CAARA Newsletter

AN ARRL AFFILIATED CLUB OCTOBER ISSUE- 2010

President's Corner *by Stan-W4HIX*

It was two short years ago that I got my ham license and joined CAARA. If someone had said "Stan, you'll probably be president of the club in two years", I would have said, "yeah, right." The last thing I was president of was my high school science club. That said, it is a real honor to have been elected president of CAARA. This is a responsibility that I take very seriously. My father was a ham for most of his life and I know he'd be proud of me today.

I would like to thank Curtis Wright for his leadership of CAARA. There has been a great resurgence and CAARA today is a dynamic club with a membership with years of experience and deep knowledge in the hobby. I've seen educational programs spring to life, new hams join the club, old hams joint the club, very successful Field Day efforts, public service events handled with great professionalism and a real respect from the City for our emergency communications capabilities.

CAARA has turned a critical corner and takes its place as an important club in New England. My job is to make sure this progress continues, that we recruit new members, conduct more training and educational events, better prepare the club for emergency service, and elmer more new hams. I hope to provide direction to continue this progress, and to make the club more visible in the public's eye. I call upon the members to get involved, take initiative, call up members we haven't seen in a long time, and find people who might be interested this fascinating hobby. Remember, we are all ambassadors for this club and hobby.

Thank you for the faith you have placed in me to lead your club.

73 de Stan W4HIX

Circa 1865. "Signalmen of Rear Admiral John A. Dahlgren's flagship receiving a message from the Georgia shore."

Tech-in-a-Day Course on Saturday, October 9

The Cape Ann Amateur Radio Association is sponsoring another Tech-in-a-day Course which will be led by club member Stan Stone W4HIX.This one day course will provide the atmosphere to study for and take the Technician class test at the end of the day.The course will be held on Saturday October 9th at the Lanesville Community Center which is located at 8 Vulcan Street in Gloucester.The course will start at 8:30 AM and last all day until 4 PM when you take the exam.Please bring $ 20.00 which will cover testing materials,snack and the testing fee which is required by the FCC.Please bring a photo ID plus your Social Security Number as well. You must pre register for this course so please contact Stan at stan@lanescove.us or at 1-978-283-2015

73's

Dean Burgess KB1PGH

Caara Clerk

CAARA Newsletter
Cape Ann Amateur Radio Association
6 Stanwood Street
Gloucester, MA 01930

Jon Cunningham-Editor
K1TP

Welcome to CAARA:

CAARA, an ARRL affiliated club, operates the 2 meter W1GLO repeater on 145.130 MHz with antennas located on the Cingular tower in the Blackburn Industrial Complex in Gloucester Massachusetts. It has an average effective radius of 60 miles, and serves Eastern Massachusetts, Cape Cod, Rhode Island, Southern New Hampshire, and maritime mobile stations. CAARA also operates the W1GLO repeater on 224.900. The W1RK 443.700 repeater with antennas located in Magnolia is owned and operated by club member Ralph Karcher and it too is available for club use.

The Association is one of the few amateur radio clubs that has its own clubhouse. Located at 6 Stanwood Street in Gloucester, it includes a permanent HF station with rotating beam and vertical antenna along with a 2 meter packet station and 2 meter voice and 220 MHz transceivers.

Amateur radio exams are held on the second Sunday of each month at 10:00AM at the CAARA clubhouse. Anyone who is considering a new license or an upgrade, is welcome to test with us. There is no pre-registration necessary. Contact the head of our VE team Bob Quinn if you have any questions about monthly testing.

Monthly member meetings are held on the first wednesday of each month at 7:30 PM except for July and August.

Each Sunday evening at 9:00pm, the club operates a 2 meter net on 145.130. This is an open and informal net which disseminates club news and prepares operators for emergency communications work. All are invited to check into the net as club membership is not a requirement.

THE CW AND OLDE TYME RADIO CORNER
Rick, WZ1B

I am captivated by "old" equipment and a ham's life going from WWII back to the beginning. I bought the 1930 ARRL's The Radio Amateur's Handbook: A Manual of Amateur Short-Wave Radiotelegraphic Communication. Price $1.00.

