Yankee Clipper Contest Club

Scuttlebutt

No. 60 November 1985

Captain's Cabin

Bill Santelmann, N1AU

The CQ WW SSB '85 contest is now history. I hope you were part of it! If you weren't, you missed an excellent contest. Conditions were far better than expected. Ten meters even opened to Europe for a half hour, and fifteen was good to Europe both days. Twenty meters was still where the action was, though. #1 son Stu, KC1F, operating at K1OX, set a new US single-band CQ WW record for both modes with 2300 contacts and 140 countries on 20 for a score of 1.2 megapoints! Ted says he never saw Stu look so tired after his 44 hours of continuous operation. Congratulations, Stu!!

We seem to have done quite well, especially with scores from the DXpeditions to HC8X, VP2VCW, and J87DX. The consensus is that we have a good shot at winning the CQ WW '85! It will depend on our performance in the upcoming CW weekend of the CQ WW (November 23-24), and on SENDING OUR LOGS IN BEFORE THE DEADLINES.

Still, a number of YCCC members were not heard during the SSB weekend. If our participation this year is similar to that of 1984-85, then 75 of our 167 members (45%!) will not be involved in either weekend of the CQ WW. And yet we lost by only 4 megapoints, or the scores from possibly 10 or 12 of these inactive members! With commitment like this, no wonder we lose!

It appears that this lethargy is far more prevalent in "1-land" than in "2-land", where our members have displayed a winning spirit an enthusiasm. In fact, there are tensions building within the YCCC because of our spotty commitment which could threaten its continued existence. It has been suggested that the YCCC needs a new rule requiring participation in the CQ WW or the ARRL DX for continued membership. I'd like to hear your opinions on this idea or other means for improving participation.

Hopefully, this 'Butt will arrive before the CQ WW CW weekend. Please do your best to participate. If your station is on the modest side, find a better one within the Club and help make it a multi-single. This is perhaps the best way to maximize the score per member. The only better ways are multi-multi and DXpeditions. If you don't know where to operate, call your Area Manager. And good DX!

Our next meeting will be on December 7 at 1 pm in Worcester at the PNIC. With a little luck, directions and a map will be found elsewhere in this 'Butt. We are planning reports on our DXpeditions and a very special K1DG/K2WR skit, "Hamtainment Tonight". See you there!

SECRETARY'S REPORT
YANKEE CLIPPER CONTEST CLUB

The October YCCC meeting was held on 19 October 1985 at the Holiday Inn in East Hartford, Connecticut, with 61 members and guests attending.

The club welcomed four new members:

AD1Z	William Clemons
K1DW	Dallas Ward
KA2MXO	Ed Kritsky
KA1MI	Dave Meldrum

Contest Cookbooks for the 1985-86 season were handed out to attendees (the other copies will be mailed).

Everyone chuckled over the "Pileup Busters" video while W1FM's (Jake's) son Jason sold mints for the Cub Scouts.

John, K1AR, presented a CQ WW Contest quiz. Here are the questions and answers, so there is no need to embarass yourself:

1. CQ WW SSB starts at 8 pm on Friday and ends at 7 pm on Sunday. How many hours is that? 48 hours - you didn't forget daylight savings time, did you?

2. What countries and how many points are represented by working these stations:

P44B	3	Netherlands Antilles
J87DX	2	St. Vincent
OX3UD	2	Greenland
OY2R	3	Faroe Islands
8J5SUN	3	Japan
4K1D	3	South Shetlands
4U1UN	2	United Nations (NY)
XN7WJ	2	Canada
FD1JCH	3	France
EC9DI	3	Melilla
6E5EBE	2	Mexico
HC8X	3	Galapagos

3. What zone are the following stations in:

9V1TL	28
KC4AAA	39
AH8A	32
KH8AC	5 (he lives in Connecticut)
OX5ZM	40
N2IC	4 (he lives in Colorado)
TR8DR	36
A4XGZ	21
UZ9WZZ	6
FR5ZD	39
J28EB	37
AP2ZA	21
4N2D	15
ZP5LOB	11

4. Which of these are valid callsigns:

UP1BOO	no
HA9BVK	yes
G0EZZ	no (not issued yet)
PA3BM	no
KA1MI	yes
FK0AT	yes
FM7WD	no
F5KAR	yes
TK6UC	no
UK9AYA	no
ZY5EG	yes

N2JJ missed only three and was the BIG WINNER.

