NEBE ------- a Super Signal Snatcher January 15, 1975 -- de Ghoti, Ph.Dx

As a sequel to the SUPER SIGNAL SNATCHER which appeared in both DXN and DXM, this writing, as stated, partially describes Project NEBE (NEbraska BEverage) which began in October 1972. Described here are the method of construction, the antenna location; a subsequent writing will give the basic performance of NEBE and a description of the receptions on the BCB.

Project NEBE participants: Carl "Skip" Dabelstein, K6SBV, Lincoln, NE (NRC,IRCA); Bernie C. Macholan, ex-K9NXV, Wahoo, NE (IRCA); Bob Mitchell of Back to the Bible Broadcasts, Lincoln, NE and de Ghoti. We regret very much that "Mac" died of cancer in late 1973. His fundamental grasp of things abstract was indeed out of the ordinary!

The first antenna was erected in about two hours time and was 3200 feet in length, about 5 feet above the ground and located on an envious square mile of land given over to the Project by the University of Nebraska at its Field Laboratories about 7 miles southeast of Wahoo.

As pointed out by GPH in THE BCB DXer's BEVERAGE in DXN and also in the Super Signal Snatcher, a Beverage operates with improved efficiency as the conductivity of the ground over which it is located becomes increasingly lower (poorer) but also that a good ground is required to terminate or ground the ends of the antenna and receiver system. So, one works against the other: High conductivity allows an easier good ground but the antenna pickup is reduced and conversely so for low or poorly conducting soils of the earth. The conductivity at the NEBE site is about the highest (best) in the USA. As a guide to the type of soil across the USA, refer to GPH's article above where the FCC Conductivity map of the region can be found.

Other than the conductivity dilemma, which exists at any location in general, the NEBE site is as ideal or envious as one could desire. A BCB shack including operating tables and power is located on the site--out in the middle of nowhere there's a BCB shack beautifully positioned for BCB Beverage work!! Furthermore, the land lays very flat for tens of miles around and the largest elevation differential at the site is on the order of 7 feet. We realize that few will have it so lucky!

The following materials were obtained or prepared prior to the construction of the antenna:

1) a sufficient number of 1"x6'x6" stock lumber cut into 3/4"x3/4"x6' stakes to allow about 50-60 foot spans of wire along the antenna run;
2) four 1 lb spools of 24 gauge plain enamel copper wire (about $15 at that time);
3) a hammer and a few nails;
4) a 560 ohm carbon resistor (suggest a 1000 ohm carbon potentiometer);
5) a box of small U-tacks;
6) a roll of ruber based insulating electrical tape;
7) a propane tourch and rosin solder;
8) a 50 foot tape measure;
9) several copper ground rods (1/2" x 8');
10) twenty foot or so of cloth clothesline rope and a number of cloth ribbons;
11) a magnetic compass;
12) a geographical topography map of the site; and
13) a 7 foot by 1.75 inch round steel rod (wrecking bar) with a pencil pointed end.

We recognise that the last item may be hard to find! But there are substitutes as mentioned below. It was merely fortituous that one was on hand.

The azimuth bearing of NEBE was chosen to be 120°/300° (roughly SE/NW) with the 300° azimuth for use in the unidirectional Beverage mode.

True North was determined from the BCB shack housing the RX and the tape recorders by use of the topographical map and then crudely checked with the magnetic compass. Once this N/S line had been determined, the tape measure was used to determine a point 600 feet due North of the RX shack. (600' was merely convenient--any distance of that order is fine). Then from that Northern point, with the compass again and the topographical map an E/W baseline was determined. Then by some trivial trigonometry, a point was located along the E/W line by measuring off with the tape measure. The point so determined lay on the 300° azimuth line from the BCB shack. The point and the shack then determined the line of construction for the antenna.

Now the antenna erection began. Always siting along the reference points marking the azimuth line of the antenna, the wrecking bar was used to punch 5" to 6" deep holes in the ground, the holes being separated about 50-60 feet apart. While one person did this, another followed placing a wooden stake (3/4 x 3/4 x 6') in each hole. No effort was made to cause the stakes to stand vertically before the wire was attached. When the wire is attached, the wire catenary causes the stakes to come vertical and align with excellent form!! Following close behind the staking operation, two of us attached the wire to the top of each stake as follows --in a very simple manner. A short piece of the rubber based electrical tape was cut and folded flat over the stake top, then a U-tack was hammered into the stake with the antenna wire passing thru the U-tack and over the rubber electrical tape.

