and a comparison of the '756PROII to the '746PRO. I do not generally operate data, VHF, RTTY, AM or FM, so I have not included any evaluation of these modes.

*QST* published detailed product reviews by Rick Lindquist, N1RL, of the IC-756PROII and IC-746PRO in February and May 2002, respectively. Each of these articles provided excellent technical reviews of the radios, including performance characteristics, laboratory measurements and comparisons to previous versions of each model. The May 2002 article also provided a "side by side" comparison of the two radios. A detailed study of the '746PRO receiver's performance numbers described in that article will lead you to conclude that the receiver is on balance with that of the '756PROII — a conclusion that I can second after doing on the air comparisons of both radios. I recommend a review of these two articles, which are available to members on the ARRL Web site.

My two IC-756PROIIs have been subjected to heavy use in contests, routine daily operation and three trips to Dominica (J7) where multiple operators used them. With the exception of one failure caused by lighting and another from operation with a faulty amp, these '756PROII's have performed flawlessly.

A new IC-746PRO used in the August NAQP SSB contest and during two weeks of daily operation (rag chewing and chasing DX) was the basis for comparing the performance of the '746PRO to that of the '756PROII. I found the sensitivity and selectivity of the '746PRO's receiver, as well as its dynamic range — the ability to copy a weak signal in the midst of adjacent strong QRM — to be excellent. On the transmit side, I found the '746PRO to be equal to the '756PROII. I have not had a chance to use a '746PRO in a CW contest, but I have no doubt that its basic performance would score on a par with my '756PROIIs.


**The author standing over the '746PRO and '756PROII**

### Similar Features of the Two Radios

Many features of the '746PRO and the '756PROII are identical and I have nothing further to add about their functionality. These features include: MIC, PHONES, SPEAKER, NUMBER KEYPAD, RIT & ?TX, TWIN PBT, NB, MEMORIES and XFC.

Other apparently similar features of both radios are important to discuss, however. These are features of the radios that I feel are especially important to understand, either because I have learned something about them through experience, or because they are subtle and I believe need to be highlighted.

#### *Basic Radio Functions*

When it comes to the basic receive and transmit capabilities of the two radios, they are essentially equal in terms of functionality and performance. Both have 100 W output transmitters. They both use the same DSP engine. Both cover 160 through 6 meters, although a big differentiator is that the '746PRO also includes 2 meters (with the full 100 W output on 2 meters!). Both offer general coverage receivers covering 30 kHz through 60 MHz. The '746PRO also has additional receiver coverage from 108 MHz to 174 MHz. There is approximately


**Close-up of '746PRO and '756PROII**

a $1,000 difference in the street price of the two radios, with the '756PROII being the more expensive.

*DSP Functionality*

DSP filter shape and filter bandwidth controls on both radios appear similar. On both the '746PRO and the '756PROII, the DSP filter shape can be set to either soft or sharp and filter bandwidth (BANDWIDTH) is adjustable from 50 Hz to 3.6 kHz. On the '746PRO, adjusting both filter shape and bandwidth is easily done with a one second push of the FILTER button which brings up the filter adjustment display. Accessing the same function on the '756PROII is more difficult. On the '756PROII, a one second push of the FILTER button only brings up a filter bandwidth adjustment display (no shape adjustment). Changing filter shape requires four pushes of the EXIT/SET button to get to the DSP filter set display. I definitely liked the ability on the '746PRO to set BANDWIDTH and SHAPE from the same display.

DSP noise reduction (NR) is an outstanding feature of both radios. The level of NR is fully adjustable with the front panel control. At times, during marginal band conditions — weak signals buried in QRN — I found that introducing NR, just to the level where it begins to take effect, provides the best results for pulling weak signals out of the noise. I found no difference in NR functionality between the '746PRO and the '756PROII.

*Frequency Tuning*

Both radios are very flexible in selecting rates of tuning. Frequency is displayed to the nearest 10 Hz as the default. A one second push of the TS button turns on an additional digit, thereby providing frequency resolution to one Hz. On CW, pushing the 1/4ON button provides band spread to an amazing 125 Hz per dial revolution on the '756PROII (150 Hz on the '746PRO)! A momentary push of TS turns on quick tuning. This function allows the operating frequency to be changed in selectable steps from 100 Hz to 25 kHz for "quick tuning" from one end of a band to the other. Activating Main Dial Auto TS will cause quick tune to kick in automatically when rapidly turning the main dial.

*Memo Pads*

Both radios have a memo pad function which stores frequency and operating mode for easy recall. A push of the MP-W button stores the current frequency and operation mode. Change frequency or operating mode and push MP-W again, and the new frequency and operating mode will be stored – and so on, up to five or ten (user selectable) levels of storage. A push of MP-R recalls the stored frequencies and operating modes, last in first out (LIFO). This feature is especially useful when chasing DX or searching and pouncing in a contest, and is somewhat analogous to the search and pounce memory function in *WriteLog*.

*Split Operation*

The '746PRO and the '756PROII have similar split frequency features, including "quick split". With quick split activated (in the SET menu), a one second push of the SPLIT button sets the frequency of VFO B to that of VFO A. F-INP is then used to input a kHz split (e.g., 1 kHz or 2 kHz) on the number keypad. When SPLIT is pushed again, VFO B is then changed to the split transmit frequency.

*CW Operating*

Semi break-in works equally well on both radios. Full break-in, however, sounds slightly "choppy" at higher CW speeds; this is true with both the '746PRO and the '756PROII. The only way I have discovered to cure this problem is to use an external Logikey keyer (**www.idiompress.com**). The Logikey keyer has built in adjustable "keying compensation" that increases keying on-time and decreases keying off-time by a few milliseconds to correct the full break-in distortion. Setting the keying compensation anywhere from 6 to 10 milliseconds cures the problem and produces beautiful sounding, high speed CW using full break-in.

In both the '746PRO and the '756PROII, a keyer rise time adjustment sets the time it takes for output power to raise to the set transmit power level. It is adjustable from 2 to 8 milliseconds. I received complaints of key clicks during my early days with the 756PROII, and discovered that a rise time of 2ms was causing the problem. I adjusted rise time to 6ms and received no further complaints. Like the '756PROII, the '746PRO also produces key clicks when rise time is too short. Setting the '746Pro's rise time to 6 or 8ms will reduce the clicks to a tolerable level.

John Seney, WD1V, did an excellent analysis of '756PROII rise times using a digital oscilloscope to view the keyed waveforms at various settings of rise time. This analysis is available at **www.qsl.net/wd1v/756cw.html**. John explains that "too fast a rise time can cause key clicks that are essentially analog distortions of the CW waveform that contain out of band products that produce noise (clicks). If the keying circuit lets the transmitter go from zero power to full power too rapidly the transmitter's output becomes distorted."

Both the '746PRO and the '756PROII have four memories for storing CW messages to be transmitted. A push of one of the four MEMORY KEYER buttons (M1 through M4) transmits the respective CW message. A momentary push of the same memory button or a tap of the paddle stops the message from being sent. Messages are transmitted at a speed controlled by the internal keyer's KEY SPEED adjustment on the front panel.

When sending stored CW messages on the '746PRO, Menu M1-KEY-SND displays scrolling characters of the CW message as it is being sent — a clever feature that is useful for code practice.

There is a repeat timer on both radios that allows you to automatically repeat any of the four CW messages at intervals from 1 to 60 seconds. Holding the MEMORY KEYER button (M1 – M4) for one second activates the repeat timer.

A CW paddle connected to the ELEC-KEY jack on the front panel of the radio keys the internal keyer. The KEY jack on the rear panel bypasses the internal keyer and must be used with an outboard keyer or for computer generated keying. In my case, I use both a Logikey K-3 keyer and computer generated keying, so I use a stereo Y connector for paralleling the two 1/4 inch plugs into the rear KEY jack.

*Voice Operation*

Since different microphones have different audio characteristics, it is a good idea to do some on-the-air testing with a friend to determine the TX bandwidth, TX treble and TX bass that sounds best for your set up. The monitor function will also allow you to listen to your TX audio while you make the adjustments. There are also RX treble and RX bass adjustments that should be set to your preferences.

*Accessories and Connections*

The I-MATE is an accessory for the '746PRO and the '756PROII, developed and sold by The BetterRF Company (**www.betterRF.com**). Its purpose is to provide the external keypad function to trigger the sending of voice and CW messages. Using the I-MATE with the '756PROII allows the spectrum scope to be visible while having access to the memory send function. The I-MATE works equally well with both radios. However, since the '746PRO does not have a recorder for storing voice messages to be transmitted, the I-MATE will only trigger CW messages with that radio. The repeat timer works well with the I-MATE. Holding down any one of the I-MATE's MEMORIES buttons for one second activates the repeat timer for that

message.

I use *WriteLog* for contests and my everyday logging. Since *WriteLog* does not have a "Rig Type" selection for either the IC-756PROII or IC-746PRO, I used Rig Type "ICOM-756PRO" on *WriteLog*'s setup menu to control both radios. In each radio, the CI-V Baud Rate is set to 9600 and the CI-V Address to "5Ch".

The specifications for the SEND relay contacts are 16 V dc at 500ma. An early version of the IC-756PROII manual indicated 16 V dc at 2 A, but this was wrong and was corrected in a later version of the manual. If you are going to use the transceiver's SEND jack for keying a linear amplifier, be sure that the amp does not exceed these specifications, else the radio's internal reed relay may be damaged. If the amp's keying relay requires a higher current than 500ma, or exceeds 16 V dc, you can use pin 7 (+13.8 V dc) and pin 3 (TX Ground) of either ACC(1) or ACC(2) to key an external 12 V dc relay which, in turn, can key an amplifier.

These are nominal 12 V dc radios, and any good, electrically clean, 13.8 V dc supply capable of delivering at least 23 A should handle them just fine. The ICOM PS-125 power supply is popular because it is currently being offered at no additional cost by some dealers with the purchase of a new '746PRO or '756PROII. The ICOM PS-125 is a physically compact unit that powers either radio quite nicely. Note, however, that it has a 16 inch 12 V dc power cable that makes it necessary to locate the power supply adjacent to the radio. A slight amount of fan noise is noticeable. Curiously, the fan cycles on and off even with the 12 V dc cable unplugged from the radio. In my shack, I power the radios with an Astron power supply.

The label marking the various connections on the rear panel is quite small and difficult to read. I used a Brother P-Touch label maker to make labels for each rear panel jack and connector. As I pointed out in my previous article, I keep a flashlight handy!

**Features That Differ Between the Two Radios**

*Displays*

Clearly a major difference between the '746PRO and the '756PROII is the LCD display. The basic display functions (frequency readout, function switch menus, memory channels, set up modes, etc.) are quite similar, but their looks are totally different, with the primary difference being color. The '746PRO has a bright white screen with crisp blue lettering that I find very pleasing to use. It displays all of the many pieces of information I need as an operator conveniently and legibly. The color display on the '756PROII, however, is magnificent — with the colors adding a dimension that makes it exceptionally easy to recognize the wealth of information that is displayed.

There is no comparison between the spectrum scope on the '756PROII and the band scope on the '746PRO. The '756PROII's spectrum scope provides an active, real time display of the relative strengths of signals around a center frequency. The span can be set to +/- 12.5 kHz, +/-25 kHz, +/-50 kHz and +/-100 kHz. I have become so accustomed to this spectrum display, especially during heavy contest conditions, that to do without it at this point in my life is unthinkable. The scope is an invaluable tool for "finding holes" and moving away from offending QRM in a crowded band and for finding signals on a "dead" band.

The '746PRO's band scope allows — in a limited way — the ability to check signal conditions around a center frequency. The scope indicates the relative strength of signals and their locations with respect to the center frequency. The sweep width is adjustable in steps from 500 Hz to 25 kHz. Unlike the '756PROII's spectrum scope, the signal display is not active in real time. Each time you want to see a profile of the signals above and below the center frequency, you must push the F1 button to activate a scan to refresh the display. The scan lasts only a moment but, during that time, the audio is muted. You can turn on an active display of the signals by holding down the F1 button for one second. You can even tune up and down the band, "looking" for signals while the active scan is underway. However, once again, the audio is muted, thus making the "active" scan virtually useless. My personal conclusion about the '746PRO's band scope is that it is a very marginal feature on the radio, one that certainly would not be useful in a contest. Furthermore, I find the loss of audio while scanning to be unacceptable.

The many menu selections on both the '746PRO and the '756PROII will lead you into the inner depths of the radios, not unlike exploring an Egyptian tomb. I am constantly amazed at the functionality that brilliant engineers design into modern day radios and these ICOM models are an embodiment of that talent. Virtually anything an operator would wish to set, adjust, manipulate, influence, control, regulate, alter, fiddle with, bend, amend or modify can be found somewhere in a menu! The trick is knowing how and where to set, adjust, manipulate, etc., etc…you get the point. It is difficult to say if the menu layout in the '756PROII is superior to that of the '746PRO. They are both complex, and each requires a thorough study of their manuals to get a complete understanding. I do, however, personally prefer the menus of the '756PROII since many selections are presented in a convenient table on the color LCD screen. I will make one last point about the many features buried in the menus. That is, in researching this article, I have discovered features in the '756PROII that I had no idea were there, and I have been actively using this radio for two years!

The '756PROII has a dual watch feature and an audio balance (BAL) control that allows for monitoring of VFO B while listening on VFO A. The '746PRO does not have dual watch capability.

The '756PROII has four memories for storing voice messages to be transmitted. A push of one of the four MEMORY KEYER buttons (T1 through T4) transmits the respective voice message. A momentary push of the same memory button stops the message. As discussed above, the I-MATE can be used to trigger the sending of the voice memories in the '756PROII. Note - the repeat timer only functions on CW and, therefore, does not work with the voice memory keyer on the '756PROII.

*Antenna Options*

Both the '746PRO and the '756PROII have two antenna ports for HF thorough 6 meters. Antenna Switch selection can be set to OFF, MANUAL or AUTO in the SET Menu. In the OFF position, antenna port 1 is "locked in" on each band, and cannot be changed from band to band. In the MANUAL position, selection of antenna port 1 or 2 must be done manually when switching from one band to another. In the AUTO position, selection of antenna port 1 or 2, as preset by the operator, is done automatically on each band.

The '746PRO has a separate antenna port for 2 meters.

The '756PROII has a rear panel RCA jack for connecting a separate receiving antenna. A one second push of the ANT button selects the receiving antenna and 1/R or 2/R is displayed as the antenna. A separate receiving antenna port is not available on the '746PRO, a severe limitation for serious contesters and low band DX'ers.

As protection from external RF voltages, I use an ICE Model 196 RF Limiter/Arrestor at the input to the '756PROII from my receiving antenna.

*Dimensions*

The '756PROII is some 34 cubic inches larger in volume and 1 pound 6 ounces heavier than the '746PRO, which is a consideration when packing for a DXpedition. The '756PROII is approxi-

mately 2 inches wider, 1¼ inch less deep and of equal height to the '746PRO.

## Conclusion

The '746PRO and the '756PROII are both excellent radios and alike in many ways. The 756PROII has numerous features beyond those of the '746PRO. The more significant ones, in my opinion, include: LCD color display, real time band scope, multi-level attenuator, analog meter, clock, dual watch, TX voice memories, digital voice recorder and separate RX antenna port. On the other hand, the '746PRO has a 100 W, 2-meter capability that makes it an attractive "all in one" package.

In choosing one radio over the other it really comes down to how the operator values the extra features on the '756PROII relative to the $1,000 difference in their cost AND his or her operating preferences.

For the casual operator who occasionally works a contest, likes to chase DX and spends much of his or her time rag chewing, the '746PRO offers excellent value as a full function HF, 6 and 2 meter radio that can be bought new for under $1400. Price, weight and volume also make the '746PRO a serious contender as a DXpedition radio. For the active contester and serious DX'er, however, the bottom line is that the LCD color display, real time band scope, multi-level attenuator, dual watch and separate RX antenna port most likely justify the additional cost of the IC-756PROII. NCJ

**Additional differences are summarized below.**

| *Feature* | *IC-756PROII* | *IC-746PRO* |
|---|---|---|
| Analog meter | Yes – multi function | None |
| Clock & timer | Yes | None |
| Digital voice recorder | 8 memory channels 15 sec. Ea 4 each for TX and RX, | None |
| Voice message recorder for TX | 4 memory channels, 90 sec. total | None |
| CW message recorder for TX | 4 memory channels, 55 char. max each | 4 memory channels 50 char. max each |
| Attenuator (ATT) | 6, 12 or 18 db | 20 db |
| Preamp/ATT | Yes, separate buttons | Yes single button |
| Preamp 1 | 10db for all HF bands | 1.8 to 21 MHz* |
| Preamp 2 | 16db for 24 MHz and up | 24 to 50 MHz* |
| Preamp – 2 meters | N/A | 108 to 174 MHz |
| Tx filter width – NAR | 2.0 kHz | 2.2 kHz |
| Tx filter width – MID | 2.6 kHz | 2.4 kHz |
| Tx filter width – WIDE | 2.9kHz | 2.8 kHz |
| ACC(2) on rear panel | Pin 6 activates on XVERT I/O | Pin 6 to gnd on 2m TX |
| Data Socket on rear panel | None | TNC jack |

*Gain unspecified

United States Postal Service

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# The July 2003 CQ WW VHF Contest Tropo Opening

Jon K. Jones, NØJK

Often considered primarily a 6-meter contest, the 2003 CQ VHF Contest experienced one of the best VHF tropospheric openings in many years. Due to tropo, 2-meters was "the place to be" for DX contacts in the contest. But 6-meters was not forgotten, as the tropo was so good it even got down to the "magic band." The tropo was there at the beginning of the contest at 1800 UTC July 19 and continued until 1700 UTC July 20. Many DX contacts were made on 2-meters, including some very long haul contacts over 1000 miles such as W3ZZ (FM08) to NØLL (EM09) and NØJK portable in EM08 Saturday evening.