Tom, K1KI, is going to J87DX (station of J88AQ) for CQ WW SSB. QSLs to John, K1AR. N4PN will operate J87J 75m singleband.

Tom, K1KI, also talked about Hurricane Gloria, and showed a bent piece of one leg of the bottom section of his 120 foot Rohn 45 tower, which he had cut out and rewelded after straightening up the tower from the damage done when one of his screw-in anchors pulled free during the storm.

Paul, K1XM, and Charlotte, KQ1F, will operate CQ WW SSB m/m from HC8X. Mark, K1RX, and Ken, K1EA, will operate m/m from VP2VCW.

Doug, K1DG, presented "How to Prosper in the Coming Low-Sunspot Years, as Related by WA1EKV", a slide-show of the installation of Chucks's 75m 3-element KLM beam, which, incidentally, survived the hurricane with no damage.

Tom, K1KI, reported Sprint results.

The area managers presented reports on their areas. In Connecticut/RI, W1GNC wants to host a multiop on CW and needs operators, while K1RX wants someone to operate his home station for SSB while he is on from VP2VCW. In East Mass., N1AU needs antenna help and wants to host a multi-single, K1VR wants to host a multi-single, and K1XM/KQ1F needs an operator for SSB when Charlotte and Paul operate from HC8X. In NH/Vt., there is more CW than SSB

activity; K1IK in Vermont needs help installing a 40m beam and could use more ops, WA1TZV needs ops, K1OX may be available for both contests but Ted is planning major construction that will require removal of his hardlines soon, and W1RR reports much storm damage but expects to be on for CW. In East NY, K2TR will host a multi-multi on CW; ENY expects the same high level of participation as last year. Southern NY/NJ is in good shape. Dave, KY1H, replace Danas, K1RQ, as West Mass. area manager.

Dan, K1TO, wants to put together a bulk Rohn tower and accessory order.

John, K1AR, is going to produce new club QSL cards; the price may go up as he is changing printers. The next meeting will be December 7th in Worcester. The following meetings will be February first and April 5th.

Respectfully submitted,

Charlotte L. Richardson, KQ1F

Secretary/Treasurer

7 November 1985

YCCC December Meeting

The next meeting of the Yankee Clipper Contest Club will be at 1 PM on December 7 1985 at the Polish Naturalization and Independence Club (PNIC) in Worcester, Massachusetts.

From the Massachusetts Turnpike (I-90):
Get on I-290 North, take exit 12 to Brosnihan Square. Go around the rotary under I-290, then take an immediate right and park in the lot on the right. PNIC is across the street.

From I-290 heading South:
Take exit 12, go around the rotary passing under I-290 twice, then turn right as above.

From 146 (RI, etc.):
Follow 146 into the rotary at I-290, go around and under I-290, turn right as above.

PNIC operates a bar and serves some food. There are no quick-food establishments within walking distance. There are, however, several restaurants a short drive from the PNIC.