No U-tack was nailed completely down or into the top of the stake, thus allowing the wire to slide across the top of the stake as required. When an end of a spool of wire was reached, the torch was used to solder a "Western Electric" splice to the beginning of a new reel of wire. Note, if the wire has plastic insulation on it, the rubber based electrical tape is not necessary.

When the 3200' point was reached, the end of the antenna was wrapped (to prevent slippage) about a nail driven into the top of the last stake with about 10 feet of wire left over to allow the end to be soldered to the resistor which would then be soldered to wire connecting to the ground rods in the ground near the last stake. (NEBE was first operated in the bidirectional, unterminated mode). Rope was used to guy the last stake to smaller stakes driven in the ground around to keep this stake from breaking due to the torque from the antenna wire. The same guying was used on the first stake at the start of the antenna next to the BCB shack. The arc or catenery formed by the wire as it spanned from stake to stake was determined by merely pulling the wire forward from span to span as it was being installed. Common sense determined the tension of each pull--perhaps the wire sagged a foot at the most in the middle of a span.

After being up for a few days, the copper wire stretched (as expected) and the wire had to be respanned. About 70 foot of wire was pulled out at the end stake as a result of stretching (that's about 2% of 3200'). Thereafter very little increase in sagging between stakes was noted even though cloth ribbons were attached at each mid span to alert any trespassers of its existence--hoping they would then not walk into it or through it.
After the extra wire due to stretch was pulled from one end of the antenna, and a few hours of operation in the bidirectional mode, the resistor was connected on the NW (300°) end by soldering it in series with the end of the antenna and the ground rods. The propane torch was used and is necessary to solder the wire to the heavy metal rods--we chose not to use a mechanical "crimp" connection. That's all it took to erect NEBE!

Later on, about late November 1972, the antenna was moved some 10° to the North, 310° and instead of placing the stakes in the ground, they were mounted or strapped atop every other metal fence post of a wire fence running almost the length of the antenna. (We discovered that cattle broke into the area and that they do not mix well with Beverage antennas!). The antenna was now some 7 to 8 feet above the ground. This was NEBE 1A. The results of NEBE 1 and 1A were affected by the fence but the receptions were still so phenomenal or out of the ordinary that the effect was of little concern to us--if noticed at all.

The antenna was used on quite a number of occasions for many hours--NN on a Beverage is something else!!! Ice accumulated on the antenna once or twice and we had to resplice it and respan it and were back in operation. Use of larger diameter wire would have prevented this problem however. The way the antenna was constructed, once the wire broke, the tension was sufficiently relieved that only one break was found.

III. Nighttime Reception. Both the directional and the gain characteristics of the Beverage were quite apparent during the nighttime hours. Many posts at the home QTH were totally absent at the NEBE site.

Due to the limitations noted above, we were able to have only two all-night sessions at NEBE. Surprisingly, although both occurred during periods of high auroral activity, reception to the northwest was outstanding.

The most surprising station of all our NEBE loggings had to be KBMY-1240, Billings, MT. At a distance of over 700 miles, their 250 watts provided a consistent S-9 signal between midnight and 6 a.m. local time.

One has to hear the tapes of this station to appreciate the value of the Beverage. Fellow DXers Paul Hart, Dick Truax and Bill Nittler have heard some of our tapes and will readily attest to our description.