The surface weather map for July 19 (see Figure 1), showed a large high pressure system centered over western Illinois and eastern Iowa (actually right over K2DRH in EN41). The 500 mb height contour showed strong southerly flow across the western portion of the surface high. At ground level, cool moist air flowed from the south. Tropo or refraction of VHF and UHF signals can occur when gradients occur in atmospheric temperature and humidity. Typically, dry air overriding moist air and/or warm air aloft can create conditions that refract VHF signals for hundreds of miles.

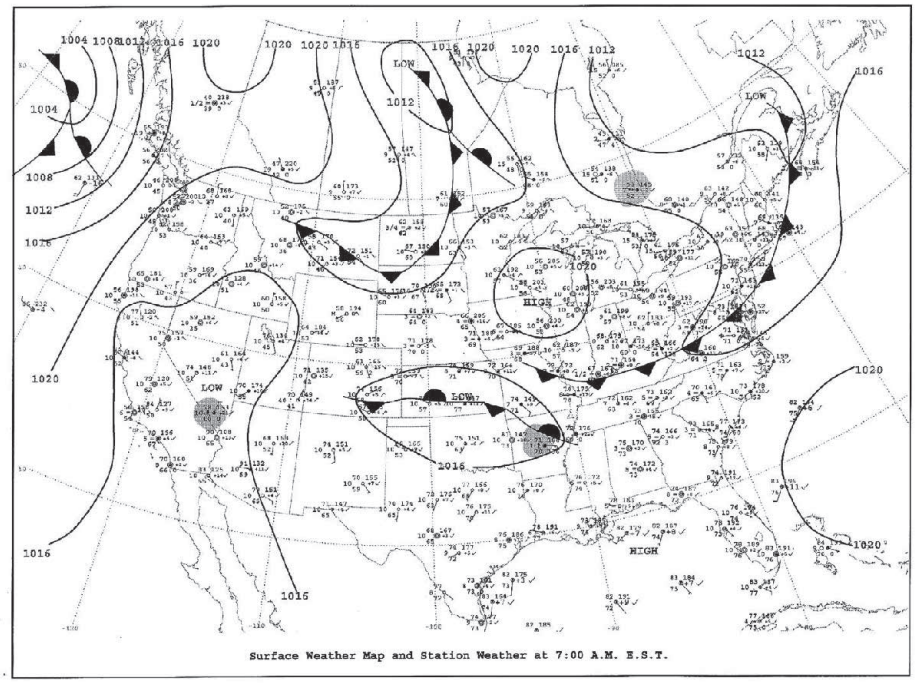


**Figure 1—A surface weather map for July 19.**

Saturday morning July 19 was cool and damp in Wichita with low level clouds and strong wind from the south. I saw spots for the NØLL (EM09) and KØUO (EM07) 2-meter beacons by NØPB (EM39) and N9DQS (EN22). I got on 2 meters from my home in EM17 and worked NØPB while running 10 W and a "halo" antenna on the barbeque grill. I could see something was definitely "up!" K2DRH (EN41) worked W8MIL (EN74) at the same time. Later that morning on 2 meters WØEKZ (EM17) worked W8BYA (EN70) and NØKQY (DM98) contacted KG9IL (EN52). Some nice summer tropo on 2 meters, but usually this stuff "burns off" when the temperature rises by mid-day. Pat, WA5IYX, notes, "Long haul tropo in the summer rarely survives the mid-day heating."

The CQ contest started at 1800 UTC. It was blazing hot in Wichita, with high humidity and stagnant air. And there was tropo! I had to work Saturday afternoon, but brought my 10 W 2-meter radio and a 4-element Yagi along. I was parked on top of the parking garage, and during a break at 1830 UTC I worked NØSM (EN30), NØDQS (EN22) and KT8O (EN34) on 2 meters. Tropo with 500 mile contacts in the middle of the day! NØKQY (DM98) worked KØMQS (EN31) at 1914 UTC. I wondered if the tropo would still be there when I got off work in the evening.

I was off work and home by 0100 UTC. My original plan was to operate portable from EM08 in the new low power portable six hour category for the contest. It had been a busy day in the emergency room, so I was tired and it was still over 100 degrees with high humidity outside. I just wanted to kick back and have a "cold one" at home rather than go back out in the heat. I turned on my 6 meter radio and heard the NØLL (EM09) beacon 599+. Normally I don't copy Larry's beacon from home. I found Larry on 50.125, and he was pegging the meter. He said he was working into the Chicago area on both 6 and 2-meter tropo. He said with the humid wind from the east, "The tropo should get even better as it gets dark." Heat or not, I decided to go out to EM08 to hand the out the rare grid in the contest. I put a "QST" out on the 144 MHz Prop Logger at 0121 UTC saying I would be operating from EM08 in about an hour.

While I drove out to EM08, the tropo was building. I could hear lots of co-channel interference in the commercial FM broadcast band on the car radio. NØLL (EM09) worked KX9X (EN60) at 0237 UTC. At 0251 UTC Larry posted tropo "All the way to North Carolina W4GRW, K4SCH." I arrived in EM08 and had the 4-element 2-meter Yagi up on a 10 foot mast and a whip for 6-meters by 0250 UTC. WTØA (EN10) was 5x9 and logged on 6-meters, followed by N2BJ (EN61) at 0252 UTC on 2-meters. Over the next 2 hours I worked into the EN20s, 30s, 40s, 50s, 60s and 70s on 2-meters. KX9X (EN60) spotted me on 144.235 at 0308 UTC and KB8U (EN71) was logged at 0317 UTC. The EN40s and EN50/EM50 area stations were the loudest. K2DRH (EN41) pegged the meter every time he pointed his antenna towards Kansas. The opening seemed to fizzle out at the EN80s – I heard K8CC (EN82) calling CQ but I was unable to raise Dave. There was considerable fading on signals, with K9MRI (EN70) peaking well over S9 at 0345 UTC and he said my 10 W was 5x7. I tried calling CQ but there were few answers, so I mainly "hunt and pounced" for contacts. I worked WBØDRL (EM18) at 0415 UTC – nice to see Pete back on VHF. That brought back memories of our multi-ops on the "hill" 10 years ago. Pete said he was working into Chicago on 432 and 1296 MHz and WØGR (EM38) told him he worked Chicago on 10 GHz.

It was still very hot even at 11 PM and the dome light on the car was drawing lots of bugs. I swatted bugs with one hand while trying to log and work the radio with the other. I left the 2 meter Yagi pointed just north of east. I got a short run going on 2 meters at 0400 UTC when NØPB let me work a few stations on his frequency. I tried with K2DRH on 6 meters, but no luck with the whip. I forgot to bring the portable 6-meter Yagi along.

### W3ZZ (FM08) Works Into Kansas on 2-Meters

At 0427 UTC I heard a 9 station on 144.200 say W3ZZ was on from FM08 in the contest and would move to 144.190 MHz. Earlier Gene had worked K2DRH (EN41) and KCØHFL (EM17) on 2-meters. I figured there would be no way of hearing FM08 on 2 meters with my small antenna, as this is well over 1000 miles from south central Kansas, but I listened on 144.190 anyway. I heard some weak SSB and on QSB peaks I could tell Gene was there. I heard him work NØLL (EM09) at 0433 UTC. Now I was determined. I wanted that 1000 mile QSO in the log! I tried calling Gene on SSB, but no luck. Switched over to CW and dropped my call in several times. Gene rolled up on a QSB peak and heard me at 0440 UTC. I sent EM08, he confirmed and sent FM08. Rogers back and forth, then he faded back down 30 seconds later. Over 1000 miles on 2-meters with 10 W and a 4-element Yagi on a 10 foot mast! I sat there for a few minutes savoring the contact. A bright flash lit up the countryside and then a loud "kaboom." It was lightning from a thunderstorm rolling in from the west. It was time to shut down and pack everything up. That was it for EM08 in the CQ VHF Contest.

### The Tropo Continues Sunday Morning

The 2-meter band was open across the Midwest all night Saturday. At 0608 UTC, N9NJY (EM58) spotted W3ZZ (FM08) "still CQing" on 144.190 MHz. Conditions seemed to drop out around 0800 UTC with K5SW reporting only meteor scatter pings. With sunrise, the tropo began building again and NV8V (EN61) worked K5BZM (EM18) at 1353 UTC on 144.200 with loud signals. NØLL said W3ZZ was in all morning on 2 meters and even louder than Saturday night. I had to work Sunday morning, but was able to take a short break at 1500 UTC. From my car in EM17, I heard W3ZZ (FM08) calling CQ on 144.197 and worked N2BJ (EN61) "20 over S9" and W4OH (EM96) on 144.233 MHz with 10 W and a 4 element Yagi. WRØF/mobile (EM29) worked W4GRW (EM96) on 144.210 5x9 + with his "stacked bigwheels" at 1539 UTC. The tropo finally faded out by 1800 UTC.

This tropo opening extended from EM08/09 on the west, south to EM25/36 and east to EM96, northeast to FM08 and north to EN71/82 on back to the EN60s, EN50s, EN40s, EN34 and EN12. Gene, W3ZZ (with W4XP and K8ISK) on Reddish Knob in FM08jl was the most easterly station to be in the duct consistently. I saw a report that K4QI (FM06) was in the duct partially Sunday morning.

### Unusual Things About This Tropo Opening

The tropo opening continued during the day despite the high summer temperatures. Contacts were made over 400 – 500 miles paths during mid-day. Signal strengths were very high and the duct was stable, with low power and mobile stations able to make tropo contacts over 900 – 1000 mile paths. The tropo extended all the way down to 6-meters, with W3ZZ (FM08) working KØHA (EN10) for one of the longest 6-meter tropo contacts reported. Strong 6-meter tropo was noted on shorter paths. The presence of 6 meter tropo implies a duct at least several hundred meters thick. From the weather maps, it appears the tropo was due to a stagnant high pressure system aloft with low level humid winds. This created the strong deep inversion across the Midwest.

It was good timing to have the tropo occur on a major VHF contest weekend. This ensured high activity and portable stations active from rare grids like W3ZZ (FM08), W4GRW (EM96) and NØJK from EM08. I had a good time operating in the new six hour portable category. The contest tropo opening was a golden opportunity for midwest stations to work West Virginia and FM08 on 2-meters thanks to Gene and his crew on Reddish Knob. Gene observed, "All of this was a real treat." Bud, WØEKZ, commented "W3ZZ was in solid for hours on 2-meters, but nobody else from his area. This was the best opening on 2-meters for a very long time." NCJ

# WRTC-Style Team Competition in IARU-2003—Keeping the Flame Alive"

H. Ward Silver, NØAX

World Radiosport Team Competitions are a blast. If you've never been to one of the events, put it on your lifetime to-do list. The only problem is that they are years apart, having run in 1990, 1996, 2000, and 2002. The next one is scheduled for 2006 in Brazil, but what can a WRTC aficionado do in the meantime? How can we keep alive the great WRTC spirit that burned so brightly in Seattle, San Francisco, Slovenia and Finland?

As both a member of the WRTC Sanctioning Committee and a contester, that question was bugging me all winter until inspiration struck. The WRTC runs as a contest-within-a-contest during the IARU HF World Championship in July. There's no reason why two-man teams couldn't face off during IARU in any year! And thus, the WRTC-Style IARU-HF 2003 Team Competition was born.

Of course, thinking up such a thing is easy. How can it actually be made to happen? A big team of volunteers was not an option, but I definitely wanted to keep the public aspect of the event and have a quick turn-around of scores. In this Bruce Horn, WA7BNM, ably assisted me. He kindly agreed to adapt his contest score-reporting system so that the teams could drop in their scores right after the contest. Henry Heidtmann, W2DZO, chipped in with some webmeister-ing to host a rules and scores Web page. We were all set.

The basics of the contest followed the WRTC competition rules, with some minor adaptations to the home station environment:

Two-man teams, running low power under IARU multi-single rules

One high-band beam antenna for 20,15 and10 meters, no higher than 25 meters

One wire low-band antenna no longer than a 160-meter dipole

Scores due within one hour following the end of the contest

This set of rules allowed everyone to compete fully within the IARU rules on the honor system. No prizes would be awarded; it was just "have fun" and practice for other multi-op contesting. A complete list of the rules was posted by W2DZO at **summitschool.com/faculty/wrtcrules.html**.

To run this kind of event, it's important not to be disruptive to the main contest. Rules for the teams should respect the main contest rules and if any deviations are made, they should be more restrictive. This allows the team scores to count for the final published scores and for any local teams. Requiring any kind of special software is also going to generate problems that a small team of

**Table 1**

**WRTC-Style 2003 Teams**

| *Call Team* | *Name* | *Operators* | *Location* |
|---|---|---|---|
| SMØW | | SMØWKA/SMØW (captain), SM4THN/SM4O | Sweden |
| OK1N | OK1QM, OK1NR | Czech Republic at OK1QM | |
| W2DZO | Team Kiva | W2DZO, WS4NC | NC/W2DZO |
| WB4MSG | Team P-Town | WB4MSG, AG4RZ | NC/WB4MSG |
| W4WS | Team 007 | KG4NEP, KG4ECI | NC/KG4NEP |
| W4NC | Team Woodpecker | N0KTY, KF4PLQ | NC/N0KTY |
| K7ED | Paladin RC Have Rig, Will Travel | WAØRJY, NØAX | WA/NØAX |
| N3BB | Texas Tornadoes | N3BB, K5PI | TX/N3BB |
| K4AAA | Chattahoochee | K4BAI, KU8E River Contesters | GA/K4BAI |
| OT3R | Belgian HF Devils | ON4CCP, ON5ZO | Belgium at ON4CCP |
| S56A/P | Silver Tigers | S55A, S56A | Istra, Croatia |
| 9A7P/P | Beer Is the Name | 9A5AEI, DJ1YFK of a Beautiful Woman | Istra, Croatia |
| 9A1P/P | Italian Black Tie | 9A6NDX, IZ3ESV | Istra, Croatia |
| 9A9D/P | Dinky 100W | 9A6XX, 9A6NPM | Istra, Croatia |
| K8AJS | The League of Extraordinary Gentlemen | K8AJS, W8AV | Ohio |
| LU7DW | Empanada's Team | LU7DW, LU1AEE | Argentina at LU7DW |
| N8RY | Michigan Mud Ducks | N8RY, KB8RJU | Michigan |
| G6UW | Vraka Men | MØBBB/5B4AFM, | Cambridge, UK |

**LU7DW and LU1AEE are working hard to get through a pileup of empanadas.**

**WAØRJY and NØAX, operating K7ED, and keeping busy pulling signals out of the ether.**

sponsors can't deal with effectively. Stay close to the basic parameters of the main contest.

It's also important to be precise in rules and definitions. There were a number of questions about our rules, but luckily, the WRTC-2000 and -2002 groups had a good set of rules to begin with, so we were able to use them with some minor exceptions. It was more difficult to deal with antenna issues. In the last two WRTC events, identical antennas were provided to all competitors, but that was clearly not the case here. There is a tremendous amount of variation in what constitutes a "triband Yagi" these days. We were able to deal with the issues raised and I believe everyone was satisfied.

### The Competition

Would anybody actually sign up for the competition? Right away, teams began registering from Europe and North America. Soon, Carlos, LU7DW, another WRTC alumnus, had contributed a South American entry. Hrle, 9A6XX, organized a four-team group that would all operate portable from Croatia and Henry, W2DZO, collected four teams from North Carolina.

By the time the contest rolled around, we had 18 teams registered—eight from Europe, one from South America, and nine from North America. The team names were an amusing addition. My favorite was either "Vraka Men", 5B4AFM and 5B4WN, or "Texas Tornados", N3BB and K5PI. A complete list of the teams is shown in Table 1.

July 12 at 1200Z found us all tuned up and ready to go, but conditions did not cooperate, as anyone that was on for IARU can attest. Well, so what? You do your best and be happy, that's what! Table 2 shows that this kind of summer conditions (can the bands be considered "muggy"?) clearly favored the densely packed continent of Europe, home to four of the top five teams.

LU7DW and LU1AEE registered as "Empanada's Team." An empanada turned out to be the Argentinean equivalent of a calzone or piroshkii. As the photo shows, Team Empanada definitely had a large pileup of them to work through and managed to make some QSOs, too, finishing fourth over a much longer path. Carlos reported that "During the early morning (5AM local time), a bus bumped into a power pole 30 meters away from home. It was a big mess, but reduced our line noise! Maybe it will be the solution for the next contest. The ICOM IC-735 used as our second radio is a historic radio. It was the second radio for the last three WRTCs; at W6W in 1996, at S522R in 2002 and at OJ1C 2002."

N3BB and K5PI reported: "our HyGain 80 and 40 meter trapped dipole was pretty effective on 160 meters. I mounted it as a sloper. It was very hard, and it took some time, but we worked zones 4 (VE3DZ schedule from 40 meters), zones 6-7-8, W1AW/3, and a loud XE2AC in Zone 10. Count on us to be there next year to defend the US title against all comers!"