Flakey Ideas

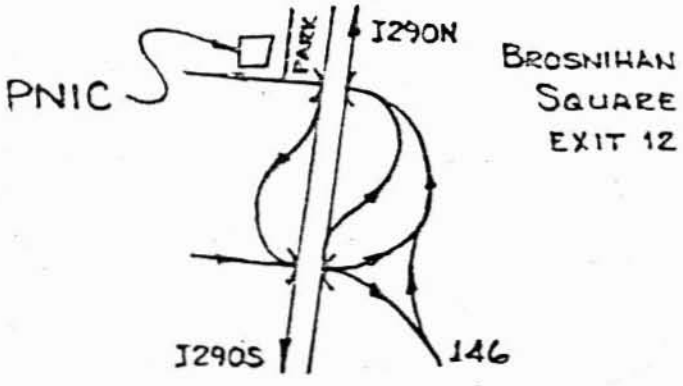
Paul Young, K1XM

I'm postponing my discussion of 900 MHz, because I have a topic which is of greater relevance to contesters:

When the FCC came up with the new callsign allocation scheme several years ago, they created a problem for hams by reducing the significance of the number in a callsign. Ever since then, a sweepstakes exchange such as "40 A W7XXX 55 LA" has elicited a "what section?" response. Some hams have tried to solve this by signing portable, but this runs them afoul of the rules since they are NOT portable! I have a solution. It's voluntary, so it does not force anyone to use a longer callsign. Unfortunately it requires a change in the FCC rules, but it is not a complicated one.

What I propose, is that if you are not in your own call area, that you be allowed to put the call area number you are in after the digit in your callsign. For example, if he wanted to, Jeff Briggs could sign K12ZM, and AA1K would be able to sign AA13K. This would create 90 new prefixes for the people who care about such things.

The FCC allowed double-digit callsigns during the Olympics (remember the W84 and K23 calls?). That was long enough ago now that there would not be too much confusion over those "reassigned" callsigns. And when you work W75XXX you will know he is in Louisiana!



Vertical Antennas for the Low Bands Part I

John Kaufmann, W1FV

Two years ago, motivated by a move to a new location, I began exploring the potential of vertical antennas for use on the low frequencies (80 and 160 meters). In the course of designing and building my present vertical system, I have learned a lot about what it takes to make these antennas work and I would like to share some of that knowledge here. In Part I, I will confine the discussion to single-element verticals. Part II (to appear in a future issue) will deal with design and operation of multi-element phased vertical arrays.

Why vertical antennas?

It is well documented that vertical antennas concentrate most of their radiation at low angles which is exactly what is desired for DX work. This also proves advantageous in receiving in that high-angle stateside interference is reduced considerably - as much as 20 to 30 dB compared to a horizontal dipole. Furthermore, with a phased array, very large attenuation of signals from unwanted directions is possible. To achieve low-angle radiation from horizontal antennas requires antenna heights of a half wavelength or more, which creates obvious challenges on 80 and 160 meters.

Siting considerations

Verticals should be kept away from other large vertical structures such as towers, particularly those which are likely to be resonant at the operating wavelength. Trees are not a problem except as a possible physical obstruction in erecting the antenna. While locating in a region of high ground conductivity (such as salt water) is preferred, don't be discouraged if your QTH is not the ideal. I have achieved considerable success from a geographically mediocre location. Also, if installing a single-element vertical is the immediate objective, keep in mind the possibility and the space requirements for expanding to multiple elements (as I did).