The following is a summary of some typical after-midnight reception during the Fall of 1972 at NEBE compared to that at the home QTH:

Frequency	Lincoln Dominant	NEBE Dominant
550	KSD,KOY	KFYR,KBOW
560	KWTO	KMON
800	KEYNA	CBU
730	KEX	CKDM
790	KULF,WAKY	KGHL
800	XELO,PJB	CHAB
850	KOA(MM's)	CJJC
900	XEW,CHML	CKBI,CJVI
910	KGLC,KPOF	CJDV,KISN
930	WKY	CJCA
940	KIOA	CJGX
960	KOOL,WERC	CFAC
970	WAVE,XEJ	KOOK,KREM
980	KMBZ	CKRM
1030	WBZ	KTWO
1060	KYW,WNOE	CFCN
1080	KRLD	CKSA
1140	WRVA	KGEM, CKXL
1150	CKOC,WIMA	KSEN,KAGO
1180	WHAM	KOFI
1230	WQUA	KGEK
1240	KAKE,WINN	KBMY
1260	KVSF	CFRN
1270	KFJZ	CHAT
1300	WOOD,KCMO	KOZE
1310	WRR,WIFE	KEIN
1320	WILS	CHQM
1340	KICK	KCAP
1350	WSMB	KRLC
1370	WSPD	KXLF
1380	WAOK	KBKO
1600	KFRU	KATI
1410	WING,WIZM	CFUN
1450	KLAW	KUDI
1480	KLMS	KOCX
1510	WLAC	KGA
1520	WKBW(MM's)	KYKI

In conclusion, it's difficult to talk about the Beverage Antenna without using superlatives. Everyone should have an opportunity to use this remarkable piece of BCB DXing equipment. Our time spent at NEBE, as explained above, was all too limited. Plans are presently being made to construct a new Beverage "Son of NEBE" this coming summer. Now, if someone will only figure out how to make it both portable and rotatable!

About the wrecking bar. It can be replaced by a 1" diameter piece of pipe which can be driven in the ground with a sledgehammer or some such klobberer. Removal of the pipe isn't easy--suggest a hole be drilled thru the side of the pipe and a heavy wire or cable be attached, then pull for retrevial.

Note that not every procedure mentioned here need be followed in the construction of other Beverage antennas and not all items listed in the materials list absolutely necessary. Too, other structures are conceiveable for a Beverage, the method used in this case seemed most appropriate for the location and the ease of installation.

Finally, a few comments on grounding and terminations. A good ground is absolutely essential for proper termination of a Beverage, but obtaining and maintaining such is like holding a tiger by the tail! Multiple ground rods well spaced and well connected are a good start. What appears to the eye as a sufficient ground system is not necessarily so!!! A cheaper method than ground rods is to use coffee tins punched full of holes, bare copper wire then threaded thru the holes thus running both around the outside and thru the inside of the cans and soldered at every point the wire passes thru a hole. A multitude of such can wired together is then buried about the earth in the vicinity of the end of the antenna. Other such objects to which electrical connection can be made prior to burial are car radiators, tanks, pipes, metal sheeting (ideal!), and so forth. Once you've got what is believed to be a good ground, a single good sized wire will run from the ground system to the point of connection with the terminating resistor for the Beverage.

Regardless of the ground you obtain, the termination in most cases will "float" and it will be quickly discovered that the termination is not ideal. A Beverage must be pruned or tuned with some method of varying the termination over a range of resistance (simplest case) while monitoring at the RX. For a Beverage like the 3200' NEBE, this can be quite a feat. Communication between antenna ends is not easy to come by. Some have used walkie-talkies or even a separate "talk" wire. Use of the beverage for such communication is not correct when the RX is being used simultaneously however.

Such tuning presupposes a variable potentiometer (resistor) for the termination. The simplest method of tuning is to have some one or someway of tuning the termination while the receiver is monitored. The RX is tuned to a station off the backside of the antenna (RX end) and the resistor is varied until the best "null" is obtained on the backside station. Once such a setting is obtained, it will be discovered that it is also frequency dependent and that off on another frequency the setting will be different. Too, the ground electrolysis, etc. will cause the termination to change and resetting is required with respect to time because ground conditions have changed. Treating the ground with salt, etc. may help obtain a somewhat improved LOCAL ground, but its change with time will likely be more pronounced. A tiger by the tail.

GPH has written a beautiful paper titled "On the Goodness of Beverage Terminations", as I recall, that covers the techniques extremely well and based on adroit theory as well as practical verification. This paper remains to my knowledge as unpublished correspondance.

The Beverage antenna is indeed a phenomenal BCB antenna. It's employment in more serious technical endeavors in BCB work is extremely justified. For one, daytime DX! Those of you who have made some long haul day time receptions in the 1000-1330 local time period by the mechanism of partial D-region reflections will understand my point. Who will be the first to log a daytime E-layer hop? That's a real challenge and a noteable objective. There's a lot of high noon DX work that can be found in the USA during the winter months.