In the introductory section, there is the The Amateur's Code. I especially like numbers II, V and VI. Definitely a sign of the times.

The Amateur's Code

I *The Amateur is Gentlemanly.* He never knowingly uses the air for his own amusement in such a way as to lessen the pleasure of others. He abides by the pledges given by the A.R.R.L. in his behalf to the public and the Government.

II *The Amateur is Loyal.* He owes his amateur radio to the American Radio Relay League, and he offers it his unswerving loyalty.

III *The Amateur is Progressive.* He keeps his station abreast of science. It is built well and efficiently. His operating practice is clean and regular.

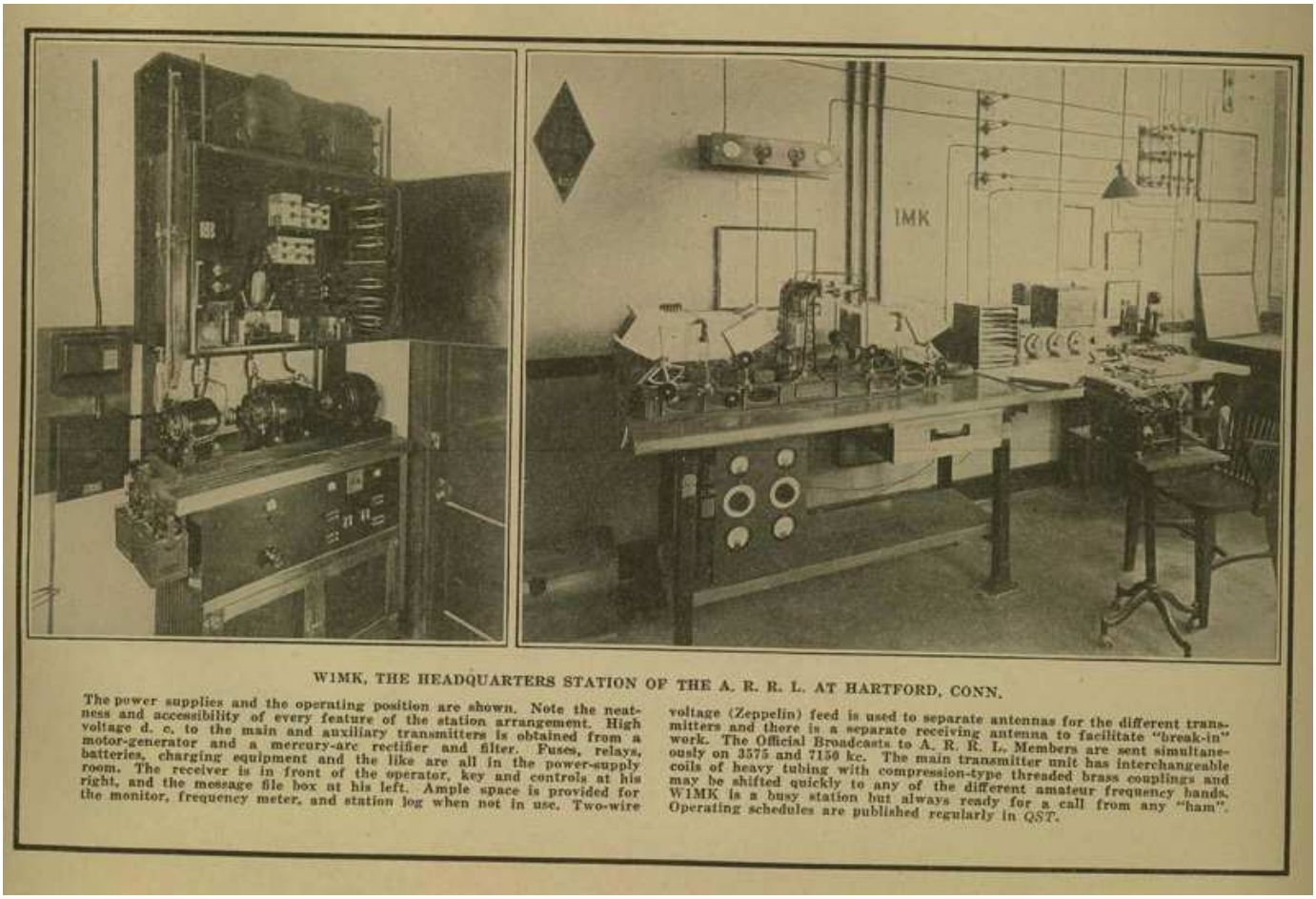
IV *The Amateur is Friendly.* Slow and patient sending when requested, friendly advice and counsel to the beginner, kindly assistance and coöperation for the broadcast listener; these are marks of the amateur spirit.