Vertical size

Generally one thinks of verticals as being a quarter wave in height, but this does not have to be the case. The principle advantage of the quarter-wave vertical is that is looks approximately resonant at the desired operating frequency. This makes the job of impedance matching easier but otherwise offers no theoretical performance advantage over other heights. Increasing the height to 5/8 wavelengths provides an additional 3 dB gain, but such dimensions are impractical for most of us at the low frequencies. What can be very attractive for 80 and 160 meters from a practical standpoint is the use of short verticals (less than a quarter wavelength). It appears not to be well known in the amateur community that the theoretical gain of a very short vertical (even approaching zero length) is only a fraction of a dB less than that of a quarter-wave vertical. This fact may seem contrary to intuition, but has been well known in the engineering field for many years. (see Ref.s 1 and 2). Therefore, there is no reason, in principle, to use a vertical as large as a quarter wave in the hopes of extracting more gain. Of course, there are practical considerations to be taken into account, namely that short antennas will exhibit lower radiation resistance and considerable capacitive reactance at the drive point, making matching somewhat more involved, and the SWR operating bandwidth will be less than for larger antennas (the shorter the antenna, the smaller the bandwidth). More importantly, though, the lower radiation resistance makes it imperative that a low-loss ground radial system be employed to attain efficient operation. The radiation resistance depends partly on the method of loading used to resonate the antenna - capacitive "top hat" loading provides the highest radiation resistance and thus the highest efficiency, while base-coil loading techniques give the lowest radiation resistance and poorest efficiency. (See the following section on radial systems and ground loss for further discussion). Also, top loading gives the largest operating bandwidth. Jerry Sevick, W2FMI, demonstrated in the 1970's that practical short verticals can be highly effective. His series of articles in QST (Refs. 3 - 5) makes very interesting reading and is highly recommended for those who wish to get more deeply into the subject. My first try at a vertical was a top-loaded 38-footer on 80 meters (with about 80 quarter-wave radials). With this antenna, I was able to place first in the 80-meter single-band category in the 1983 CQWW and the 1984 ARRL DX CW contests. Over the winter of '83/'84, it was quite satisfying to be able to work DX such as VU2, 4S7, YB0, UM8, UH8, long and short path JA's, etc., that no one else even seemed to be able to hear. At this moment I am experimenting with 60-foot verticals on 160 and am very encouraged by the initial DX results.

Ground Radial Systems

Without a doubt, the ground radial system is the single most important determinant of how the vertical will perform. If there is any secret to getting verticals to work, this is it. A ground

rod simply won't do for a ground system unless you are fortunate enough to live over salt water. To be a bit more quantitative about the subject, consider the following expression for antenna radiation efficiency (fraction of power actually radiated versus that delivered to the antenna):

Radiation efficiency = $R_{rad}/(R_{rad}+R_G+R_C)$

where R_{rad} is the antenna radiation resistance, R_G is the ground loss resistance, and R_C represents circuit loses in any matching network components, all in units of ohms. If R_G and R_C can be made to approach zero, then the efficiency approaches unity, i.e., 100 percent. Also, if the various losses are fixed, then raising the antenna radiation resistance, by top-loading instead of base-coil loading, for example, improves the efficiency. Now consider the following practical example of an eighth-wave vertical with a radiation resistance of 7 ohms, a ground loss of 20 ohms, and a matching network loss of 2 ohms (all typical of a simple installation). The efficiency, compared to the ideal, is only 24 percent. Most of the power is lost in heating up the ground. It is the poor efficiency of verticals when installed with a lossy ground system that probably accounts for the relatively unfavorable reputation of vertical antennas, at least in amateur circles. The point of installing ground radials is to drive R_G to zero to get the efficiency up.

The message is clear - put down lots of radial wire if you want the antenna to work. My current 3-element 80-meter array has consumed about 15,000 feet in radial wire. Installing this much wire was very tedious and time-consuming but eventually the job got done and was well worth it. A few tips: (1) Large-gauge wire isn't necessary for radials since they won't be carrying much current if many radials are employed. I use number 22 gauge. (2) Insulated wire will do just fine, and, in fact, is probably preferrable to bare wire since it will resist corrosion much better. Don't use noninsulated steel wire, i.e. electric-fence wire, as it will corrode away very quickly. (3) Don't bother burying the radials unless they present a physical nuisance. There is nothing to be gained performance -wise. In fact, burying them too deeply can decouple the radial system from the antenna because of the intervening presence of the earth. If the radials are to be installed in one's yard, as mine are, the grass should be cut as short as possible, and the radials laid flush with the surface of the ground. In time the grass will grow around the wires and conceal them. I was fortunate enough to be able to get the radials in before I even had a lawn since I had just moved into a new home. Now, not a single radial is visible in the lawn, even inches from the base of each vertical. There is no problem mowing the grass or carrying on other activities in the yard. (4) How many radials are required? There is no single correct answer for all situations. The higher one's ground conductivity, the fewer radials that are needed. Commercial broadcast standards call for 120 radials a half-wavelength long. This may seem like overkill but I would consider 40 quarter-wave radials to be the minimum number for a serious installation in an average environment for a quarter-wave vertical (and more for shorter systems). Furthermore, as I will discuss in Part II, the need for a low-loss radial system is more vital, in many cases, to multi-element phased arrays than for single-element systems. (5) As for radial length, there is no critical length except that the longer the better. They don't need to be all the same length. Stretch them out where the space permits. My radials range in length from 30 feet to 130 feet because of the dimensions of my property. Generally speaking, however, if all the radials must be short (say, 0.1 wavelength or less), it turns out that a few radials are almost as good as many radials. Large numbers of radials are used to best advantage if they can be made as long as a quarter to a half wave long. References 5, 6, and 7 contain a thorough discussion of radial systems.