To end, NEBE was surely a noteable experience for all of us and more details of receptions made will follow in a writing to be authored by Skip Dabelstein. He has some interesting data to display as a result of our early morning and late night trecks out to the NEBE project. We can only encourage others to erect such antennas but caution to take the time to install properly. The reward is certainly serendipity!

--de Ghoti

(Note: For those interested in a source for Beverage antenna wire, contact me!!!)

NEBE - A DXER'S PARADISE

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We have been asked by Dave Fischer to write a supplement to his recent article "NEBE--A SUPER SIGNAL SNATCHER".

Our Project NEBE (NEbraska BEverage) was set up during the Fall of 1972 at the University of Nebraska Field Laboratories, about midway between Lincoln and Omaha. We were authorized to use one square mile of land for the erection of our BCB Beverage. The site, which included an unheated metal building about 8 ft. square, was approximately halfway between the towns of Ithaca and Memphis, one mile south of Nebraska Highway 63--a location totally free of manmade noise. We were roughly 22 miles from the nearest BCB transmitter, four miles from the nearest town and slightly over one mile from the nearest road. A more ideal setting for BCB DXing cannot be found.

Reaching the NEBE site required a trek of one mile over land, and the only "road" to our site was frequently impassible. This proved to be the only drawback to our location. The slightest rain or snow made ready access impossible. We could have made the journey on foot, but we would have been unable to carry our receivers, recorders, power and audio cables, etc. Due to this limitation we were able to spend only a few DX sessions at the NEBE site after the antenna was erected.

Comfort in sub-freezing temperatures was possible, thanks to an electric heater, a Coleman stove, heavy coats and a great quantity of hot coffee and tea.

Our Beverage was 3200' (about 0.6 miles) in length, situated on a bearing of 300°, or just west of northwest. The antenna performed much better than we had anticipated. Everything you have read about the performance of the Beverage is true. Any time of the day, the performance was fantastic. The remainder of this article will describe some of our reception observations during the day, night and transition periods.

I. Daytime Reception. Due to the bearing of our Beverage, we were somewhat handicapped in evaluating its daytime performance. The station density along a bearing of 300° in this part of the country is very low. There were some definite surprises though. At our home QTH in Lincoln (some 25 miles to the south), the daytime regulars on 1350 are KRNT, Des Moines, IA, and KMAN Manhatten, KS. At NEBE there was no trace of these stations; rather, KBRX, O'Neill, NE, dominated the frequency with an S-9 signal. Other loggings included KTWO, Casper, WY, on 1030, with an S-4 signal, which is totally inaudible at the home QTH in the daytime. KIOA, Des Moines, IA, completely dominates 940 in Lincoln. At NEBE, this signal was fighting it out with KVSH, Valentine, NE. In five years of BCB DXing in Lincoln, Ghoti was never able to log KCSR-610, Chadron, NE; the usual pest being WDAF in Kansas City. At NEBE, KCSR was definitely audible under WDAF. Obviously, the above daytime loggings were only possible due to the signal-snatching power of the Beverage Antenna.

II. Transition Period Reception. DXing both the sunrise and sunset conditions proved to be most interesting. Evening signals from the west appeared at least one hour earlier on the Beverage than on the home equipment. As a result of the antenna's directional characteristics, many sunset sign-offs previously unheard became regulars. The nulling of signals from the east really opened up many of the frequencies. Regular evening sign-offs included KMER-950, Kemmerer, WY, KBHB-810 Sturgis, SD, KBRJ-950, Boise, ID, KGRL-730, Billings, MT, and KBLI-690, Blackfoot, ID.

Sunrise skip also was unique. Daytime signals from Wyoming, Montana and Idaho were heard nearly 1-1/2 hours after our sunrise. This is long after the respective signals have disappeared at the home QTH. Stations which could regularly be heard at this time included KURL-730, KGHL-790, KSEN-1150, KOCK-1490, and KOFI-1180 from Montana, and KYME-740, KBOI-670, KBEI-930, KAYT-970, KBPI-980 and KGEM-1140 from Idaho.