V *The Amateur is Balanced.* Radio is his hobby. He never allows it to interfere with any of the duties he owes to his home, his job, his school, or his community.

VI *The Amateur is Patriotic.* His knowledge and his station are always ready for the service of his country and his community.

—PAUL M. SEGAL, W9EEA,
Director, Rocky Mountain Division, A.R.R.L.

Below: The following is the 1930 ARRL station. A bit different than it is today. Wouldn't it be fun to get your hands on this? There is something missing, can you figure out what?



W1MK, THE HEADQUARTERS STATION OF THE A. R. R. L. AT HARTFORD, CONN.

The power supplies and the operating position are shown. Note the neatness and accessibility of every feature of the station arrangement. High voltage d. c. to the main and auxiliary transmitters is obtained from a motor-generator and a mercury-arc rectifier and filter. Fuses, relays, batteries, charging equipment and the like are all in the power-supply room. The receiver is in front of the operator, key and controls at his right, and the message file box at his left. Ample space is provided for the monitor, frequency meter, and station log when not in use. Two-wire voltage (Zeppelin) feed is used to separate antennas for the different transmitters and there is a separate receiving antenna to facilitate "break-in" work. The Official Broadcasts to A. R. R. L. Members are sent simultaneously on 3575 and 7150 kc. The main transmitter unit has interchangeable coils of heavy tubing with compression-type threaded brass couplings and may be shifted quickly to any of the different amateur frequency bands. W1MK is a busy station but always ready for a call from any "ham". Operating schedules are published regularly in *QST*.

Amateur Radio can prevent age-related dementia

In an article appearing in the *American Chronicle*, ham radio enthusiast **Daniel Taverne, KE5UTN** suggests that amateur radio might help to prevent dementia.
Daniel's article begins:
Dementia, simply put, is a decline of mental ability, usually associated with age. Folks with dementia typically have problems functioning and performing activities of daily living.

Well, a Study in Sweden suggests that mentally and socially stimulated people reduce their risk of this diagnosis.

Data from the 1987–1996 Kungsholmen Project, a longitudinal population-based study suggests that "stimulating activity, either mentally or socially oriented, may protect against dementia, indicating that both social interaction and intellectual stimulation may be relevant to preserving mental functioning in the elderly."

Wouldn't you agree that we Amateur Radio operators are mentally and socially stimulated? I know I am. Both on and off the air, we hams have plenty to do, and plenty of fine folks to do it with.
You can read the full article by Daniel at:
http://www.americanchronicle.com/articles/view/187297

History of ships' radio room clocks

Remember when all ships had real radio operators? If you do you'll know that the ops had to maintain "silent periods" when they wouldn't transmit, instead listening for distress calls on 500kHz and 2182kHz. After the loss of the Titanic, the radio frequency of 500 kHz became an international calling and distress frequency for Morse code maritime communication. For most of its history, the international distress frequency was referred to by its equivalent wavelength, 600 meters, or, using the earlier frequency unit name, 500 kilocycles [per second] or 500 kc. 2182kHz was added later and transmissions on 2182 kHz commonly use single-sideband modulation (SSB) (upper sideband only). However, amplitude modulation (AM) was often used in some parts of the world.
Maritime coastal stations used to maintain 24 hour watches on these frequencies, staffed by highly-skilled radio operators.
As a reminder, a ship's radio room clock would have the 500kHz silence periods marked by shading the sectors between h+15 to h+18 and h+45 to h+48 in RED. Similar sectors between h+00 to H+03 and h+30 to h+33 were marked in GREEN, which is the corresponding silence period for 2182 kHz.
Anyone breaking the rules would soon hear "QRT SP" in Morse Code, meaning "STOP SENDING - SILENT PERIOD!"