**Table 2**

**Results of the 2003 WRTC-Style Team Competition**

| *Call* | *Team Name* | *Score* |
|---|---|---|
| OT3R | Belgian HF Devils | 1,289,130 |
| 9A9D/P | Dinky 100W | 942,084 |
| 9A1P/P | Italian Black Tie | 916,479 |
| LU7DW | Empanadas Team | 838,508 |
| G6UW | Vraka Men | 829,330 |
| S56A/P | Silver Tigers | 701,947 |
| 9A7P/P | Beer is the Name of a Beautiful Woman | 697,760 |
| OK1NR | | 617,826 |
| N3BB | The Texas Tornadoes | 550,605 |
| K4AAA | Chattahoochee River Contesters | 437,415 |
| K7ED | Paladin RC | 267,810 |
| W2DZO | Team Kiva | 256,105 |
| WB4MSG | Team P-Town | 243,712 |
| K8AJS | The League of Extraordinary Gentleman | 241,128 |
| W4NC | Woodpecker | 68,595 |
| W4WS | Team 007 | 21,780 |
| N8RY | | no score received |
| SMØW | | no score received |

A note registering our second team came from Jan, OK1QM, whom I met at WRTC-2000 in Slovenia. Jan and Martin, OK1FUA, (better known as OL5Y) shared our breakfast table during that week and we all became good friends, so it was a special pleasure for Jan to sign up a team. Even better was that Jan's teammate would be his father and Elmer, also named Jan, OK1NR—a familiar contest call. As Jan the Younger said, "He is my Elmer and we are looking forward to WRTC-2003." Martin and Jan had just put on their own Field Day style challenge during the CQ-M so interest was high. Pictures can be viewed at **www.sweb.cz/cric2003/**. Photo 19 of the set shows OK1QM, OK1NR, and OK1FUA, from left to right.

Jan and Jan used a 12-meter tower, a borrowed beam (in need of repair), and an 83-meter long wire from the garden of friends OK1WC and OK1MWC in the small city of Vrchlabi located under the Giant Mountains, the highest in the Czech Republic. "The conditions until Friday were great but on Saturday morning they were considerably worse. The contest was really great. How simple the set up and how much fun we had! The activity in the contest was very good and there was somebody answering our CQ or new stations for S and P. Our long wire worked very well and we had nice pileups on 80 and 40 meters. Cooperation with my father was a great experience."

Here at home I put up an extended double zepp (80 feet of wire on either side, fed by 76 feet of 450-Ω window line) that did quite well and even took power well on 160. The high band antenna was a 3-element SteppIR Yagi. We ran *TR-LOG* in a two-PC network that didn't get hardly the workout we were hoping for, but conditions made it easy to decide when to take a dinner break!

### Next Year

Will we run the WRTC-Style Team Competition again in 2004? Absolutely! I expect that with a little success on this first run, we'll get some additional participation. Questions about rules have been answered and it should be easy to put the event together.

If you think you'd like to put together a team for next year, now is the time to start. The two sets of four regional teams seemed to be a good idea - are there some other good ideas for encouraging participation out there? IARU-HF has been picking up participation in the past few years, so the summertime contest should be even more fun. Let's start publicizing it right away, and next year maybe we'll have even more goofy team names to enjoy! NCJ

# Propagation

Carl Luetzelschwab, K9LA

## Using Propagation Predictions to Help Decide on a Contest QTH

**Question: My contest buddy and I are heading to the Caribbean in February to do a multi-single CW effort in the ARRL International DX Contest. We want this to be a serious effort, and we're debating whether to go to 6Y or YV. Could propagation predictions help us make this decision?**

Yes, I think they can help. What we can do is run predictions from 6Y and YV to the US to see which offers the "best" opportunities. We can run the predictions ourselves, using our favorite software. Or we can take the easy route and use the predictions that are in the *ARRL Antenna Book* CD-ROM.

Dean, N6BV, used *VOACAP* to put together propagation-prediction tables for 144 different transmitting QTHs throughout the world, including 40 locations in the USA. The data is presented as a signal level in S-units. Each file is in PDF format, and a hard copy can easily be printed for future reference. There are two types of data sets. One is a single-page *Summary Table* for a specific month and solar activity level to seven general areas of the world. The other is a six-page *Detailed Table* for a specific month and solar activity level to all 40 CQ zones on all six HF contest bands.

Figure 1 shows the *Summary Table* for 6Y for February at a Low sunspot number (low is defined as 21 to 40, and this level was chosen because the predicted smoothed sunspot number for February 2004 is 39 – from **sec.noaa.gov/ftpdir/weekly/Predict.txt**.

With a similar table for YV, we can compare the number of hours each band is predicted to be open to North America (since this is for the ARRL DX contest). Table 1 summarizes this comparison.

Overall, both QTHs have the same number of hours of propagation. Digging a little deeper, it looks like 6Y is somewhat favored on the low bands, whereas YV is somewhat favored on the high bands. This makes sense on the low bands, as 6Y is closer to NA and would be expected to have a higher signal level due to less absorption. And this also makes sense on the high bands, as the level of ionization at a low solar activity level can better support the farther out YV due to a lower elevation angle needed.

But we have a slight problem. North America, as defined by these predictions, is all of the USA (including KL7), Canada and Mexico. So we have some extraneous information (at least for our specific purpose) running around in the data. We can eliminate this by looking at the *Detailed Table*.

**Table 1**

**Number of Hours for Propagation to All North America**

| | 80m | 40m | 20m | 15m | 10m | total |
|---|---|---|---|---|---|---|
| 6Y | 18 | 24 | 24 | 18 | 11 | **95 hrs** |
| YV | 17 | 22 | 24 | 21 | 11 | **95 hrs** |

**Table 2**

**Number of Hours for Propagation to Zones 3, 4,and 5**

| | | 160m | 80m | 40m | 20m | 15m | 10m | overall total |
|---|---|---|---|---|---|---|---|---|
| 6Y | zone 3 | 14 | 16 | 19 | 22 | 6 | 2 | |
| | zone 4 | 16 | 16 | 24 | 24 | 15 | 11 | |
| | zone 5 | 17 | 17 | 24 | 24 | 13 | 10 | |
| | band total | 47 | 49 | 67 | 70 | 34 | 23 | **290 hrs** |
| YV | zone 3 | 10 | 13 | 17 | 23 | 10 | 8 | |
| | zone 4 | 14 | 15 | 20 | 24 | 12 | 1 | |
| | zone 5 | 15 | 15 | 21 | 24 | 18 | 11 | |
| | band total | 39 | 43 | 58 | 71 | 40 | 20 | **271 hrs** |

Figure 2 shows the *Detailed Table* for 6Y for February at a Low sunspot number on 10m.

Using detailed tables for each band and similar detailed tables for YV, we can again compare the number of hours each band is predicted to be open to North America – which we now can define properly as zones 3 (West Coast USA and VE), 4 (Midwest USA and VE), and 5 (East Coast USA and VE). Also note that the detailed tables have 160m. Table 2 summarizes this comparison.

Once we eliminate KL7 and Mexico, and add in 160m, it looks like 6Y has the edge over YV (290 hours to 271 hours, respectively), with the low bands giving the advantage.

Table 2 is for all signals levels – from S1 to S9 plus. Realizing that having a big signal is important to attracting all the multipliers on all the bands, we could re-do Table 2 for signal levels greater than or equal to S9. The overall total hours for this scenario works out to 208 hrs for 6Y and 158 hrs for YV, again with the low bands having the biggest difference due to being closer to the target area (USA and VE). Thus 6Y appears to be the place to be.

Of course all the above assumes that the antennas and the site issues (obstructions to low elevation angles, ground conditions, noise, etc) are the same. If they're not, it's not an insurmountable issue to resolve which QTH is best – it's just much more difficult. You'd have to run the predictions yourself with your favorite software, inputting the appropriate parameters to best compare the two QTHs.

What if Table 2, even with the greater than or equal to S9 cut-off, had ended up essentially in a tie? Is there a way to resolve this? Yes, there is. The ARRL predications only give signal strength (which, by the way, is a monthly median value). So what this analysis has been based on is signal strength only, with no consideration of the amount of ionization needed to get a signal from Point A to Point B. Not including this MUF issue (specifically, mufdays from *VOACAP*) would be most critical on the high bands with low solar activity. You would have to go through an exercise similar to what was described in *Using Propagation Predictions for Band Change Strategy* in the July/August 1998 *NCJ*, treating signal strength and MUF as probabilities and determining which QTH had the highest probability. Doing this should break any tie.

And finally, what if your QTH isn't one of the 144 listed in the ARRL predictions? Most of the time you should be able to find a QTH in the tables that is close enough to your desired QTH. For example, 6Y would suffice for ZF, and YV would suffice for P4. In those cases where there's nothing close, then you're be back to rolling your own predictions.

So the next time you're trying to figure out where to go, take a look at the situation with propagation predictions – they should be able to help with your decision.

## Feb., Jamaica (Kingston), for SSN = Low, Sigs in S-Units. By N6BV, ARRL.

| | 80 Meters | | | | | | | 40 Meters | | | | | | | 20 Meters | | | | | | | 15 Meters | | | | | | | 10 Meters | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UTC | EU | FE | SA | AF | AS | OC | NA | EU | FE | SA | AF | AS | OC | NA | EU | FE | SA | AF | AS | OC | NA | EU | FE | SA | AF | AS | OC | NA | EU | FE | SA | AF | AS | OC | NA | UTC |
| 0 | 9 | - | 9+ | 9 | 6 | - | 9+ | 9+ | 1 | 9+ | 9+ | 9 | - | 9+ | 5 | 9 | 9+ | 9 | 9+ | 9 | 9+ | - | 8 | 9+ | 8 | - | 9 | 9+ | - | 1 | 9 | - | - | 7 | 6 | 0 |
| 1 | 9 | - | 9+ | 9+ | 7 | - | 9+ | 9+ | - | 9+ | 9+ | 9 | 2 | 9+ | 1 | 9 | 9+ | 9 | 9+ | 9 | 9+ | - | 6* | 9+ | 4 | 2* | 9 | 9 | - | - | 5 | - | - | 5 | - | 1 |
| 2 | 9 | - | 9+ | 9+ | 6 | - | 9+ | 9+ | - | 9+ | 9+ | 9 | 6 | 9+ | 8 | 7 | 9+ | 8 | 8 | 9 | 9+ | - | 2* | 9+ | 2 | 2* | 9 | 4 | - | - | - | - | - | 1 | - | 2 |
| 3 | 9 | - | 9+ | 9+ | 3 | 4 | 9+ | 9+ | - | 9+ | 9+ | 9 | 8 | 9+ | 4 | 5 | 9+ | 8 | 6 | 9+ | 9+ | - | - | 9+ | 3 | - | 9 | - | - | - | 1 | - | - | - | - | 3 |
| 4 | 9 | - | 9+ | 9+ | - | 7 | 9+ | 9+ | - | 9+ | 9+ | 8 | 9 | 9+ | 5 | 4 | 9+ | 9 | 8 | 9+ | 9+ | - | - | 9+ | 4 | - | 8 | - | - | - | - | - | - | - | - | 4 |
| 5 | 9 | - | 9+ | 9+ | - | 8 | 9+ | 9 | - | 9+ | 9+ | 4 | 9+ | 9+ | - | 5 | 9+ | 9+ | 7 | 9+ | 9+ | - | - | 8 | 3 | - | 6 | - | - | - | - | - | - | - | - | 5 |
| 6 | 9 | - | 9+ | 9 | - | 8 | 9+ | 9 | 5 | 9+ | 9+ | - | 9+ | 9+ | - | 7 | 9+ | 9 | 5 | 9+ | 9+ | - | - | 3 | 4 | - | 4 | 1 | - | - | - | - | - | - | - | 6 |
| 7 | 9 | - | 9+ | 9 | - | 9 | 9+ | 9 | 7 | 9+ | 9 | 1 | 9+ | 9+ | 6 | 8 | 9+ | 9 | 7 | 9+ | 9+ | - | - | 2 | 2 | - | 3 | 2 | - | - | - | - | - | - | - | 7 |
| 8 | 8 | - | 9+ | 8 | - | 9 | 9+ | 9 | 8 | 9+ | 9 | 7 | 9+ | 9+ | 8 | 8 | 9+ | 6 | 8 | 9+ | 9+ | - | - | 1 | - | - | 5 | 6 | - | - | - | - | - | - | - | 8 |
| 9 | 3 | 6 | 9+ | 1 | - | 9 | 9+ | 8 | 9 | 9+ | 9 | 8 | 9+ | 9+ | 6 | 8 | 9+ | 5 | 7 | 9+ | 9+ | - | - | 1 | - | - | 3 | 5 | - | - | - | - | - | - | - | 9 |
| 10 | 1 | 6 | 9+ | - | - | 8 | 9+ | 8 | 9 | 9+ | 8 | 7 | 9+ | 9+ | 7 | 8 | 9 | 8 | 5 | 8 | 9+ | - | - | 1 | 4 | - | - | - | - | - | - | - | - | - | - | 10 |
| 11 | - | 4 | 9+ | - | - | 8 | 9+ | 4 | 9 | 9+ | 2 | 7 | 9 | 9+ | 9 | 7 | 9 | 9+ | 9 | 7 | 9 | 2 | - | - | 9 | 3 | - | - | - | - | - | - | - | - | - | 11 |
| 12 | - | - | 9+ | - | - | 8 | 9+ | 2 | 8 | 9+ | - | 6 | 9 | 9+ | 9+ | 9+ | 9+ | 9 | 9 | 9 | 9+ | 9 | 3* | 9 | 9 | 9 | 3* | - | - | - | - | 5 | 1 | - | - | 12 |
| 13 | - | - | 9+ | - | - | - | 9 | - | 5 | 9+ | - | 3 | 8 | 9+ | 9 | 9 | 9+ | 7 | 9 | 9+ | 9+ | 9 | 8 | 9+ | 9 | 9 | 5* | 9+ | - | 1 | 9 | 9 | 7 | - | - | 13 |
| 14 | - | - | 7 | - | - | - | 4 | - | - | 9+ | - | - | 7 | 9 | 9 | 8 | 9+ | 5 | 8 | 7 | 9+ | 9 | 9+ | 9+ | 9 | 8 | 4* | 9+ | - | - | 5 | 9 | 6 | - | 4 | 14 |
| 15 | - | - | 1 | - | - | - | - | - | - | 9 | - | - | 2 | 7 | 8 | 8 | 9+ | 5 | 5 | 5 | 9+ | 8 | 9 | 9+ | 9 | 9 | 3* | 9 | - | 4 | 3 | 9 | - | - | 9 | 15 |
| 16 | - | - | - | - | - | - | - | - | - | 9 | - | - | - | 4 | 9 | 1 | 9+ | 6 | 5 | 8 | 9+ | 9 | 7 | 9+ | 9 | 8 | 1* | 9+ | - | - | 1 | 9 | - | - | 9 | 16 |
| 17 | - | - | - | - | - | - | - | - | - | 8 | - | - | - | 2 | 9 | 1 | 9+ | 9 | 7 | 7 | 9+ | 9 | 5 | 9+ | 9 | 2* | 9 | 9+ | - | - | 1 | 9 | - | - | 9 | 17 |
| 18 | - | - | - | - | - | - | - | - | - | 9 | - | - | - | 2 | 9 | 1 | 9+ | 9 | 8 | 5 | 9+ | 8 | 1 | 9+ | 9+ | 1* | 9 | 9+ | - | - | 2 | 9 | - | 4 | 9 | 18 |
| 19 | - | - | 2 | - | - | - | - | 2 | - | 9 | 1 | - | - | 5 | 9+ | 3 | 9+ | 9+ | 8 | 4 | 9+ | 3 | 1 | 9+ | 9+ | - | 9 | 9+ | - | - | 5 | 8 | - | 8 | 9 | 19 |
| 20 | - | - | 7 | - | - | - | - | 6 | - | 9+ | 6 | - | - | 9 | 9+ | 4 | 9+ | 9+ | 5 | 4 | 9+ | - | - | 9+ | 9+ | - | 9 | 9+ | - | - | 7 | 9 | - | 8 | 9+ | 20 |
| 21 | 1 | - | 9+ | - | - | - | 6 | 8 | - | 9+ | 9 | 1 | 2* | 9+ | 8 | 8 | 9+ | 9+ | 8 | 5 | 9+ | - | - | 9+ | 8 | - | 9 | 9+ | - | - | 9 | 9 | - | 9 | 9+ | 21 |
| 22 | 6 | - | 9+ | 5 | - | - | 9+ | 9 | - | 9+ | 9+ | 8 | 1* | 9+ | 6 | 9 | 9+ | 9+ | 8 | 8 | 9+ | - | 8 | 9+ | 9 | - | 9 | 9+ | - | - | 9 | 8 | - | 8 | 9+ | 22 |
| 23 | 8 | - | 9+ | 9 | 3 | - | 9+ | 9 | 4 | 9+ | 9+ | 8 | - | 9+ | 4 | 9 | 9+ | 9+ | 8 | 8 | 9+ | - | 9 | 9+ | 7 | - | 9 | 9+ | - | 2 | 9+ | 5 | - | 8 | 9 | 23 |
| | EU | FE | SA | AF | AS | OC | NA | EU | FE | SA | AF | AS | OC | NA | EU | FE | SA | AF | AS | OC | NA | EU | FE | SA | AF | AS | OC | NA | EU | FE | SA | AF | AS | OC | NA | |