In Part II, I will discuss the promises and problems of vertical phased arrays, based on my experience in designing and building such systems. Stay tuned.

References

1. C. Smith and E. Johnson, "Performance of Short Antennas," *Proceedings of I.R.E.* October 1947, pp. 1026-1038.

2. L. Smeby, "Short Antenna Characteristics - Theoretical", *Proceedings of the I.R.E.*, October 1949, pp. 1185-1194.

3. J. Sevick, "The Ground-Image Vertical Antenna", *QST*, July 1971, pp. 16-22.

4. J. Sevick, "The W2FMI Ground-Mounted Short Vertical", *QST*, March 1973, pp. 13-18.

5. J. Sevick, "Short Ground-Radial Systems for Short Verticals", *QST*, April 1978, pp. 30-33.

6. J. Stanley, "Optimum Ground Systems for Vertical Antennas", *QST*, December 1976, pp. 13-15.

7. G. Brown, R. Lewis, and J. Epstein, "Ground Systems as a Factor in Antenna Efficiency", *Proceedings of the I.R.E.*, June 1937, pp. 753-787.

Elementary Mechanics - Part I, Statics

Bill Shaheen, N1CQ

In order to understand the behavior of structural components (towers and antennas, for example), the elementary conditions of equilibrium for a body (Part I), and stress development within the body (Part II) are presented.

STATICS - External Equilibrium

Many readers may recall taking at least one course in elementary mechanics while in college (how could you forget, right!). You might recall learning about static equilibrium of a non-accelerating body first described by Isaac Newton as Newton's first law; namely, a particle on which no net forces are acting has no acceleration.

or: $F = m\,a = 0$ (1)

This force is actually the net resultant force on the particle. So, from (1), if a = 0, then the sum of the forces in a particular direction must be zero. Generally, forces are considered acting in convenient orthogonal directions. This is done to simplify the mathematics of the problem at hand.

Typically, coordinate axes are separated in x, y, and z components (Cartesian), where each component axis is 90 degrees from one another (orthogonal) as illustrated in Figure 1.

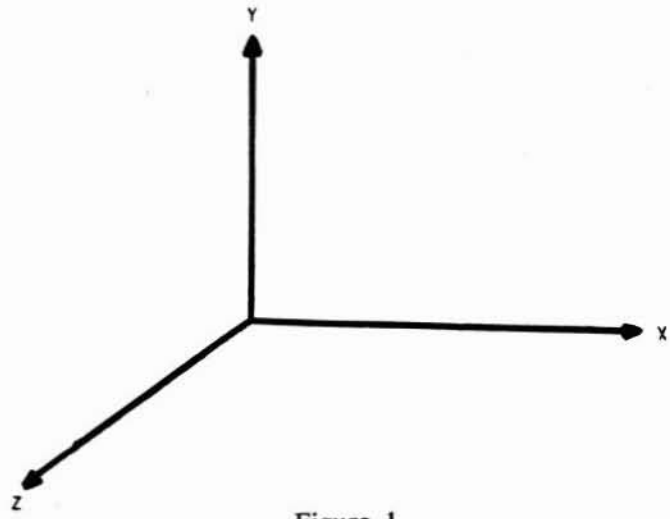


Figure 1.