Phoenix-area Boy Scout troop rescued near Prescott

Authorities say a Phoenix-area Boy Scout troop was rescued near Prescott after they used a ham radio and mirrors to signal for help.
The troop included two adults and six children under the age of 15. They were in the mountains last weekend with other scout teams, learning to use signal mirrors in case of an emergency and climb different peaks to signal one another.
The Yavapai County Sheriff's Office says one troop became stranded in the Pine Mountain Wilderness off of the Bishop Creek Trail. The troop was close to running out of drinking water and one scout had fallen ill when they radioed for help.
The Arizona Republic says a Prescott resident received the troop's transmissions from the ham radio and notified county authorities. The troop was rescued by a state Department of Public Safety helicopter Saturday night. Authorities say the scouts and the troop leaders were all in good condition and did not require medical attention

Amateur Radio Quiz: In the Here and Now

The last quiz took a long look in the rear-view mirror. Let's turn around to the future and take a look out the windshield with this collection of new ham radio jargon!

1) What information is contained in a "spot"?
a. Time
b. Frequency
c. Call sign
d. All of the above

2) Which of the following components could be a "roofing" type?
a. Antenna
b. Connector
c. Filter
d. Cable

3) A buck-boost converter is a type of what?
a. Rectifier
b. Filter
c. Power supply
d. Mixer

4) What causes aliasing in a DSP system?
a. Under-sampling
b. Over-sampling
c. Dither
d. Noise

5) Which of the following is a type of spectrum display?
a. Dobsonian
b. Waterfall
c. Magic-eye tube
d. Delayed sweep

6) What does the SOHO satellite observe?
a. Ocean surface temperatures
b. Solar phenomena
c. Geomagnetic pole drift
d. Cosmic rays

7) What type of communication is the WSJT suite of software used for?
a. High-speed CW
b. Networking
c. Satellite
d. Weak signal

8) Rover stations constitute a category in what type of contest?
a. VHF/UHF
b. Field Day
c. Digital mode
d. Sprints

9) Through what platform does "bent-pipe" communication take place?
a. Digipeater
b. D-STAR
c. Satellite
d. Passive reflector

10) What does a "Skimmer" skim?
a. CW signals
b. Intruders
c. VLF "whistlers"
d. Meteor trails

Bonus Question — How did the "screwdriver antenna" get its name?

Answers

1) d — Spotting networks distribute reception reports of stations for DXing and contesting.
2) c — A roofing filter helps reject strong in-band signals.
3) c — Buck-boost is a type of switchmode dc-to-dc converter.
4) a — To avoid aliasing, sample at a minimum of twice the maximum signal frequency.
5) b — A waterfall display shows a sequence of spectrum sweeps.
6) b — The Solar and Heliospheric Observatory (SOHO) keeps an eye on our Sun.
7) d — WSJT is written by Joe Taylor, K1JT, for EME and meteor scatter modes.
8) a — Rover stations move from grid square to grid square during the contest.
9) c — Signals are received by the satellite and transmitted back to the ground without processing.
10) a — Alex Shovkoplyas, *VE3NEA*, wrote this software to decode CW signals automaticall.

Bonus Answer — The original models used electric screwdriver motors to adjust the antenna's resonant frequency

PBS Show Features History Mystery with an Amateur Radio Twist

In the PBS show *History Detectives*, a group of researchers helps people to seek answers to various historical questions they have, usually centering around a family heirloom, an old house or other historic object or structure. So when Chuck Roedel, WA2MXR, of Beverly Hills, Florida, had what he thought may be an artifact from the turning point in

the US space race against Soviet Russia, he called on the detectives to help him sort it all out. The show featured Roedel and his history mystery back in June, and his segment was just made available to the public on the *History Detectives* Web site.