Figure 1—Summary Table for 6Y for February at a Low sunspot number

## 10 Meters: Feb., Jamaica (Kingston), for SSN = Low, Sigs in S-Units. By N6BV, ARRL.

| Zone | UTC --> 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KL7 = 01 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| VO2 = 02 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| W6 = 03 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | 1 |
| W0 = 04 | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | 3 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 4 |
| W3 = 05 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2 | 6 | 5 | 5 | 5 | 2 | 4 | 4 | 2 | 4 |
| XE1 = 06 | 6 | - | - | - | - | - | - | - | - | - | - | - | - | - | 4 | 9 | 9 | 9 | 9 | 9 | 9+ | 9+ | 9+ | 9 |
| TI = 07 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| VP2 = 08 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | 1 | 1 | - | - |
| P4 = 09 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| HC = 10 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5 | 3 | 1 | - | 1 | 2 | 7 | 9 | 9 | 6 |
| PY1 = 11 | 2 | - | - | - | - | - | - | - | - | - | - | - | - | 9 | 2 | 1 | 1 | 1 | 1 | 5 | 7 | 8 | 8 | 9+ |
| CE = 12 | 2 | 5 | - | 1 | - | - | - | - | - | - | - | - | - | 5 | 1 | 1 | - | - | - | - | 2 | 5 | 6 | 4 |
| LU = 13 | 9 | 3 | - | - | - | - | - | - | - | - | - | - | - | 8 | - | 1 | 1 | 1 | 2 | 5 | 7 | 8 | 9 | 8 |
| G = 14 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| I = 15 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| UA3 = 16 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| UN = 17 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| UA9 = 18 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| UA0 = 19 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 4X = 20 | - | - | - | - | - | - | - | - | - | - | - | - | 1 | 5 | 5 | 3 | - | - | - | - | - | - | - | - |
| HZ = 21 | - | - | - | - | - | - | - | - | - | - | - | - | 1 | 7 | 6 | - | - | - | - | - | - | - | - | - |
| VU = 22 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| JT = 23 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| VS6 = 24 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| JA1 = 25 | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2 |
| HS = 26 | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - |
| DU = 27 | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| YB = 28 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 4 | - | - | - | - | - | - | - | - |
| VK6 = 29 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| VK3 = 30 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| KH6 = 31 | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 4 | 8 | 8 | 9 | 8 | 7 |
| KH8 = 32 | 7 | 5 | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3 | 4 | 1 | - | 2 | 8 |
| CN = 33 | - | - | - | - | - | - | - | - | - | - | - | - | - | 3 | 6 | 5 | 5 | 5 | 3 | - | - | - | - | - |
| SU = 34 | - | - | - | - | - | - | - | - | - | - | - | - | 2 | 7 | 8 | 6 | 1 | - | - | - | - | - | - | - |
| 6W = 35 | - | - | - | - | - | - | - | - | - | - | - | - | 1 | 6 | 8 | 7 | 7 | 8 | 9 | 8 | 7 | 5 | 1 | - |
| D2 = 36 | - | - | - | - | - | - | - | - | - | - | - | - | 5 | 9 | 9 | 9 | 9 | 9 | 9 | 9+ | 9 | 9 | 8 | 5 |
| 5Z = 37 | - | - | - | - | - | - | - | - | - | - | - | - | 4 | 8 | 8 | 8 | 8 | 9 | 9 | 9 | 8 | 8 | 6 | 3 |
| ZS6 = 38 | - | - | - | - | - | - | - | - | - | - | - | - | 5 | 9 | 9 | 8 | 7 | 7 | 6 | 4 | - | - | - | - |
| FR = 39 | - | - | - | - | - | - | - | - | - | - | - | - | 5 | 9 | 6 | 7 | 7 | 5 | 2 | - | - | - | - | - |
| FJL = 40 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Zone | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| | UTC --> | | | | | | | | | | | | | | | | | | | | | | | |

Expected signal levels using 1500 W and 4-element Yagis at 60 feet at each station.

Figure 2—Detailed Table for 6Y for February at a Low sunspot number

# Contest Tips, Tricks & Techniques

By Gary Sutcliffe, W9XT

A couple of years after I started writing this column, I started keeping a list of the topics covered for each installment. According to my list this should have been installment number 100. Eagle eyed *NCJ* editor, Carl Luetzelschwab, K9LA, found some discrepancies with my list of columns. Sure enough, I made a mistake, and this installment is really number 99.

For #100 I was planning on doing my favorite tips, and that will still be the topic for this issue. For the real number 100 I will open it up to your favorite tips. That is probably more appropriate anyway, since the reason for the success and long life (over 15 years!) of CTT&T is you, the reader.

**W9XT's Favorite Tips**

My list of favorite tips has been derived from a talk that I have given at several club meetings. The talk is aimed at hams who have some exposure to contesting, usually Field Day, with the aim of helping them improve their scores. Hopefully you will find one or two you have not considered before, or more likely something that needs revisiting. Sometimes athletes and sports teams spend so much time on high-level techniques that they ignore some of the basics. I'm sure that happens frequently in radio contesting.

*Prepare for the contest*

A little bit of work beforehand can pay big dividends during the contest. Check out the station well before the contest. Load up every antenna you expect to use. Make sure that the computer is talking with the radio and accessories properly. The contest period is not the time to be repairing the station.

Review logs from previous efforts. Use them to set goals before the start of the contest. Set targets for multipliers, total QSOs and hourly QSO totals.

A computer spreadsheet is a good way to do some strategy "what if" analysis. Set it up so you can enter QSO totals and multipliers on each band, and calculate the score. Then fill in the expected QSOs per band and multipliers on either a band-by-band basis or total, depending on the contest. Play around and see the results if you were to change your strategy. This can be very enlightening, especially if you are trying a new contest for the first time.

Finally—read and understand the rules for the contest.

*Be Efficient*

Contacts are the currency of contesting. You need to make them as quickly and with as little effort as possible. Proper station layout goes a long way toward minimizing the effort. Design the station layout to minimize the motions required to operate most the frequently used controls.

When I visit Field Day sites I am amazed at the number of operators using a hand microphone and listening through the speaker of the radio. For some voice operators, going to head phones with a microphone mounted on it, or a boom microphone and a foot switch can be the single best improvement possible. You simply can't pull out the weak ones through the speaker. Using your hand to hold the microphone and activate the PTT is a phenomenal waste of an appendage that should be more properly deployed.

Finally, technology in the form of the computer and other accessories can help to automate some of the more common functions. They can also help reduce mistakes like selecting the wrong antenna.

*Watch the Rate*

The main object of a contest is to work as many stations as possible in a fixed period of time. That means maximizing the QSO rate. Keep an eye on the rate meter on your logging program. Try something else if the rate drops. Call CQ, try Search and Pounce (S&P), change bands, take your break times.

A particularly important time to watch the rate meter is when you are calling CQ, especially after a recent switch from S&P. It takes a lot less mental effort to hit the CQ button than it does to tune the band, extract calls, check if you worked before, etc. After a few CQs with no answer, it is easy to believe that CQs are not working. Comparing the actual rate is critical.

*Be Loud*

Being loud isn't just about big antennas and amplifiers. Being loud is relative. You are loud at S5 on a quiet band, but weak at S9 if QRM is S9+20 dB. Know which bands and at what times you are loudest. If things are not in your favor for slugging it out at the bottom of the band, it is usually less crowded at the top of the band.

If you have the room, put up more antennas. I am a firm believer that you can't have too many antennas. There are propagation modes that favor different takeoff angles. The high antennas will not perform as well for domestic contests nor sometimes during high sunspot periods.

The extra antennas don't always have to be big and expensive. Another dipole on the low bands at right angles to your current one can pay big dividends. Bringing up that weak signal a few dB or cutting the QRM a few dB can make the difference.

Even better yet, build a power splitting system. Dave Pruett, K8CC, used to conduct an *NCJ* column, "Contest Aerials". His January-February 1988 column titled "Switching Stacked Antennas" is a classic. Dave discussed an inexpensive method of feeding and switching antennas. You can switch in the antennas individually or both at the same time and the transmitter still sees 50 Ω. All you need is a coax switch and some coax, and you don't need to stack yagis for it to work. For years, my favorite Field Day antenna system for 40m has been two different dipoles using this system. The difference in signal strength between the two is often amazing, and is responsible for many extra contacts.

*Call CQ Whenever Possible*

If conditions are right, you can make contacts faster by calling CQ than by S&P. There are times in every contest that nearly every station can call CQ effectively. You need to figure out when those times are.

A few years ago I could not put in a full effort in a CW DX contest, so I thought I would try QRP for the few hours I could put in. I had a couple of hours when I was able to call CQ and keep a rate over 70/hour on 10M running just 5 W. Ten is a quiet band and my antenna system is most effective there. I knew my best shot at running would be on 10, and I gave it a shot.

In general little pistols have more luck calling CQ on the higher bands and higher in the band. Later in the contest may be a more effective CQ time for these stations as well. Also try CQing when bands are opening or closing. A good trick is to try a few CQs whenever you tune across a quiet frequency and see if you can get a good run going.

Another reason it is important to call CQ is that there are many operators who never call CQ. If you don't call CQ, you will never work any of them. This includes some rare DX multipliers.

*Have Fun*

Have fun and keep things in perspective. Compete against your previous efforts and other stations in the area at your level.

From time to time there will be a thread on the Internet contest forums about how contests are unfair or fixed. Usually this is started by a contester who has been contesting for a couple of years and has been unable to crack the top ten list. While the playing field is certainly not level, the reality is that some contesters spend decades developing

their skills and stations. They spend countless hours between contests preparing for the next one. It would be unrealistic to make the PGA tour a year or two after picking up your first golf club. You are not going to become a world-class contester just by operating a couple of Sweepstakes.

Consider specializing. Concentrate on contests that suit your interests and station—DX, domestic, SSB, CW, RTTY, QRP, etc. Maybe you have a favorite band. It is easier to put up a killer antenna on one or two bands than it is to put competitive antennas on all bands. If you become a band specialist you will also become an expert on propagation for that band, and know when to get the tough multipliers.

That wraps up this issue of CTT&T. I look forward to hearing your favorite contesting tips for the centennial installment of this column.

**Topic for the Jan-Feb 2004 issue: (deadline November 10)**

Special 100th installment topic – Your favorite contest tip, trick or technique.

Send in your ideas on these subjects or suggestions for future topics. You can use the following routes: Mail: 3310 Bonnie Lane, Slinger, WI 53086. Internet: **w9xt@qth.com**. Be sure to get them to me by the deadline.

NCJ

# DX Contest Activity Announcements

**Bill Feidt, NG3K**
**bill@ng3k.com**

If you want to appear in the January/February issue, the deadline is November 18. You can submit your data using the form you'll find at **www.ng3k.com/Contest/consub.html**. If you prefer to e-mail your information, please include:

• Call sign to be used • DXCC entity • CQ Zone (for the CQ WW contests) • Entry class • QSL Route • Your call sign and e-mail address • Operators and other information of interest

Send your information to **bill@ng3k.com**. You can review what has been received to date at **www.ng3k.com/contest/conasc.html**. This Web page is continually updated as new announcements are received.

**CQ World Wide DX CW Contest (November 29-30, 2003)**

| *Call* | *Entity* | *Class* | *Operators* |
|---|---|---|---|
| 4X6FR | Israel | SOAB LP | 4X6FR |
| 7S2E | Sweden | SOSB 40M | SM2DMU |
| C53M | Gambia | M/2 | International team |
| CU2F | Azores | SOSB 20M | SM4DHF |
| D4B | Cape Verde | TBD | 4L5A |
| D44TD | Cape Verde | SOSB 20M | IK2NCJ |
| EA8ZS | Canary | SOAB HP | EA5FV |
| EY8MM | Tajikistan | SOSB 80M | EY8MM |
| FS/K3LP | St Martin | M/S | K3LP, N7DD, W3ARS |
| GJ2A | Jersey | SOAB | HP K2WR |
| GZ7V | Shetland Is | SOAB | GM4AFF |
| IH9P | African Italy | SOSB 40M | OL5Y |
| JW5E | Svalbard | M/? | JW5NM + others |
| KH6/KEØUI | Hawaii | SOAB LP | KEØUI |
| KP3Z | Puerto Rico | SOAB | HPN5TJ |
| LA6FJA/DU1 | Philippines | SO HP | LA6FJA |
| LY1YK | Lithuania | M/2 | LY2FY, LY2CO, LY3CI, LY4CW + others |
| LZ9W | Bulgaria | M/M | LZ1ZD, LZ1UQ, LZ1PM, LZ2HM, LZ2CJ, LZ2FV, LZ2PO, LZ2JE, LZ2UU, LZ3FN |
| MU/DL2OBF | Guernsey | SOAB LP | DL2OBF |
| P4ØTA | Aruba | SOAB HP | K6TA |
| PJ2T | Neth Antilles | M/2 | K4BAI, N8BJQ, K8MFO, K8ND W8WTS, WØCG, S5ØR |
| PJ5NA | St Maarten | SOAB | K1NA |
| T32WW | East Kiribati | M/2 | NØKV, KØMP, N2WW, WØZA NOØT NØZM |
| TA3/DK3KD | Turkey | M/? | DL5JQ, DK3KD |
| TS7N | Tunisia | M/29 | K2RR, JH4RHF, DK1BT, DJ9CB, DJ7IK, DK7YY, DL3KDV, DF2SS + others |
| V26K | Antigua | LP | AA3B |
| VP5X | Turks Caicos | M/S | KY1V WA4PGM |
| VP8/LZ2UU | South Shetland | SOAB LP | LZ2UU |
| ZD8Z | Ascension | M/2 | N6TJ, K6NA, N6ND |

Thanks to: 4L5A, 4X6FR, AA3B, DJ7IK, DK3KD, DL2OBF, EA5FV, EY8MM, GM4AFF, IK2NCJ, JW5NM, KØMP, K1NA, K2WR, K3LP, K6TA, KEØUI, LA6FJA, LY2FY, LZ2CJ, LZ2UU, N5TJ, N6TJ, NG3K, OH9MM, OL5Y, SM2DMU, SM4DHF, WØCG
See **www.ng3k.com/Misc/cqc2003.html** for further details

**ARRL 160 M Contest** (December 5-7, 2003)

| **Call** | **Entity** | **Class** | **Operators** |
|---|---|---|---|
| LA6FJA/DU1 | Philippines | SO HP | LA6FJA |
| P4ØTA | Aruba | SO | HPK6TA |

Thanks to: K6TA, LA6FJA
See **www.ng3k.com/Misc/arrl160_2003.html** for further details

**ARRL 10 M Contest** (December 13-14 2003)

| **Call** | **Entity** | **Class** | **Operators** |
|---|---|---|---|
| DA0BCC | Germany | unknown | OE7AJT |
| P40K | Aruba | M/S HP | K6KO K6TA |

Thanks to: K6TA, OE7AJT
See **www.ng3k.com/Misc/arrl10_2003.html** for further details

# *NCJ* Station Profile

Mark Beckwith, N5OT

## W4MYA

The last time we visited was at the one tower multi-op station of Jim,VE1JF. This station is located high above the Bay of Fundy in Nova Scotia, where the tide comes in and goes out a greater distance than anywhere else on earth. Though modest by hardware addict standards, the strength of Jim's operation is his great success at infecting new operators with the "great truths of contesting."

"Contesting is fun," as we used to say. Even though the phrase is passé, I don't recall contesting getting less fun. On the contrary, contesting is more fun now than it has ever been, in my humble opinion. Station builders like Jim, with a heart for cultivating new blood in our sport, get to go to the front of the line in my book.

### From an Early Age

W4MYA is a call you hear on the air in a lot of contests. Bob Morris has been a ham since he was 12. He was first licensed in West Virginia as KN8NNC in 1958, but his family moved to Virginia later that year. "I was KN8NNC/4 in Sweepstakes (SS) that year, but I messed up the log. I didn't know what I was doing."

**This view shows the 15 meter stack (tower on the right), and the TH7 (tower on the left) with an A3WS with a 30 meter kit above it.**

Bob quickly upgraded the following year. "I was delighted to be 13 years old with the call W4MYA."

While we were talking about his "early years" (it's hard to imagine some people as teenagers), Bob related a great "real-radios-glow-in-the-dark" story. "I was a member of my high school radio club. Paul Watson, W4MQE, was the principal. We used old surplus stuff and dimmed the lights in the school when we fired up on 20 meters. Not many contacts at all were made with it! I don't remember the numbers on the equipment." Hence the name "footwarmers."

In 1963 Bob graduated and went to work for AT&T. Bob's years from 1963 to 1969 were a blur. "Not much contesting

### W4MYA Equipment

**Radios**

*160 Meters*
Position 1: Yaesu FT-1000MP, homebrew 8877

*80 Meters*
Position 1: Yaesu FT-1000 MkV, homebrew 4-1000
Position 2: Yaesu FT-990

*40 Meters*
Position 1: Yaesu FT-1000MP, Dentron DTR-2000
Position 2: Yaesu FT-1000, Drake L4B

*20 Meters*
Position 1: Yaesu FT-1000MP, Ameritron AL-1500
Position 2: Yaesu FT-990, Drake L4B

*15 Meters*
Position 1: Yaesu FT-1000, Commander 2500
Position 2: Kenwood TS-940, Henry 2K

*10 Meters*
Position 1: Yaesu FT-1000, Ten-Tec Titan
Position 2: Yaesu FT-990, Drake L4B

*Other Radios*
ICOM IC-746, Heathkit SB-220 (converted to 6 meters), Johnson Viking Thunderbolt for 6 and 2 meters.