equations of equilibrium:

$\Sigma Fx = 0$ (sum of external forces in x direction = 0)

(F = 0) $\Sigma Fy = 0$ (sum of external forces in y direction = 0)

$\Sigma Fz = 0$ (sum of external forces in z direction = 0)

Let us now consider a statics problem involving the forces acting on a radio tower (2-D representation for clarity) as shown in Figure 2. This is shown as a "free body" diagram, meaning the object of concern is isolated in space from all externally acting forces.

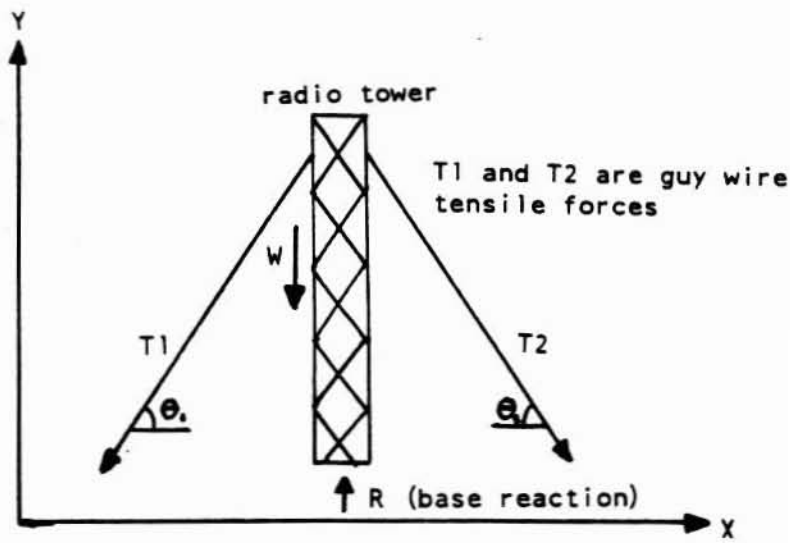


Figure 2.

Now, one can set up the conditions of equilibrium in the x and y directions respectively.

Recalling, $\Sigma Fx = 0$ and $\Sigma Fy = 0$

Then, $\Sigma Fx = T1\cos\theta_1 + T2\cos\theta_2 = 0$,
therefore T1 = T2
and $\Sigma Fy = R - T1\sin\theta_1 - T2\sin\theta_2 - W$.

It is seen that the tower base reaction force can be readily computed knowing the tower weight (W) and the guy wire tension forces (T1 and T2). For the 3-D case, 3 equations will be formulated and solved. This upward reaction force (R) will become important later in this series when soil bearing pressures and settlement considerations are discussed.

In addition to the 3 equations of equilibrium developed in terms of forces, 3 equations also exist in terms of rotational equilibrium. That is, the sum of the moments acting about any point is equal to zero in the x, y, and z directions in order to have equilibrium.

$\Sigma Mx = 0$ (sum of moments caused by external forces around the x axis)

$\Sigma My = 0$ (sum of moments caused by external forces around the y axis)

$\Sigma Mz = 0$ (sum of moments caused by external forces around the z axis)

The moment caused by a force F about a point O is the product of the force F and the normal distance $\overline{ON}$ between the point O and the line of action of the force (Figure 3).

One can see that the structural member in Figure 3 is unstable, that is $\Sigma F \neq 0$. Let us introduce a guy cable T2 to stabilize the structure.

To satisfy moment equilibrium, the sum of the moments about O in the plane of the paper must equal zero (Figure 4).

If the magnitude of F is known, one can readily solve for T2. Note T2 is broken into x and y components and these are considered separately.

$$Mo = F(\overline{ON}) - T2(\overline{PO})\cos\theta - T2(0)\sin\theta$$

The basic principles of statics show that external force and moment equilibrium must exist if the structure is to be stable.