Back in October 1978, Roedel — an ARRL member — met Dwight "Doc" Saxmann, W3HNT (now a Silent Key), of Baltimore, Maryland, on the air. In one of their QSOs, Saxmann told Roedel that in the early 1960s, he had worked on *Echo 2*, an early NASA communications satellite made out of an experimental material. *Echo 2* — a 135 feet diameter metalized PET film balloon — was a balloon satellite that functioned as a reflector, not a transmitter, so that after it was placed in a low Earth orbit (LEO), a signal would be relayed to it, reflected or bounced off of its surface and then returned to Earth.

Launched on January 25, 1964 on a Thor Agena rocket, *Echo 2* was used for passive communications experiments, as well as to investigate the dynamics of large spacecraft and for global geometric geodesy. *Echo 2*, orbiting in a near-polar orbit, was conspicuously visible to the unaided eye over all of the Earth. Brighter than all stars and sometimes even outshining Jupiter, it was probably seen by more people than any other man-made object in space. *Echo 2* reentered the Earth's atmosphere and burned up on June 7, 1969. NASA abandoned passive communications systems in favor of active satellites following *Echo 2*.

But as Roedel explained to Sociologist Dr Tukufu Zuberi, one of the researchers on *History Detectives*, he told Saxmann that he really didn't understand just what the balloon was made out of, "so he said if I sent him an envelope, he would send me back a piece of the satellite. And he did. I'd like to know if this is a piece of an NASA satellite. And if you could, I'd like to know a little bit more about Doc." Along with the material, Saxmann included a note and a diagram of the satellite.

So Zuberi got down to business, trying to find out all he could on NASA's *Echo* program — and Saxmann. Zuberi found that when the *Echo* satellites were launched into space, it inflated and then operated like a giant mirror, bouncing radio waves back to Earth. "So the *Echo* was a major publicity event for the United States, something which is putting the US in direct competition with the Soviet Union," he explained. "But this is interesting — the US shared the *Echo* technology with other countries. And it seems the Soviets actually participated in experiments with *Echo 2*, launched in 1964. The Soviets called *Echo 2* 'the friendly *Sputnik*.'"

Zuberi took the 4 inch square of metallic fabric — half of it covered in mysterious pink powder — that Saxmann sent Roedel to NASA's Goddard Space Flight Center (GSFC). There, Ron Muller explained to him that *Echo 2* had a Mylar structure, but it had actual aluminum on the inside and the outside; this special fabric was glued together in panels for a 100 foot balloon. "And then it gets all folded up very carefully in a 'Z' shaped kind of a thing," Muller explained. And then the whole works gets stuffed into [a small] canister very carefully. Once it was in orbit, it would inflate to full size."

Next, Zubari sought out Debbie Thomas, also at GSFC; Thomas is the operator of the lab's scanning electron microscope. Thomas, with Roedel's permission, took a small cross-section of the material to scan it. Based on what she finds, she will be able to tell if was of the same fabric as Echo 2. "Looks like maybe two metallic layers here," she said. "Let's see, I'm going to take a spot on here. Looks like aluminum. And this is Mylar here. So we know that we've got an aluminum sandwich, essentially. Your total thickness of your aluminum is about point three mils, thereabouts."

Armed with this information, Zubari met with Margery Sovinski, a material analyst at GSFC. She explained that "the total thickness for the material is very similar to what the report indicated it should be. So we've confirmed that it's very likely that the sample that you have here could have been used for the *Echo 2* projects." And the strange, pink powder? Sovinski explained that a fluorescent tracer was added to the material so that if there was a leak, the powder was bright enough that Mission Control could see it if the *Echo* balloon exploded in orbit.

So now Zubari was sure that this piece of material was indeed from the Echo 2 project. But how did Saxmann get a hold of it? In searching for Saxmann, he was able to find his son Milt, who explained to Zubari that his father had passed away in 1983. Doc Saxmann worked for Westinghouse, at the time, a sub-contractor to NASA. He confirmed to Zubari that the note Roedel received with the material was indeed written by his father: "Oh, yeah, that's his writing. He always printed." He also said his father was known as "Antenna Doc."