**Antennas**

*Beverages:*
30 degrees—580 feet
60 degrees—400 feet
110 degrees—400 feet
140 degrees—400 feet
210 degrees—580 feet
240 degrees—400 feet
290 degrees—400 feet
320 degrees—400 feet

*160 Meters*
Full wave loop—135 feet
Inverted L at 120 feet
80 Meters
Quad loop at 135 feet NE/SW
Quad loop at 120 feet NW/SE
Flat-top dipole at 120 feet E/W

*40 Meters*
Force 12, 3 element at 120 feet
Telrex 3 element at 60 feet
Homebrew 2 element at 140 feet (rotary)—position 2
Homebrew 2 element at 105 feet (fixed SE) – position 2

*20 Meters*
HyGain 204BA at 120 feet
HyGain 204BA at 60 feet
HyGain 204BA at 100 feet—position 2

*15 Meters*
Homebrew 6 element at 140 feet
Homebrew 5 element at 90 feet
Homebrew 5 element at 45 feet
Homebrew 7 element at 150 feet
TA-33 at 50 feet—position 2
HyGain DB-1015 at 75 feet—position 2

*10 Meters*
Homebrew 7 element at 145 feet
Homebrew 5 element at 65 feet (fixed E)
Homebrew 5 element at 35 feet (fixed E)
HyGain TH-7 at 65 feet—position 2

*Other Bands*
Cushcraft A3WS with 30 meter extensions at 130 feet
Homebrew 5 element 6 meter Yagi at 56 feet

during that time–most of my time was spent working two jobs to support us. I played in some CD Parties and DX and SS contests. I remember putting up a telephone pole and a 2-element quad with the help of WK4Y. The first big storm took it down."

"My first sideband rig was an EICO 753 (I think). I borrowed an amp from K4YZT in 1968. It had a pair of 4-125s in it. We upgraded it first to 4-250s and then to 4-400s. It used a pole-pig transformer–the old kind with the laminations. It made so much noise I put it under the house, which was good until it caught fire. Fortunately there was no damage. Then a friend from AT&T loaned me the same 4-1000 deck I am still using on 80 meters today."

That friend was Jack Reichart, then W3ZKH, now N4RV. In 1969 Jack invited Bob to operate the CQ World Wide contest with him at the W3MSK multi-multi, where Bob first experienced lots of antennas, racks of amplifiers and Collins S-Lines. "That really planted the seed that one day I would like to have a station like that."

### A Passion for Teaching

That first contesting experience must have made a lasting impression, operating for the first time alongside the legendary likes of K3ZO, K3EST and W3AZD. Twenty years later, Bob has built a station that supports on-the-job training of new contesters and facilitates mentoring relationships between seasoned operators and newcomers.

"Our scores run close to two-thirds of the bigger multi-multi scores and we're looking to increase that percentage," Bob says of his Virginia-based multi-multi station. Virginia is not the optimum location to win the big DX contests, but there is plenty of fresh contesting talent to train and sharpen.

I asked Bob to scribble a list of operators he had mentored. His reply was, "I hope we have learned from *each other!*" This list is probably not complete, and these calls are all their present calls: W4DR, N4EHJ, WK4Y, NJ4H, WA8WV, KC6FS, N4ZJ, W4PM, N4KFT, K4PUF, W4HJ, W4HZ, W4TJ, WU4G, NW4V, K4MA, W4PFM, K4KJL, K4KML, KG4PMJ, WA4PGM, K4GAU, K4WNA, W4TNX, KF4QQY, WX3B, N3SB, AC4OB, K7MX and KU4FP.

### A Big Station

In 1989, Bob established his current location–five acres in Goochland County, Virginia. His lot is long and narrow, like a landing strip bearing 30 degrees. Bob describes the kinds of things any HF enthusiast loves to hear. "When you climb above the tree line, all you see is horizon."

Over the years, Bob has built 7 towers along his short wave landing strip.

**Hurricane Isabel took out the local power so this emergency generator was still running as of early morning September 26.**

**This is the tower behind the old shack. This was the first tower put up at W4MYA in the spring of 1990. It went from 80ft to 100ft in 1992.**

**Here is an A3WS with a 30 meter kit at 130ft and a 4 element 20 meter Yagi at 120ft.**

He opted for the classic "one tower per band" design approach with stacked antennas on each tower — *for the "**run**" stations.* For the multiplier positions on each band, he has a lot (read: a *lot*) of additional antennas on additional towers pointed in additional directions (see sidebar). When you get inside the shack, you realize he has two complete stations on every band except 160 meters, so all this additional hardware outside gets put to good use. W4MYA offers excellent coverage of the high-traffic directions on all the high-traffic bands.

### Darwin was a Ham

What started in February of 1990 as a 14x20 foot radio room, detached from the house with two towers, has evolved over time. In 1991, two more towers went up. In 1992, two *more* towers went up. In 1993, Bob installed the last tower. Finally, in 1999, Bob built a 24x30 foot radio room, bridging the original detached radio room to the house. "When I moved here in 1989, I had to walk out through the weather to get to the shack. Now we just go through the side door on the house, take a left through the enclosed porch, go up 2 steps and into the new shack. The old station is a bunk house now, it sleeps five or six." That was definitely "survival of the fittest" at work.

### Dayton Comes Through Again

To try to describe just what an extensive contest station W4MYA is, I think a photo is worth a thousand words. I met up with Bob at Dayton and was able to ask him to tell me more about his station. After a few beers, we trucked down to his room from the hospitality suites and started the interview.

Bob takes his work as a station builder seriously, so by the time we were finished, he had used up an entire Crowne Plaza note pad (and part of another one) scribbling notes and drawings about W4MYA. When this article came due for *NCJ*, I was vacationing. One sunny summer Saturday morning found me sitting on W6AQ's patio with my laptop and notes.

### Go to the Front of the Line

W4MYA is one of those legendary calls you honestly can't remember *not* working in a contest. Bob Morris has worked hard to keep his signal loud and skills honed—not only his own, but those of about half the operators in Virginia, by the looks of it. If you will allow my closing pontification, "It's multi-multi owner-builders like W4MYA, who have a passion for passing it on, who are making the greatest contribution to keeping our sport alive." Go to the front of the line, Bob. And *thanks!*

Also thanks to Ward, NØAX, for occasional quotes from his 2000 interview with W4MYA. NCJ

# CONTEST CALENDAR

**Compiled by Bruce Horn, WA7BNM**

Here's the list of major contests to help you plan your contesting activity through February 2004. The Web version of this calendar is updated more frequently and lists contests for the next 12 months. It can be found at: **www.hornucopia.com/contestcal/**.

As usual, please notify me of any corrections or additions to this calendar. I can be contacted at my Callbook address or via e-mail at: **bhorn@hornucopia.com**. Good luck and have fun!

**November 2003**

| | |
|---|---|
| IPA Contest, CW | 0600Z-1000Z, Nov 1 and 1400Z-1800Z, Nov 1 |
| Ukrainian DX Contest | 1200Z, Nov 1 to 1200Z, Nov 2 |
| ARRL Sweepstakes Contest, CW | 2100Z, Nov 1 to 0300Z, Nov 3 |
| NA Collegiate ARC Championship, CW | 2100Z, Nov 1 to 0300Z, Nov 3 |
| IPA Contest, SSB | 0600Z-1000Z, Nov 2 and 1400Z-1800Z, Nov 2 |
| High Speed Club CW Contest | 0900Z-1100Z, Nov 2 and 1500Z-1700Z, Nov 2 |
| DARC 10-Meter Digital Contest | 1100Z-1700Z, Nov 2 |
| WAE DX Contest, RTTY | 0000Z, Nov 8 to 2359Z, Nov 9 |
| Japan Int. DX Contest, Phone | 0700Z, Nov 8 to 1300Z, Nov 9 |
| SARL Field Day Contest | 1000Z, Nov 8 to 1000Z, Nov 9 |
| OK/OM DX Contest, CW | 1200Z, Nov 8 to 1200Z, Nov 9 |
| Anatolian ATA PSK31 Contest | 1800Z-2400Z, Nov 8 |
| All Austrian 160-Meter Contest | 1600Z, Nov 15 to 0700Z, Nov 16 |
| ARRL Sweepstakes Contest, SSB | 2100Z, Nov 15 to 0300Z, Nov 17 |
| NA Collegiate ARC Championship, SSB | 2100Z, Nov 15 to 0300Z, Nov 17 |
| RSGB 1.8 MHz Contest, CW | 2100Z, Nov 15 to 0100Z, Nov 16 |
| LZ DX Contest | 1200Z, Nov 22 to 1200Z, Nov 23 |
| CQ Worldwide DX Contest, CW | 0000Z, Nov 29 to 2400Z, Nov 30 |

**December 2003**

| | |
|---|---|
| QRP ARCI Topband Sprint | 0000Z-1200Z, Dec 4 |
| ARRL 160-Meter Contest | 2200Z, Dec 5 to 1600Z, Dec 7 |
| PSK31 Death Match | 0000Z, Dec 6 to 2400Z, Dec 7 |
| TARA RTTY Sprint | 1800Z, Dec 6 to 0200Z, Dec 7 |
| TOPS Activity 80-Meter Contest | 1800Z, Dec 6 to 1800Z, Dec 7 |
| QRP ARCI Holiday Spirits Sprint | 2000Z-2400Z, Dec 7 |
| ARRL 10-Meter Contest | 0000Z, Dec 13 to 2400Z, Dec 14 |
| Great Colorado Snowshoe Run | 0200Z-0400Z, Dec 14 |
| AGB Party Contest | 2100Z-2400Z, Dec 19 |
| Russian 160-Meter Contest | 2100Z-2300Z, Dec 19 |
| OK DX RTTY Contest | 0000Z-2400Z, Dec 20 |
| Croatian CW Contest | 1400Z, Dec 20 to 1400Z, Dec 21 |
| International Naval Contest | 1600Z, Dec 20 to 1600Z, Dec 21 |
| DARC Christmas Contest | 0830Z-1059Z, Dec 26 |
| RAC Winter Contest | 0000Z-2400Z, Dec 27 |
| Stew Perry Topband Challenge | 1500Z, Dec 27 to 1500Z, Dec 28 |
| Original QRP Contest, CW | 1500Z, Dec 27 to 1500Z, Dec 28 |

**January 2004**

| | |
|---|---|
| AGB NYSB Contest | 0000Z-0100Z, Jan 1 |
| SARTG New Year RTTY Contest | 0800Z-1100Z, Jan 1 |
| AGCW Happy New Year Contest | 0900Z-1200Z, Jan 1 |
| AGCW QRP Winter Contest | 1500Z, Jan 3 to 1500Z, Jan 4 |
| ARRL RTTY Roundup | 1800Z, Jan 3 to 2400Z, Jan 4 |
| Kids' Day Contest | 1800Z-2400Z, Jan 3 |
| EUCW 160-Meter Contest | 2000Z-2300Z, Jan 3 and 0400Z-0700Z, Jan 4 |
| Hunting Lions in the Air | 0000Z, Jan 10 to 2400Z, Jan 11 |
| East Asia 160/80 DX Contest | 0900Z, Jan 10 to 2200Z, Jan 11 |
| UK DX Contest, SSB | 1200Z, Jan 10 to 1200Z, Jan 11 |
| Midwinter Contest, CW | 1400Z-2000Z, Jan 10 |
| North American QSO Party, CW | 1800Z, Jan 10 to 0600Z, Jan 11 |
| NRAU-Baltic Contest, CW | 0530Z-0730Z, Jan 11 |
| NRAU-Baltic Contest, SSB | 0800Z-1000Z, Jan 11 |
| Midwinter Contest, Phone | 0800Z-1400Z, Jan 11 |
| DARC 10-Meter Contest | 0900Z-1059Z, Jan 11 |
| 070 Club PSKFest | 0000Z- 2400Z, Jan 17 |
| LZ Open Contest, CW | 1200Z-2000Z, Jan 17 |
| MI QRP January CW Contest | 1200Z, Jan 17 to 2359Z, Jan 18 |
| Hungarian DX Contest | 1200Z, Jan 17 to 1200Z, Jan 18 |
| North American QSO Party, SSB | 1800Z, Jan 17 to 0600Z, Jan 18 |
| ARRL January VHF Sweepstakes | 1900Z, Jan 17 to 0400Z, Jan 19 |
| CQ 160-Meter Contest, CW | 0000Z, Jan 24 to 2359Z, Jan 25 |
| REF Contest, CW | 0600Z, Jan 24 to 1800Z, Jan 25 |
| BARTG RTTY Sprint | 1200Z, Jan 24 to 1200Z, Jan 25 |
| UBA DX Contest, SSB | 1300Z, Jan 31 to 1300Z, Feb 1 |

**February 2004**

| | |
|---|---|
| Vermont QSO Party | 0000Z, Feb 7 to 2400Z, Feb 8 |
| New Hampshire QSO Party | 0000Z, Feb 7 to 2400Z, Feb 8 |
| 10-10 Inter. Winter Contest, SSB | 0001Z, Feb 7 to 2400Z, Feb 8 |
| Minnesota QSO Party | 1400Z-2359Z, Feb 7 |
| Delaware QSO Party | 1700Z, Feb 7 to 0500Z, Feb 8 and 1300Z, Feb 8 to 0100Z, Feb 9 |
| Mexico RTTY International Contest | 1800Z, Feb 7 to 2400Z, Feb 8 |
| North American Sprint, Phone | 0000Z-0400Z, Feb 8 |
| CQ/RJ WW RTTY WPX Contest | 0000Z, Feb 14 to 2400Z, Feb 15 |
| SARL Field Day Contest | 1000Z, Feb 14 to 1000Z, Feb 15 |
| Asia-Pacific Sprint, CW | 1100Z-1300Z, Feb 14 |
| Dutch PACC Contest | 1200Z, Feb 14 to 1200Z, Feb 15 |
| YL-OM Contest, CW | 1400Z, Feb 14 to 0200Z, Feb 16 |
| FISTS Winter Sprint | 1700Z-2100Z, Feb 14 |
| OMISS QSO Party | 1700Z, Feb 14 to 0500Z, Feb 15 |
| RSGB 1.8 MHz Contest, CW | 2100Z, Feb 14 to 0100Z, Feb 15 |
| North American Sprint, CW | 0000Z-0400Z, Feb 15 |
| QRP ARCI Winter Fireside SSB Sprint | 2000Z-2400Z, Feb 15 |
| ARRL School Club Roundup | 1300Z, Feb 16 to 0100Z, Feb 21 |
| ARRL Inter. DX Contest, CW | 0000Z, Feb 21 to 2400Z, Feb 22 |
| YL-ISSB QSO Party, CW | 0000Z, Feb 21 to 2400Z, Feb 22 |
| YL-OM Contest, SSB | 1400Z, Feb 21 to 0200Z, Feb 23 |
| CQ 160-Meter Contest, SSB | 0000Z, Feb 28 to 2359Z, Feb 29 |
| REF Contest, SSB | 0600Z, Feb 28 to 1800Z, Feb 29 |
| UBA DX Contest, CW | 1300Z, Feb 28 to 1300Z, Feb 29 |
| Mississippi QSO Party | 1500Z, Feb 28 to 0300Z, Feb 29 |
| FYBO Winter QRP Field Day | 1600Z-2400Z, Feb 28 |
| North American QSO Party, RTTY | 1800Z, Feb 28 to 0600Z, Feb 29 |
| High Speed Club CW Contest | 0900Z-1100Z, Feb 29 and 1500Z-1700Z, Feb 29 |
| North Carolina QSO Party | 1700Z, Feb 29 to 0300Z, Mar 1 |

NCJ

# Contesting for Fun

Brian Kassel, K7RE

### How About Some Brew?

No, not the holiday kind that comes in a gaily wrapped container, but the ham radio kind—the stuff where you can construct your own package. If summer is the season for antenna work, then winter must be the time for building up that project that has been gnawing at you for a long time.

Many of you will probably make a comment like "building in the Amateur Radio arena is dead, has been for a long time." I agree that home brewing has taken a long hiatus after commercial rigs and accessories became the norm rather than the exception. With the demise of Heathkit, many folks felt that quality kit building was all over. But around the middle of the '90s that began to change as the QRP movement began to mushroom. Small companies that catered to QRP kits began to flourish. Even a US company or two began offering kits and many of these small operations are still alive and well.

But why in the world would anyone want to build a rig or accessory that can be purchased already built and ready to go out of the box? Well, if you never have experienced the unique thrill of making a QSO with something that you built with your own two hands, you really are missing out on one of Amateur Radio's greatest pleasures. The thrill is an order of magnitude greater if one scratch builds a rig or accessory. More about that later.

When is the last time that you built a kit? I find that for many active contesters it has been innumerable years, and most hearken back to the wonderful days of Heathkits. Technology, of course, has taken leaps and bounds since the Heathkit days. Rigs and accessories can be built with features that were only pipe dreams for us who were around during the peak years of equipment building and hardware experimentation.

Elecraft is a company whose products and documentation rival the Heathkits, in the opinion of many. They offer products that range from their world class contesting rig, the K-2, down through their most recent offering, the 9 ounce ultra compact and self-contained KX-1. Their Web site is **www.elecraft.com**. Be prepared to be impressed.

Another company that has been around for a long time is Wilderness Radio. Their products can be seen at **www.fix.net/~jparker/wilderness/wild.htm**. They offer much simpler kits, such as the very lightweight single band SST.

While many readers may not wish to tackle a full transceiver, bear in mind that there is plenty of auxiliary and test equipment that can be built in kit form. A search on the Internet will yield pages of ideas.