Next time, internal forces within the structural members will be discussed.

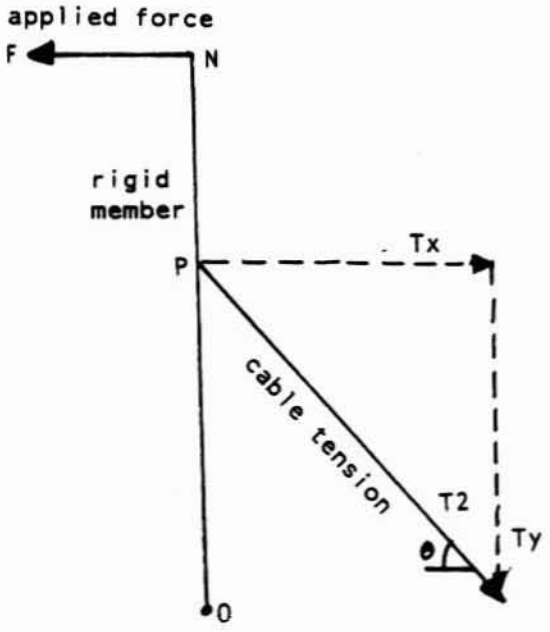


Figure 3.

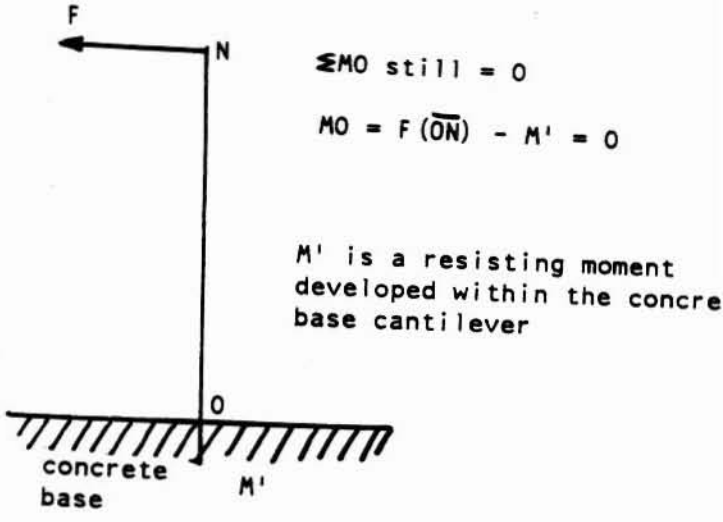


Figure 4.

Floating

Paul Young, K1XM

While I was down in Galapagos, operating from HC8X, I made a special point of listening for the YCCC crew. I pulled K1DG out of the pile-up on 40 (Hey 'DG, how come you were so weak on 40?), and I even called K1AR on 160 so he could get us on 6 bands.

Some of you were also helpful; at least one person who went single-band worked us on other bands. But some of you I never heard. We will probably be multi-single in the CW contest. Stop by and give us a zero point QSO so we will know you are on (one band only, please). I would like to see 100 YCCC stations in my log at the end of the contest.

The trip to Galapagos was nice, but we did not get to see as much of the islands as we would like. So we are considering going back next year for a multi-single in the CQ WW CW. There is already a small tribander at 60 feet to use, so antenna setup won't be too complicated. If you are interested (this is definitely a take you spouse expedition) I can provide more details.

Please excuse the messy condition of the scores in this issue. Since I was away during the contest I could not collect them myself, and the people who gave them to used several different formats. At the end of the CW contest I will be on 3830 and will collect scores.

I have been getting a reasonable supply of technical articles. What I need now are some articles on operating, particularly contesting. If you don't know a dipole from a diode, but can work 100 multipliers on 80 meters in the CQ WW, how about an article on how to do it?

I hope to see you at the next meeting. I should have some slides, or maybe even a video of the HC8X operation. Come see how a bumch of boobies could win a CQ WW contest!