### Good Things in Little Packages

What about the scratch building that I mentioned earlier? Well, let me give you an example of a personal experience of a rig that I built specifically for one contest, the monthly ARS Spartan Sprint. This contest is held on the first Monday of each month. All scores are reported via a special Web page, and the results and awards are posted by Thursday! Although it is only 2 hours in length, I often work 50 to 100 stations, all QRP. The rules are simple. Each QSO counts as 1 point and multipliers are based on station weight. The lighter the rig, the higher the score. I have used many rigs in this event over the years, but finally decided to go for the gold ring by scratch building a rig just for this event. I chose the SST design mentioned above.

### The *New* Manhattan Project

After obtaining a schematic, I had to decide how to physically build the little beastie. Since, in common with most hams, I suffer from extreme cheap-itis, I decided not to buy the kit or fabricate a PC board. I decided to use a construction technique called Manhattan construction. For those who have never heard of this approach, here is a brief description. For more details just do a *Google* search for many examples and explanations.

A blank copper clad PC board is used as a base, and as a ground plane. All ground connections are soldered directly to this surface. In cases where two components are connected, but do not go to ground, at least two possibilities exist. One is to simply solder the two component leads together, hanging in mid air. The other is to fabricate an "island" (hence the name Manhattan). I know it's a stretch, but I didn't come up with the name. Please don't shoot the messenger.

The island is simply a very small piece of PC board, glued to the base. It is at this point that the two or more component leads are soldered. There are many methods that can be used to create the islands. One may use a nibbler to cut out very small rectangular pieces. Another is to use a round punch to punch out small circles. Still another technique is to use a special drill bit in a drill press to rout out an island from the base itself - no gluing is required. A special low-cost bit can be obtained from the New Jersey QRP club. See their Web page at **www.njqrp.org/islanderpadcutter/index.html**, which also includes their amazing selection of kits.

The SST is finished, and I have used it in several of the ARS Spartan Sprints so far this year. In the weight-to-performance department, it does very well. In fact it has helped me place in one of the top 3 positions each time that I have used it. A big bonus of this type of construction is that modifications are very easy to implement - no cutting of traces, or rewiring traces that require the motor skills of a brain surgeon.

### Cheap-itis Anonymous

Recently I found a huge roll of ½ inch Heliax that was stuck under a table at a local hamfest. You see, I was looking to buy a long run of low loss coax for my 160M antenna located about 400 feet from the shack. I had gone to the event advising my ham buddies that I was on the lookout for some sort of low loss line. When I came upon the roll of Heliax, a quick conversation with the owner revealed that the length was just about right - 500 feet. I reached for my wallet. My acquaintances looked on in disbelief. "Why in the world do you want to use that VHF feed line for 160M of all things"? "You would be better off with 9913, or RG-8, that's what everyone uses you know. I saw a dealer who had some 9913 at $.40/ft".

For some reason, none of them were able to realize that the 500-foot roll of Heliax, with connectors, at 100 bucks total was a far better deal than an equal amount of new 9913. Oh yes, before I bought the roll, I found another vendor who was offering "N" style connectors for the Heliax for $5 each. He had a huge box and no one was buying them, not realizing that new, they sell for around $50 each! You see by using my imagination, flexibility, and of course my innate cheap-itis, I wound up with a far superior set up for far less money than the classic solution.

So use your imagination, try to visualize what you really wish to do with a device. There are other challenges to be had in this far ranging hobby other than contest operating, like contest building. I'll be looking for you all under the tables at the next hamfest. Bring a flashlight and develop your cheap-itis skills. Until then listen for my unencumbered 160M signal. NCJ

# VHF-UHF Contesting!

Jon K. Jones, NØJK
n0jk@hotmail.com

### Record Breaking Tropo on 144 and 222 MHz and a Big 50 MHz $E_s$ Opening for Florida Ops in September 2003 VHF QSO Party!

Now that I have your attention, these could have been the "headlines" for the 2003 September VHF QSO Party – had it occurred one weekend earlier or later. It was not to be for the contest. What a difference one week makes on the VHF Bands.

The weekend before the September VHF contest was possibly the best continental tropo opening ever recorded. A stagnating high pressure system over the Eastern States set the stage for some interesting contacts. On Saturday evening September 6 and Sunday morning September 7 tropo contacts were made on 144 and 222 MHz from Kansas, Oklahoma and Texas all the way to New England. Not to brag… OK – I will brag about this one – I worked Jan, K5MA (FN41), Cape Cod, MA, from the "Cattle Pens" in EM18 at 0433 UTC September 07 on 2 meters while running the same 10 W and a 4 element Yagi I used in the CQ VHF Contest! This is just over 1400 miles or 2259 km. Jan, K5MA, worked W5LUA at 0408 UTC at 2477 km. Some even longer 2 meter tropo contacts were made in this opening, approaching the all time tropo (c) 2 meter record of 2715 km.

I heard Jan, K5MA, for over an hour on 2 meters that night. He peaked up to 5x5 on SSB when he worked K5CM in EM25. I heard WZ1V and K1GX, but no contact was made. It was even better on 222 MHz. Dan, WB5AFY (EM04), set a new continental record on 222 MHz in this opening when he worked Jeff, K1TEO (FN31), at 1245 UTC on September 7.

This opening was not good at 432 MHz and above, despite many stations trying. K1TEO did work WØRT (EM27), on 432 MHz at 0246 UTC September 7. The microwave bands were good on some shorter paths. Unlike the tropo in the July CQ VHF Contest, there was no 6 meter tropo. Signals were often not that strong on some of the really long paths and at times it seemed like a narrow "pipeline" of tropo from New England to the Midwest. Still, imagine the 144, 222, 432 MHz and up contest QSO and grid totals if this had been the contest weekend. I noted FN32 absent in many of the VHF spots – W2SZ/1 on Mount Greylock could have really "cleaned up" on this tropo opening. So… we could have had a "record breaking" VHF contest if it had been scheduled for September 6 and 7. What if the contest had been scheduled one week later?

**Two Meter Tropo Contacts Approaching the 1994 Record**

| *Distance (miles)* | *Station 1(grid)* | *Station 2(grid)* | *Date* |
|---|---|---|---|
| **2,715** | **WB4MJE (EL94hq)** | **VE1KG (FN84cm)** | **05-Nov-1994** |
| 2,567 | KA5DWI (EM12ju) | K1WHS (FN43mj) | 07-Sep-2003 |
| 2,558 | W5FKN (EM13gh) | K1WHS (FN43mj) | 07-Sep-2003 |
| 2,508 | N5TIF (EM12hl) | K1CMF (FN42bq) | 07-Sep-2003 |
| 2,481 | KM5PO (EM12ko) | K1CMF (FN42bq) | 07-Sep-2003 |
| 2,477 | W5LUA (EM13qc) | K5MA (FN41qo) | 07-Sep-2003 |
| 2,463 | W5FKN (EM13gh) | K1CMF (FN42bq) | 07-Sep-2003 |
| 2,376 | WA5TKU (EM13ii) | K1GX (FN31su) | 07-Sep-2003 |
| 2,364 | K5WXZ (EM12qw) | K1RJH (FN31xh) | 08-Oct-1968 |
| 2,295 | NØKQY (DM98gk) | WB2QLP (EL96de) | 14-May-1998 |
| 2,279 | K5VH (EM00xe) | K2AXX (FN12cs) | 06-Sep-2003 |
| 2,259 | NØJK (EM18of) | K5MA (FN41qo) | 07-Sep-2003 |
| 2,213 | N5WS (EL09ru) | VE3VD (FN02cw) | 30-Jul-1995 |

**NØJT at VP9 for the September 2003 VHF QSO Party**

Sunday afternoon September 21 there was F2 opening on 6 meters between Florida and Ecuador, then later E-layer skip from Florida to Central America. At 1926 UTC, KD4ESV worked Gus, HC2FG, on direct F2. Starting around 2100 UTC to 2345 UTC, the Florida stations had $E_s$ on 6 meters to TI, TG, YS and YN. As the $E_s$ opening was fading, stations in Hawaii had TEP/F2 to South America with LUs and CXs worked. This would have made a nice "finish" to a *dream* September VHF QSO Party if we "add in" the tropo opening from one week before. So, what propagation did show up for the 2003 September VHF QSO Party?

The short answer – not much.

### September 2003 VHF QSO Party Propagation

The highlights – the HC8GR becan on 50.035 MHz was heard via F2 Saturday afternoon September 13 in Florida and the Gulf Coast around 2230 UTC. There was a weak $E_s$/enhanced scatter opening Sunday evening between VP9 and the northeast states. K1TOL in Maine had a good solid signal into Bermuda around 0105 UTC September 15. Stations in New England had some tropo to the northeast. Jan, K5MA observed significant tropo enhancement during the contest to VE1HD (FN95), and VY2JC (FN76). He worked VE1HD (FN95) on 144 and 432 MHz with signals above S9. That was about it. Scatter and ground wave accounted for most of the rest of the contacts reported that I saw on the various loggers and e-mail reflectors.

### VP9/NØJK in the September VHF QSO Party

I traveled again to Bermuda to operate in the September VHF QSO Party. Despite the damage from Hurricane Fabian, Ed, VP9GE, said to not cancel my plans. Power had not been restored yet at his home, so I operated "Field Day" style using a generator for electrical power. I was hoping for tropo on 2 meters, which may have happened if the high pressure system from one weekend earlier moved out over the Atlantic Ocean. Jeff, K1TEO, encouraged me saying maybe this would be the VHF contest tropo opening of a lifetime. But no tropo observed this time. I made 7 contacts on 6 meters in 7 grids. Four of these were via "scatter"—AA4ZZ, W3DOG, K1TEO and W2SZ/1. In the first hour of the contest, Saturday afternoon, I heard W8GG, EM78, and a station on 50.150 MHz giving his grid as "EN19." That was the best DX heard on 6 meters. No 6 meter contacts made on Saturday. Nice to get W2SZ/1 (FN32) worked Sunday afternoon as we did not complete a 6 meter QSO when I was in Bermuda for the June contest.

Sunday afternoon at 1844 UTC I heard both sides of a 6 meter QSO between AA4ZZ (EM96) and a "rover" in EM85. The rover was weak but solid copy. Before I could call the rover he changed bands to 144.210 MHz to work AA4ZZ on 2 meters.

Maybe some weak $E_s$? Sunday evening (September 15 UTC) some definite weak "borderline" $E_s$ from Bermuda to the northeast states. Had a "run" with K1TOL, WA2BPE and W3CMP worked between 0105 – 0155 UTC on 6 meters. WA2BPE commented my signal first came in via "pings" then built up to a "steady residual" that sounded like weak $E_s$. Lefty, K1TOL was in solid 559 to 599 on "pings." It sounded like the band was going to "break wide open" and this was the highlight for me. K1WHS was also in solid but I could not get the operator's attention.

A number of other stations were heard via "scatter" and on weak $E_s$ that I could not raise. Got W2FU's attention several times, but no QSO. Guess many did not know I was on from Bermuda in the contest, especially with the damage from Fabian. I ran 100 W and a 5 element $M^2$ Yagi on 6 meters, and 100 W and a "Jr. Boomer" Yagi on 2 meters. All of the 6 meter contacts were made with me using CW on my end. A lot of work for only a few contacts. But that is the way it works on VHF and with VHF contests. What a difference a week makes.

**Move the VHF Contest Weekend in real time? An Internet VHF Contest?**

Here was an idea I had while reviewing the propagation. With the Internet and the various loggers and VHF chat rooms, it is possible to alert operators and notify people quickly in "real time" about propagation. What if during the tropo opening September 6 and 7, which many knew was developing and occurring at the time, the ARRL could have moved the September VHF QSO Party to happen that weekend? Then we could have taken advantage of all that great tropo. I know people plan weeks ahead for time off, and in my case made airline reservations for Bermuda. Others, like big multi-ops, must plan everything well in advance. Still, sure would be nice to have the activity and opportunity to achieve a high score with a rare band opening to help. What do you think? Maybe schedule an impromptu "Internet" contest if a big band opening occurs. I recall there was an Internet 6 meter contest a few years ago. I sure don't want to wait 20 years for another big tropo opening.

# Adventures in Contesting

**You're 59 IN, but your signal sounds a little watery – and I don't think it's due to aurora.** NCJ

# *NCJ* RTTY NAQP — JULY 2003

Wayne Matlock, K7WM

Well, it was July and everyone knows radio activity is down due to summer time and the other things that beckon us. High on everyone's priority list for summer activity is antenna work (except in desert areas where metal is too hot to touch!). Vacations, hurricanes, tidal flooding, tropical storms, monsoons, and other mundane things have a tendency to drag us away from in front of the rig, and contests in the middle of summer always suffer from lack of participation.

This was *not* the case with the July RTTY North American QSO Party. With over 450 entrants (45 DX stations), three times as many multi-two entries, more teams than ever before, and propagation really not being too bad, activity was hot and lively. This was the case for both the 10-hour single ops and the 12-hour multi crews. Ten meters was the really quirky band and exhibited similarities to VHF ducting. Depending on where you were located, it was pretty good to very, very bad. To make up for it and salve the wounds of the unfortunate, 40 meters came to life and activity was hot. Even with 100 W, activity was the best to be seen in a long time. Activity from six land aced out four land for the highest number of logs submitted (28 to 24). Unfortunately, the Left Coast was one of the places that 10 meters was practically non-existent but some good scores were posted anyway.

Take a look at the Top Ten scores, QSOs, and multipliers. All were down a little from the February NAQP, but not much. The fine balancing of either running, doing search and pounce for multipliers, or both with SO2R, really show up here also. Dodging flooding and tropical storms, Don, AA5AU, dried off his antennas and surfaced again as the top single operator with a score of 98,952. Finishing in second place was Tom, WX4TM, with a score of 75,958. To round out the top 3 was another LA op, Chas, KI5XP, with a score of 73,704.

Having an increase of multi-2 teams really increased the competition in this class. Team Lar, WØETC, came to the top of the heap with a score of 121,152. Finishing in second was team Bo, K4WW, with a score of 72,980 and team Doc, NN6NN, rounding out the top three. With the increase in teams for the July NAQP, more team participants, and more team participants submitting their logs (still short a few participants who did not send in a log), the competitiveness of this class has increased considerably. The Team TCG ZIP, comprised of team members VE1OP, K4GMH,

## Single Operator (By Call Area)

| *CALL* | *NAME* | *QTH* | *80 m* | *40 m* | *20 m* | *15 m* | *10 m* | *QSO's* | *Mults* | *Score* |
|---|---|---|---|---|---|---|---|---|---|---|
| KI6DY | BOB | KS | 73/35 | 142/46 | 134/44 | 52/27 | 26/15 | 427 | 167 | 71309 |
| NØAT | RON | MN | 55/32 | 105/35 | 141/41 | 68/28 | 39/19 | 408 | 155 | 63240 |
| AKØA | BILL | KS | 48/26 | 120/40 | 175/49 | 59/27 | 8/6 | 410 | 148 | 60680 |
| KØIDT | RON | NE | 12/9 | 104/42 | 60/40 | 45/22 | 43/21 | 264 | 118 | 31152 |
| KFØOH | BILL | MO | 19/13 | 72/35 | 83/37 | 11/8 | 0/0 | 185 | 93 | 17205 |
| ABØLR | FRANKIE | CO | 0/0 | 99/36 | 101/40 | 0/0 | 0/0 | 200 | 76 | 15200 |
| KSØM | DICK | MO | 0/0 | 35/24 | 85/38 | 39/20 | 3/3 | 162 | 85 | 13770 |
| KØHW | JIM | SD | 20/16 | 47/25 | 30/15 | 27/20 | 17/12 | 141 | 88 | 12408 |
| KØCF | CRAIG | IA | 18/13 | 51/26 | 65/28 | 9/8 | 0/0 | 143 | 75 | 10725 |
| NT3R/Ø | BILL | KS | 1/1 | 70/32 | 68/36 | 0/0 | 0/0 | 139 | 69 | 9591 |
| AEØQ | GLENN | CO | 11/7 | 31/20 | 78/28 | 18/10 | 4/3 | 141 | 68 | 9588 |
| WØTY | TONY | MO | 8/7 | 22/17 | 85/31 | 19/10 | 1/1 | 135 | 66 | 8910 |
| NØOBM | SID | KS | 17/14 | 11/10 | 69/30 | 4/3 | 0/0 | 101 | 57 | 5757 |
| KØBX | JOE | MO | 0/0 | 24/16 | 89/34 | 0/0 | 0/0 | 113 | 50 | 5650 |
| ABØMV | MERRIE | CO | 0/0 | 11/10 | 83/26 | 9/7 | 0/0 | 103 | 434 | 4429 |
| NØUX | TERRY | CO | 0/0 | 17/13 | 61/28 | 4/3 | 0/0 | 82 | 44 | 3608 |
| WV7T | MIKE | CO | 0/0 | 0/0 | 42/24 | 0/0 | 0/0 | 42 | 24 | 1008 |
| ABØOX | JACK | MO | 0/0 | 0/0 | 25/13 | 0/0 | 0/0 | 25 | 13 | 325 |
| WA1EHK | GRAM | CT | 27/19 | 60/29 | 95/35 | 54/24 | 28/19 | 264 | 126 | 33264 |
| W1TO | TOM | MA | 30/21 | 90/38 | 97/32 | 31/18 | 4/4 | 252 | 113 | 28476 |
| WØBR/1 | BOB | CT | 24/17 | 67/29 | 60/26 | 26/19 | 10/9 | 187 | 100 | 18700 |
| K1GU | NED | MA | 7/7 | 48/28 | 79/28 | 16/9 | 2/2 | 152 | 74 | 11248 |
| K5ZD | RANDY | MA | 3/3 | 58/27 | 56/23 | 5/4 | 0/0 | 122 | 57 | 6954 |
| W1LZ | LES | NH | 0/0 | 0/0 | 50/24 | 10/8 | 2/2 | 62 | 34 | 2108 |
| N2WK | WAYNE | NY | 55/25 | 123/39 | 129/44 | 76/33 | 20/16 | 403 | 157 | 63271 |
| WB2JEP | AL | NJ | 0/0 | 53/27 | 82/35 | 14/13 | 0/0 | 149 | 75 | 11175 |
| KF2XF | DON | NY | 0/0 | 0/0 | 113/38 | 25/15 | 14/11 | 152 | 64 | 9728 |
| N3XLS | JOE | PA | 53/27 | 120/39 | 105/39 | 47/25 | 17/44 | 342 | 144 | 49248 |
| K3ZV | JOHN | PA | 1/1 | 52/25 | 86/30 | 33/17 | 15/12 | 187 | 85 | 15895 |
| AAØCY | JJ | PA | 0/0 | 34/22 | 62/32 | 18/14 | 0/0 | 114 | 68 | 7752 |
| AB3IA | CHRIS | PA | 4/4 | 70/33 | 39/26 | 9/8 | 0/0 | 122 | 71 | 8662 |
| N3NZ | NOEL | PA | 0/0 | 30/14 | 57/26 | 42/18 | 1/1 | 130 | 59 | 7670 |
| K3SV | BILL | PA | 15/10 | 30/21 | 59/20 | 0/0 | 0/0 | 104 | 51 | 5304 |
| WA3AAN | GRANT | PA | 13/9 | 44/27 | 26/12 | 0/0 | 0/0 | 83 | 48 | 3984 |
| N3OW | JAY | PA | 2/2 | 23/16 | 28/19 | 0/0 | 0/0 | 53 | 37 | 1961 |
| N3JIX | BILL | PA | 0/0 | 0/0 | 9/7 | 12/10 | 5/5 | 26 | 22 | 572 |
| WX4TM | TOM | AL | 52/26 | 145/42 | 174/51 | 86/35 | 9/9 | 466 | 163 | 75958 |
| KA4RRU | MIKE | VA | 55/26 | 133/39 | 158/39 | 83/31 | 32/23 | 461 | 158 | 72838 |
| N4BP | BOB | FL | 34/17 | 110/40 | 231/47 | 92/29 | 25/14 | 492 | 147 | 72324 |
| K4RO | KIRK | TN | 62/30 | 109/35 | 124/38 | 67/33 | 27/17 | 389 | 153 | 59517 |
| KE4OAR | CHUCK | TN | 58/28 | 105/36 | 113/40 | 68/31 | 27/17 | 371 | 152 | 56392 |
| K4GMH | MIKE | VA | 45/23 | 113/38 | 108/33 | 72/31 | 37/23 | 375 | 148 | 55500 |
| KE4KWE | TOM | AL | 45/24 | 95/37 | 144/41 | 69/25 | 19/12 | 372 | 139 | 51708 |
| WO4O | RIC | TN | 36/26 | 113/37 | 149/46 | 31/15 | 11/9 | 340 | 133 | 45220 |
| W4LC | JIM | KY | 59/31 | 118/40 | 108/37 | 22/17 | 8/7 | 315 | 132 | 41580 |
| W4BCG | BILL | TN | 43/22 | 109/41 | 129/38 | 34/23 | 4/4 | 319 | 128 | 40832 |
| AF4Z | DON | FL | 16/11 | 89/37 | 173/46 | 18/12 | 1/1 | 297 | 107 | 31779 |
| WB4EQS | RON | FL | 21/10 | 51/26 | 172/44 | 49/25 | 2/2 | 295 | 107 | 31565 |
| K4LQ | FRED | FL | 11/8 | 52/26 | 79/40 | 31/19 | 5/5 | 178 | 98 | 17444 |
| KC4HW | JIM | FL | 9/7 | 23/10 | 134/43 | 28/17 | 8/6 | 202 | 83 | 16766 |
| W8EMX | TUCKER | NC | 7/4 | 118/39 | 45/26 | 18/12 | 0/0 | 188 | 81 | 15228 |
| K4SB | ED | GA | 0/0 | 9/7 | 81/38 | 33/18 | 0/0 | 123 | 63 | 7749 |
| WD4GBW | JACK | VA | 0/0 | 44/27 | 36/17 | 19/12 | 3/3 | 102 | 59 | 6018 |
| AE4Y | KENT | GA | 0/0 | 21/13 | 51/28 | 19/12 | 7/7 | 98 | 60 | 5880 |
| W9WI | DOUG | TN | 13/9 | 53/25 | 33/19 | 3/1 | 0/0 | 102 | 54 | 5508 |
| K4BEV | DON | TN | 14/12 | 25/19 | 16/9 | 31/17 | 2/2 | 88 | 59 | 5192 |
| KO4XB | WARREN | VA | 0/0 | 40/22 | 42/20 | 1/1 | 0/0 | 83 | 43 | 3569 |
| WB9BSH | JERRY | TN | 0/0 | 10/8 | 34/21 | 12/8 | 2/2 | 58 | 39 | 2262 |
| AG4TJ | JEFF | TN | 0/0 | 10/10 | 29/18 | 6/6 | 1/1 | 46 | 35 | 1610 |
| AG4WH | GORDON | SC | 0/0 | 13/11 | 25/15 | 3/3 | 0/0 | 41 | 29 | 1189 |
| AA5AU | DON | LA | 69/34 | 148/42 | 169/52 | 111/41 | 35/17 | 532 | 186 | 98952 |
| KI5XP | CHAS | LA | 40/25 | 168/47 | 158/49 | 60/32 | 18/13 | 444 | 166 | 73704 |
| NA5Q | ROLAND | LA | 35/24 | 92/34 | 160/43 | 43/24 | 4/3 | 334 | 128 | 42752 |
| N5VYS | OBIE | TX | 3/3 | 61/29 | 164/48 | 29/21 | 0/0 | 257 | 101 | 25957 |
| WAØSXV | MIKE | NM | 19/12 | 100/45 | 97/33 | 8/5 | 0/0 | 224 | 95 | 21280 |
| W5RW | BOB | AR | 10/10 | 103/41 | 89/32 | 12/11 | 0/0 | 214 | 94 | 20116 |
| W1DY | WENDY | OK | 0/0 | 55/31 | 134/35 | 13/9 | 8/8 | 210 | 83 | 17430 |
| N5KR | MATT | TX | 0/0 | 88/34 | 105/40 | 10/6 | 0/0 | 203 | 80 | 16240 |
| K1NT | LEE | TX | 10/8 | 25/15 | 98/38 | 22/13 | 15/11 | 170 | 85 | 14450 |
| NI5F | BILL | MS | 4/4 | 38/19 | 80/38 | 22/13 | 7/7 | 151 | 81 | 12231 |
| N5LYG | BILL | TX | 0/0 | 23/16 | 172/45 | 0/0 | 0/0 | 195 | 61 | 11895 |
| N5NA | ALAN | TX | 0/0 | 34/20 | 120/40 | 18/11 | 0/0 | 172 | 71 | 12212 |
| N5PU | LEON | MS | 0/0 | 39/21 | 78/34 | 5/5 | 0/0 | 122 | 60 | 7320 |
| KA5EYH | DON | TX | 9/8 | 18/14 | 38/22 | 14/12 | 0/0 | 79 | 56 | 4424 |
| NA4M | PHIL | TX | 0/0 | 0/0 | 67/34 | 0/0 | 0/0 | 67 | 34 | 2278 |
| N6NT | BRUCE | CA | 34/15 | 86/36 | 151/49 | 91/38 | 5/4 | 367 | 142 | 52114 |
| K6HGF | DOUG | CA | 38/17 | 94/36 | 129/44 | 62/30 | 8/6 | 331 | 133 | 44023 |
| AD6WL | JIM | CA | 22/12 | 91/37 | 158/51 | 48/32 | 3/3 | 322 | 135 | 43470 |
| KR6E | BEN | CA | 20/14 | 92/39 | 159/48 | 41/24 | 0/0 | 312 | 125 | 39000 |
| AC6JT | BRYKAN | CA | 20/7 | 76/33 | 116/40 | 51/30 | 4/3 | 267 | 113 | 30171 |
| N6TK | DAVE | CA | 32/16 | 83/37 | 138/47 | 17/11 | 0/0 | 270 | 111 | 29970 |
| AK6R | BOB | CA | 15/4 | 85/39 | 143/45 | 12/11 | 0/0 | 255 | 99 | 25245 |
| W6IWO | DALE | CA | 0/0 | 74/31 | 136/46 | 38/24 | 0/0 | 248 | 101 | 25048 |

| CALL | NAME | QTH | 80 m | 40 m | 20 m | 15 m | 10 m | QSO's | Mults | Score |
|---|---|---|---|---|---|---|---|---|---|---|
| W6FFH | DON | CA | 19/16 | 60/25 | 107/45 | 45/25 | 0/0 | 231 | 101 | 23331 |
| KK6T | TERRY | CA | 3/1 | 27/12 | '177/50 | 35/26 | 2/2 | 244 | 91 | 22204 |
| K6UM | STEVE | CA | 29/13 | 32/18 | 90/39 | 45/31 | 0/0 | 196 | 101 | 19796 |
| WK6I | JEFF | CA | 10/6 | 64/31 | 134/46 | 10/7 | 0/0 | 218 | 90 | 19620 |
| N6PC | PAUL | CA | 16/16 | 67/29 | 122/45 | 5/5 | 0/0 | 210 | 85 | 17850 |
| AK6DV | CHUCK | CA | 0/0 | 41/19 | 109/40 | 25/18 | 1/1 | 176 | 78 | 13728 |
| KE6RAD | KEVIN | CA | 10/3 | 62/29 | 94/38 | 7/4 | 1/1 | 174 | 75 | 13050 |
| WA6BOB | BOB | CA | 9/4 | 88/38 | 35/16 | 13/9 | 1/1 | 146 | 78 | 11388 |
| KF6CNV | JEFF | CA | 14/5 | 65/31 | 48/24 | 19/16 | 0/0 | 146 | 76 | 11096 |
| W6ZZZ | MARK | CA | 14/3 | 67/28 | 43/24 | 13/9 | 0/0 | 137 | 64 | 8768 |
| K6OWL | MARK | CA | 8/1 | 50/25 | 66/34 | 7/5 | 0/0 | 131 | 65 | 8515 |
| N6VH | JIM | CA | 0/0 | 11/9 | 94/41 | 18/45 | 0/0 | 123 | 65 | 7995 |
| N6OJ | CHUCK | CA | 0/0 | 0/0 | 178/46 | 0/0 | 0/0 | 178 | 46 | 8188 |
| N6EU | RUSS | CA | 2/1 | 10/3 | 91/35 | 27/16 | 5/3 | 135 | 58 | 7830 |
| W7TI | BILL | CA | 0/0 | 0/0 | 51/29 | 47/26 | 2/2 | 100 | 57 | 5700 |
| KE6QR | GARY | CA | 5/3 | 28/12 | 50/29 | 0/0 | 0/0 | 83 | 44 | 3652 |
| W1SRD | STEVE | CA | 0/0 | 0/0 | 90/35 | 0/0 | 0/0 | 90 | 35 | 3150 |
| WB6TQG | PHIL | CA | 0/0 | 2/1 | 75/38 | 0/0 | 0/0 | 77 | 39 | 3003 |
| AD6G | FRITZ | CA | 0/0 | 9/2 | 35/22 | 2/2 | 0/0 | 46 | 26 | 1196 |
| W6RKC | RIC | CA | 0/0 | 0/0 | 21/16 | 0/0 | 0/0 | 21 | 16 | 336 |
| K7WM | WAYNE | AZ | 31/17 | 121/44 | 177/52 | 51/32 | '9/9 | 389 | 154 | 59906 |
| WG7Y | BOB | WY | 16/12 | 71/31 | 159/43 | 35/18 | 3/3 | 284 | 107 | 30388 |
| W6RLL | JOE | AZ | 13/8 | 76/39 | 73/37 | 40/25 | 3/3 | 205 | 112 | 22960 |
| K7ZUM | ZOOMIE | OR | 1/1 | 38/22 | 149/47 | 48/26 | 0/0 | 236 | 96 | 22656 |
| K7MM | DAN | WA | 25/16 | 67/33 | 66/32 | 39/22 | 5/4 | 202 | 107 | 21614 |
| KW7N | STEVE | ID | 20/13 | 52/29 | 81/37 | 19/14 | 10/9 | 182 | 102 | 18564 |
| N7ESU | JIM | ID | 3/2 | 61/32 | 82/32 | 0/0 | 0/0 | 146 | 66 | 9702 |
| KJ7NO | BRAD | UT | 0/0 | 46/24 | 72/32 | 0/0 | 0/0 | 118 | 56 | 6608 |
| W7DPW | DAVE | WA | 0/0 | 36/21 | 48/31 | 1/1 | 0/0 | 85 | 53 | 4505 |
| W7GTO | PAT | WA | 8/3 | 33/17 | 35/20 | 0/0 | 0/0 | 76 | 40 | 3040 |
| N7ON | JOHN | NV | 0/0 | 5/2 | 63/36 | 3/3 | 0/0 | 71 | 41 | 2911 |
| N7XB | BRUCE | OR | 0/0 | 27/15 | 40/23 | 4/3 | 0/0 | 71 | 41 | 2911 |
| KI7NW | CHARLESAZ | | 0/0 | 13/8 | 23/11 | 4/4 | 0/0 | 40 | 23 | 920 |
| K7ORY | HORACE | WA | 0/0 | 14/10 | 14/8 | 0/0 | 0/0 | 28 | 18 | 504 |
| K8IR | JIM | MI | 35/19 | 105/40 | 83/37 | 59/27 | 26/17 | 308 | 140 | 43120 |
| W8WEJ | JOHN | WV | 23/15 | 38/24 | 69/27 | 13/10 | 10/10 | 153 | 86 | 13158 |
| KZ8E | JEFF | WV | 23/16 | 46/27 | 62/26 | 18/14 | 0/0 | 149 | 83 | 12367 |
| KC8CON | JUDDIE | WV | 19/12 | 59/29 | 77/32 | 0/0 | 0/0 | 155 | 73 | 11315 |
| N4GXP | ROBERT | OH | 7/7 | 26/14 | 94/36 | 0/0 | 0/0 | 127 | 57 | 7239 |
| WV8T | RON | WV | 0/0 | 34/19 | 57/32 | 14/9 | 0/0 | 105 | 60 | 6300 |
| WA8SDA | FRANCIS | WV | 0/0 | 36/23 | 64/28 | 0/0 | 0/0 | 100 | 51 | 5100 |
| N8YYS | ROY | MI | 0/0 | 1/1 | 97/37 | 0/0 | 0/0 | 98 | 38 | 3724 |
| W8XC | WINFORDMI | | 4/4 | 22/16 | 54/20 | 0/0 | 0/0 | 80 | 44 | 3520 |
| WA9ALS/8 | JOHN | MI | 0/0 | 0/0 | 51/28 | 0/0 | 0/0 | 51 | 28 | 1428 |
| AI9T | STEVE | IL | 60/30 | 113/39 | 128/44 | 88/33 | 0/0 | 389 | 146 | 56794 |
| KE9S | JEFF | WI | 44/22 | 86/35 | 156/44 | 43/23 | 43/25 | 372 | 149 | 55428 |
| K9JS | JON | IL | 24/16 | 71/37 | 73/30 | 81/31 | 17/11 | 266 | 125 | 33250 |
| K9MOT | GALVIN | IL | 45/28 | 118/42 | 101/36 | 8/7 | 0/0 | 272 | 113 | 30736 |
| WB9B | MIKE | IL | 25/16 | 51/26 | 86/33 | 35/18 | 21/15 | 218 | 108 | 23544 |
| W9HLY | VERN | IN | 68/32 | 82/34 | 71/21 | 22/9 | 0/0 | 243 | 96 | 23328 |
| K9WX | TIM | IN | 27/15 | 51/25 | 101/37 | 22/15 | 6/5 | 207 | 97 | 20079 |
| N9KO | CALVIN | IL | 3/3 | 36/25 | 42/24 | 19/12 | 9/9 | 109 | 73 | 7957 |
| K9MI | MIKE | IN | 0/0 | 10/10 | 36/20 | 13/10 | 1/1 | 60 | 41 | 2460 |
| AL1G | CORLI | AK | 0/0 | 0/0 | 86/29 | 0/0 | 0/0 | 86 | 29 | 2494 |
| KH6GMP | GARY | HI | 0/0 | 21/10 | 133/42 | 17/8 | 0/0 | 171 | 60 | 10260 |
| VE1OP | SCOTT | NS | 19/17 | 65/34 | 159/42 | 87/32 | 54/26 | 384 | 151 | 57984 |
| VE2OWL | STEF | QC | 0/0 | 0/0 | 4/3 | 5/4 | 1/1 | 10 | 8 | 80 |
| VA3DX | GLENN | ON | 54/27 | 120/40 | 143/44 | 40/27 | 31/21 | 388 | 159 | 61692 |
| VE3XD | DON | ON | 34/20 | 95/34 | 159/46 | 55/22 | 14/8 | 357 | 130 | 46410 |
| VE3GSI | ERIC | ON | 28/18 | 74/32 | 128/44 | 48/27 | 17/14 | 295 | 135 | 39825 |
| VE3IAY | RICH | ON | 29/21 | 60/34 | 88/37 | 31/20 | 0/0 | 208 | 112 | 23296 |
| VE3YF | MIKE | ON | 0/0 | 66/32 | 100/28 | 87/32 | 0/0 | 253 | 92 | 23276 |
| VE3RZ | TONY | ON | 0/0 | 76/34 | 80/37 | 41/23 | 4/4 | 201 | 98 | 19698 |
| VA3XRZ | JULIO | ON | 32/19 | 43/28 | 38/21 | 34/21 | 3/3 | 150 | 92 | 13800 |
| VE3AGC | BOB | ON | 19/15 | 57/33 | 59/22 | 9/4 | 0/0 | 144 | 74 | 10656 |
| VE3NZ | BEN | ON | 0/0 | 55/26 | 69/33 | 0/0 | 0/0 | 124 | 59 | 7316 |
| VE4YU | ED | MB | 12/8 | 23/19 | 53/76 | 27/15 | 9/7 | 124 | 75 | 9300 |
| VE4COZ | IREK | MB | 0/0 | 34/18 | 60/29 | 0/0 | 0/0 | 94 | 47 | 4418 |
| VE6YR | BOB | AB | 0/0 | 64/32 | 145/42 | 26/17 | 0/0 | 235 | 91 | 21385 |
| VA7ST | BUD | BC | 13/5 | 43/17 | 75/32 | 5/3 | 0/0 | 136 | 57 | 7752 |
| HK4QHD | JUAN | DX | 0/0 | 0/0 | 146/49 | 27/15 | 0/0 | 173 | 64 | 11072 |
| HG4I | TIBOR | DX | 0/0 | 33/16 | 102/40 | 0/0 | 0/0 | 135 | 56 | 7560 |
| YU7AM | ARPAD | DX | 0/0 | 0/0 | 25/15 | 0/0 | 0/0 | 25 | 15 | 375 |
| SP3RBT | JOSEF | DX | 0/0 | 0/0 | 9/9 | 9/9 | 0/0 | 18 | 18 | 324 |
| HA3LI | ALI | DX | 0/0 | 0/0 | 23/14 | 0/0 | 0/0 | 23 | 14 | 322 |
| JA1BHK | MAZA | DX | 0/0 | 0/0 | 15/14 | 0/0 | 0/0 | 15 | 14 | 210 |
| YO2RR | NELU | DX | 0/0 | 0/0 | 10/8 | 0/0 | 0/0 | 10 | 8 | 80 |
| SP5UAF | TOM | DX | 0/0 | 0/0 | 9/5 | 0/0 | 0/0 | 9 | 5 | 45 |
| OE1KTS | TOM | DX | 0/0 | 0/0 | 6/5 | 0/0 | 0/0 | 6 | 5 | 30 |
| JA1XRH | JAC | DX | 0/0 | 0/0 | 4/4 | 0/0 | 0/0 | 4 | 4 | 16 |
| VR2BG | ALEX | DX | 0/0 | 0/0 | 0/0 | 2/2 | 0/0 | 2 | 2 | 4 |