Clipper's Log

CQ WW SSB Score Rumors

HC8X m/m

band	Qs	Zs	Cs
160	136	12	21
75	920	19	56
40	2130	27	86
20	2790	35	121
15	4480	34	138
10	1470	21	74
TOTAL	11926	148	496

VP2VCW m/m

band	Qs	Zs	Cs
160	701	13	37
75	1517	20	86
40	1818	27	98
20	4160	36	119
15	3779	30	97
10	992	20	75
TOTAL	12967	146	512

J87DX (K1KI, op.) s/o

band	Qs	Zs	Cs	
160	32	5	13	
75	314	14	57	
40	780	26	85	
20	1211	28	85	
15	1404	26	91	
10	1011	18	65	
TOTAL	4752	117	396	6M

K1AR s/o

band	Qs	Zs	Cs	
160	27	8	19	
75	169	24	80	
40	97	22	67	
20	1089	34	114	
15	1027	28	109	
10	98	13	34	
TOTAL	2507	129	423	3.9M

K1DG s/o

band	Qs	Zs	Cs	
160	42	12	s29	
75	152	19	68	
40	144	24	67	
20	825	29	100	
15	766	24	97	
10	76	19	41	
TOTAL	2005	127	402	3.0M

W2RQ	1817	119	365	2.4M
AK1A	1925	105	279	2.0M
W1WEF				2.0M
K2TR	1400	122	357	1.8M
K1KI	1299	120	340	1.6M
KM1C	1430	106	280	
KA1X (+AK1L, KC1X, KA1MI, KA1FBY) m/s				
	871	75	236	775K
N1AU (+W1FJ) m/s				
	779	82	243	
K1XM (KT1O + N1DRJ) m/s				
	626	83	222	514K
KA1MI	139	37	113	57K
K1ZM	126	19	49	1.8 MHz
K1OX	2334	36	140	14 MHz
K2EK	1750	32	144	21 MHz
KG1E	310	18	70	28 MHz

W2NC	2,124
N2AIF	258K
K2QF	425,800
K2RD	110,000
K2TR	1,897,064
K2SHZ	148,000
KB2CR	20,000
N2JJ	6,500
K2XA	238,000
KB2MG	60,000
KN2Q	200
K2VV	1,051,085

The **Scuttlebutt** is the newsletter of the **Yankee Clipper Contest Club** and is mailed about nine times per year to all paid up members. Dues are $10 per year, payable 1 April with a grace period through 30 June. Non-members may subscribe to the **Scuttlebutt** by sending $10 to the Treasurer: Charlotte Richardson, KQ1F, 11 Michigan Drive, Hudson, MA 01749. Subscribers who subsequently become members will be credited as having paid dues.

The **Yankee Clipper Contest Club** (an ARRL Affiliated Club) holds four official meetings per year, on Saturday afternoons in March/April, October (at the New England Division Convention when possible), November/December, and January/February. The next meeting will be in the Hartford area on October 19, 1985. Attendance at an official meeting is *required* in order to become a member. Club members congregate on 3830 Khz or 1900 Khz Monday evenings; many routinely monitor these frequencies other evenings as well.

Rosters are mailed to all paid members each summer. For more information and/or assistance, contact the area manager nearest you on the following list:

Area	Call	Name	Home	Work
CT/RI	K1RX	Mark Pride	(203) 271-3096	(203) 265-8825
EMass	W1FJ	Al Rousseau	(617) 598-3744	(617) 599-7500x173
WMass	KY1H	Dave Robbins	(413) 655-2714	(413) 494-6491
VT/NH	KM1C	Bill Pedersen	(603) 673-1678	
ME	K1SA	Bernie Cohen	(207) 773-6589	(207) 797-3585
NNY	K2RD	Ira Stoler	(518) 439-5804	(518) 445-8474
SNY/NJ	K2EK	Bill Gioia	(914) 221-1672	(212) 888-2102

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