**Check logs:** K1US, IT9ORA, N3UYI, S06A

Multi-2 (By Score)

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| W0ETC | LAR | IA | 86/40 | 173/48 | 238/50 | 91/33 | 43/21 | 631 | 192 | 121152 |
| K4WW | BO | KY | 69/33 | 130/41 | 155/43 | 70/29 | 21/18 | 445 | 164 | 72980 |
| NN6NN | DOC | CA | 47/20 | 133/46 | 175/51 | 90/40 | 1/1 | 446 | 158 | 70468 |
| K5BAT | CHARLESAR | | 10/8 | 109/40 | 119/42 | 66/30 | 20/13 | 324 | 133 | 43092 |
| N1MGO | CHARLIE/GORDON | | | | | | | | | |
| | | VT | 91/36 | 106/39 | 112/40 | 16/10 | 5/5 | 330 | 130 | 42900 |
| K5PI | ROB | TX | 0/0 | 45/28 | 33/19 | 20/14 | 9/7 | 107 | 68 | 7276 |

Multi-2 Operators:
K4WW (K4WW-KB4DOV), K5BAT (K5NRC-WB5BHS)_, NN6NN (W6XK-N6EE)
K5PI (K5PI-KD5HUN-K5TWJ), W0ETC (N0NI-N0HE-W0ETC), N1MGO (KT1I-N1MGO)

**Top 10 SO (Score)**

| | |
|---|---|
| AA5AU | 98952 |
| WX4TM | 75958 |
| KI5ZP | 73704 |
| KA4RRU | 72838 |
| N4BP | 72324 |
| KI6DY | 71309 |
| N2WK | 63271 |
| N0AT | 63240 |
| VA3DX | 61692 |
| AK0A | 60680 |

**Top 10 SO (Mults)**

| | |
|---|---|
| AA5AU | 186 |
| KI6DY | 167 |
| KI5XP | 166 |
| WX4TM | 163 |
| VA3DX | 159 |
| KA4RRU | 158 |
| N2WK | 157 |
| N0AT | 155 |
| K7WM | 154 |
| K4RO | 153 |

**Top 10 SO (QSO's)**

| | |
|---|---|
| AA5AU | 532 |
| N4BP | 492 |
| WX4TM | 466 |
| KA4RRU | 461 |
| KI5XP | 444 |
| KI6DY | 427 |
| AK0A | 410 |
| N0AT | 408 |
| N2WK | 403 |
| K4RO | 389 |
| K7WM | 389 |
| AI9T | 389 |

K4RO, AA5AU and AK0A, finished at the top with a score of 332,633. Finishing second was team TCG EXE with team members N6EU, AI9T, N2WK, KE4OAR and KE4KWE. Completing the top three was team TCG INI, with team members W4OX, VE9DX, WX4TM, K7WM and W4LC.

Log submissions were great this time. There were only a couple that required correspondence with the submitter to get straightened out. For those ops who use a home brewed Cabrillo converter, if you are not positive, 100% sure, no question, that your converter is correct, please send your log in .txt format and let me convert it. That way I can do it when it comes in and not have to stop in the middle of log checking and do the conversion. Violation of time-off rules was almost non-existent in this contest (a few here and there) resulting in score deduction, but there is still a score reduction of logs caused by not logging the prefix of NA countries. There are a lot of Caribbean Islands that are NA.

Thanks to all who participated and hope to see you and others in the February *NCJ* RTTY NAQP.

### Soapbox

AB0LR, New at this...AI9T, Surprised to see some had made contacts on 10-meters as listened to band several times and never heard a thing. Thanks to all who worked me...AK0A, Not as good as last time. 10 meters was bad in KS, glad to work all my team members...HG4I, It was extremely poor condx with 100 watts but nice contest. See all again next time...K4GMH, Thanks to *NCJ* for spon-

soring the contest and appreciate all the work done by all in getting the contest done. Wish more ops took a look at 10-meters. Enjoyed the contest even though it was low power...K5ZD, Not much activity but tried to help as many guys as I could...K6OWL, I am coming to the conclusion that antennas that radiate could be quite useful in radio communications in the current condx...K7ZUM, Great fun again this year, well, until it got somewhere around 100 deg. F in the shack, hot day and was a call for lots of really cold beer. (it was 124° here the day of contest, Ed)...K9JS, First time in the July running of this one for me and participation seemed pretty good. RTTY contesting is quickly becoming my favorite mode...KC4HW, Thanks for everyone for the contacts and cu in the next one... KC8CON, Operated as a team effort with the HAMJONES DX Association. This was my first RTTY contest and I loved it greatly. Had a blast and met some really nice ops...KE4OAR, I'm getting better at SO2R but at times it like rubbing your head and patting your belly at the same time. Overheated the ps so looks like I did not plan the cooling air for the ps. Learn something new every contest...KI5XP, Bands obviously weren't as good as the February contest however it was still fun. 10-meters didn't play at all and with the thunderstorms during the LA summertime, its quite hard to hear on 40 and 80 too... the SO2R keeps it fun no matter what...KSØM, Even with fair propagation, it was a fun contest. I even made 3 contacts on the dead band 10-meters. 3 hours into the contest, I had to S&P only due to a rig problem as couldn't call cq from that time on. Made 75 more q's than last year and did enjoy making the effort...KZ8E, My first RTTY contest and loved every minute of it...NOØBM, First attempt at RTTY contesting...N3UYI, Good fun first time on RTTY contest... N6EU, Great contest and enjoyed the shorter operating hours. Band condx were optimal but still had a very enjoyable 6.5 hours of on air time. Thanks to the sponsors and all those who I was able to work. See you in the next RTTY test...N8YYS, Well, it did not work out as well as I thought it might. My bug catcher was broken and only antenna was a 20-meter delta loop hung low in the trees. Condx from MI were about like they describe; miserable...NA5Q, First real effort at this contest. Band condx were terrible and not that many stations in the contest...NN6NN, 10-meter dead here. Had to move a local just to get on mult on 10-meters. Our thanks to all the skilled and courteous ops who graciously QSYed to give us a new mult. Fun contest...SP5UAF, Unfortunately I had very limited time to operate in the contest...VA3DX, Good activity and loads of fun...VE2OWL, Not much of a score but here's my log anyway (all logs are appreciated, Ed)...VE3NZ, My first RTTY contest, 40 W and wire antennas. WØETC, Bands much better shape than anticipated. Participation good. Thanks to everyone for the q's and helping us set a potential new NA M/2 record...W1LZ, No time to play... W6RKC, First ever NAQP RTTY contest. Surprised to make contacts using my 160 meter inverted-L. W6RLL, 40-meters was a nice surprise. Thanks to all who worked me. W6ZZZ, It was slow going until 40-meters came alive at 0230Z... W7DPW, Great contest with poor band condx. Lots of one way skip...W8EMX, 40-meters was HOT, HOT, HOT!!!... WA9ALS, MOBILE, sorry not much time, 73...WB4EQS, We could have had better band condx and wx. I had to shut down for an hour and half during one of Florida's famous lightening storms. I will just have to try again next time. Had fun in spite of it all...WO4O, First RTTY test ever in my 34 years in this hobby. It was a BLAST! Why did I wait so long to try this mode? Go figure! Isn't this mode like "Instant Messenger"?...WV7T, Running 2.9 W QRP into 3-element beam.

NCJ

### Teams

| Team: CCO Rising Machinists | |
|---|---|
| VA3DX | 61692 |
| VA3XRZ | 13800 |
| VE3RZ | 19698 |
| VE3XD | 46410 |
| Score | 141600 |

| Team: CCO Terminators | |
|---|---|
| VE3GSI | 39825 |
| VE3HG | |
| VE3IAY | 23296 |
| VE3YF | 23276 |
| | 86397 |

| Team: NCCC Bks | |
|---|---|
| N6TQS | |
| K6UM | 19796 |
| WK6I | 19620 |
| WA6BOB | 11388 |
| AD6WL | 43470 |
| Score | 94274 |

| Team: NCCC Kbs | |
|---|---|
| K6HGF | 44023 |
| AC6JT | 30171 |
| K6OWL | 8515 |
| W6ZZZ | 8768 |
| N6NT | 52114 |
| | 143591 |

| Team: The Bartenders | |
|---|---|
| W8WEJ | 13158 |
| WA8SDA | 5100 |
| W1TO | 28476 |
| KK5OQ | |
| VA7ST | 7752 |
| Score | 54486 |

| Team: TCG Nines | |
|---|---|
| WB9BSH | 2262 |
| K9JS | 33250 |
| WB9B | 23544 |
| W9HLY | 23328 |
| WA9ALS/8 | 1428 |
| | 83812 |

| Team: TCG coms | |
|---|---|
| N8YYS | 3724 |
| W6IWO | 25048 |
| W7TVF | |
| KR6E | 39000 |
| KH6GMP | 10260 |
| Score | 78032 |

| Team: TCG Dlls | |
|---|---|
| W4BCG | 40832 |
| KSØM | 13770 |
| N9KO | 7957 |
| K4BEV | 5192 |
| W9WI | 5508 |
| | 73259 |

| Team: TCG Exes | |
|---|---|
| N6EU | 7830 |
| AI9T | 56794 |
| N2WK | 63271 |
| KE4OAR | 56392 |
| KE4KWE | 51708 |
| Score | 235995 |

| Team: TCG Ints | |
|---|---|
| W4OX | |
| VE9DX | |
| WX4TM | 75798 |
| K7WM | 59906 |
| W4LC | 41580 |
| | 177284 |

| Team: TCG Zips | |
|---|---|
| VE1OP | 57984 |
| K4GMH | 55500 |
| K4RO | 59517 |
| AA5AU | 98952 |
| AKØA | 60680 |
| Score | 332633 |

| Team: Hamjones | |
|---|---|
| KZ8E | 12367 |
| KC8CON | 11315 |
| WV8T | 6300 |
| W8EMX | 15228 |
| KC8AFH | |
| | 45210 |

| Team: The Florida Boys | |
|---|---|
| AF4Z | 31779 |
| WB4EQS | 31565 |
| KC4HW | 16766 |
| Score | 80110 |

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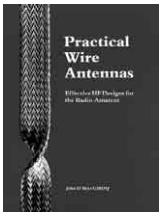


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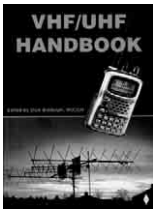


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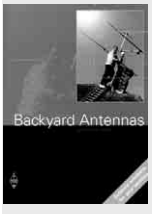


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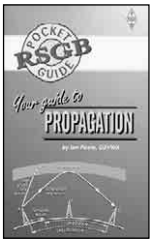


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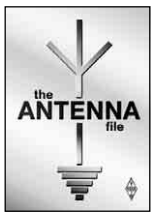


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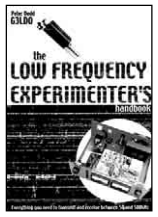


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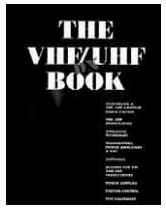


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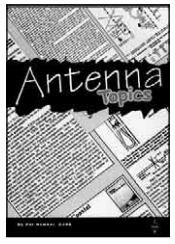


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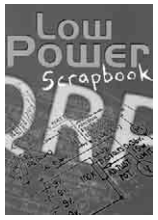


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|---|---|
| 3/8"EE / EJ Turnbuckle | $11/12 |
| 1/2"x9"EE / EJ Turnbuckle | $16/17 |
| 1/2"x12"EE / EJ Turnbuckle | $18/19 |
| 3/16" / 1/4" Big Grips | $5/6 |

**Please call for more hardware items**

## GAP ANTENNAS

| | |
|---|---|
| Challenger DX | $289 |
| Challenger Counterpoise | $29 |
| Challenger Guy Kit | $19 |
| Eagle DX | $299 |
| Eagle Guy Kit | $29 |
| Titan DX | $329 |
| Titan Guy Kit | $29 |
| Voyager DX | $409 |
| Voyager Counterpoise | $49 |
| Voyager Guy Kit | $45 |

**Please Call for Delivery Information**

## LAKEVIEW HAMSTICKS

| | | | | | |
|---|---|---|---|---|---|
| 9106 | 6m | 9115 | 15m | 9130 | 30m |
| 9110 | 10m | 9117 | 17m | 9140 | 40m |
| 9112 | 12m | 9120 | 20m | 9175 | 75m |

**All handle 600W, 7' approximate length, 2:1 typical VSWR...$24.95**

## HUSTLER ANTENNAS

| | |
|---|---|
| 4BTV/5BTV/6BTV | $129/169/199 |
| G6-270R, 2m/70cm Vertical | $169 |
| G6-144B/G7-144B | $109/179 |

**Hustler Resonators in stock–call**

## TIMES MICROWAVE LMR® COAX

| | |
|---|---|
| LMR-400 | $.59/ft |
| LMR-400 Ultraflex | $.89/ft |
| LMR-600 | $1.19/ft |
| LMR600 Ultraflex | $1.95/ft |

## HIGH CARBON STEEL MASTS

| | |
|---|---|
| 5 FT x .12"/.18" / 10 FT x .25" | $35/59/169 |
| 10 FT x .18" / 11 FT x .12" | $129/80 |
| 16 FT x .18" / 17 FT x .12" | $179/129 |
| 20 FT x .25" / 21 FT x .18" | $315/235 |
| 22 FT x .12" / 24 FT x .25" | $149/379 |

## ANTENNA ROTATORS

| | |
|---|---|
| M2 OR-2800P | $1249 |
| Yaesu G-450A | $249 |
| Yaesu G-800SA/DXA | $329/409 |
| Yaesu G-1000DXA | $499 |
| Yaesu G-2800SDX | $1089 |
| Yaesu G-550/G-5500 | $299/599 |

## ROTATOR CABLE

| | |
|---|---|
| R62 (#18) | $.32/ft. |
| R81/82 | $.25/ft./.39/ft. |
| R84 | $.85/ft |

## PHILYSTRAN GUY CABLE

| | |
|---|---|
| HPTG1200I | $.45/ft |
| HPTG2100I | $.59/ft |
| PLP2738 Big Grip (2100) | $6.00 |
| HPTG4000I | $.89/ft |
| PLP2739 Big Grip (4000) | $8.50 |
| HPTG6700I | $1.29/ft |
| PLP2755 Big Grip (6700) | $12.00 |
| HPTG11200 | $1.89/ft |
| PLP2758 Big Grip (11200) | $18.00 |

**Please call for more info or help selecting the Phillystran size you**

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