Milt explained that NASA contracted Westinghouse to

conduct a series of tests on the Echo 2 balloons here at the former naval air station at Lakehurst, New Jersey. "One of the final tests was the burst test," he said. "And it was like a just real loud dull 'thunk.'" In doing this test, the scientists had filled the test balloon up with so much gas to see how much it could take — they knew it would explode. And when it exploded, there were lots of little pieces of balloon everywhere. "You know and it split open and everybody just dived in — you know like kids with leaves? They just dove into this balloon. [Dad] dove in as well, because it was all over the place."

Zubari took all this information back to Roedel: "So a conversation over 30 years ago led to you having a piece of history in your closet." Roedel agreed, saying, "I never understood why he would send me this. I was just on the air. Now I have this story. This is really nice. Nice to know."

Ever wonder how those DX cards get to you?

I am the "V" sorter for the WØ QSL Bureau and I would like to explain how one sorter does it.

QSL cards from all over the world arrive at the local bureau. Figure 1 shows Steve, WØSJS, with a typical stack of about 18,000 cards that arrive at the bureau. My area bureau (The Mississippi Valley DX and Contest Club) then sorts the cards according to the individual suffix letters in the call. For example, all call signs, KØ, WØ, KCØ, NNØ etc, whose suffix (the first letter after the number) begins with the letter "A," are presorted by the bureau managers. These are sorted into individual letter groups, to be given to the letter "A" sorters. That's where guys like me get to work.

The Triage of Sorting

As a letter sorter, I receive a bag with hundreds of cards (see Figure 2) from the local club, which is the WØ bureau. I also receive a data sheet listing new postage purchases by bureau users. It lists the stamps, envelopes and address labels recently purchased from the bureau along with the amount of any monies deposited in the user's account. I enter this data in an *Excel* spreadsheet.

I then remove cards one by one and compare that particular card to a list of bureau users to determine if they have envelopes and postage on hand. If the station is listed as having postage on hand, their cards go into their specific letter slot according to the second letter in their call. If they are on the list but do not have envelopes or postage left, I hold these cards in their respective slots and contact them by e-mail or post card notifying them that they have cards on file and they need to purchase envelopes and postage if they want these cards to be delivered. If they don't respond, their cards are held for a year and then they are shredded. If a station is not on the list, I place them in a "dead file" and keep them for a year.

At the WØ bureau we have boxes built by one of the sorters, Mark, AAØYY, that have slots in them to hold the individual cards by the second letter in the call. As an example of this, the call WØVS gets sorted by the letter S and goes in the S slot, WØVZ, would go into the Z slot, etc. Figure 3 shows the sorting box used by this bureau. I am the letter "V" sorter and I have a larger slot for the letter V because 2 × 1 calls (WXØV, AAØV, etc) go into this slot as well as calls with a V as the second letter. Other than the 2 × 1 calls signs go into a slot designated for the second letter after the "V." This is the first sort.

After all cards are placed in their respective slots, I then start with the cards in the A slot. I sort all the cards for the same station, group them together and secure them with a rubber band so they don't get mixed again with other calls. I double-check the grouped cards to insure I didn't mix similar call sign cards. It's easy to make a mistake getting WAØxxx grouped with WBØxxx.

Preparing for Delivery

The envelopes and postage are kept in a manila folder designated by the second letter of the call. The information on a particular station is also kept in an *Excel* database to account for the postage and envelopes used and new postage and envelopes purchased.

Once each station's cards are grouped, they are again checked for mistakes and then the cards are placed in an envelope or envelopes. If a station has acquired many ounces of cards and has funds on hand in the bureau, I will request a priority envelope from the bureau manager, which could hold up to 13 ounces of cards, this will cost the user less money in postage. The weight and thickness of the standard envelopes are now very limited by the USPS. If you receive multiple envelopes from us it is because we can't send more than about 7 thin cards in the standard size envelope. With the weight and thickness regulations imposed by the USPS as I am writing this in 2009, we can get about 15 thin cards in one envelope for 61 cents (one 44 cent + one 17 cent stamp), which is 2 ounces in weight and under the 1/4 inch thickness

limit.
The envelope is weighed and its thickness is measured to see if it is within the USPS limits. If it is over these limits, another envelope is used and the cards are divided between the envelopes. Some cards are thick and are counted as two cards.

Keeping Count

Once the cards are placed in the envelopes and are counted, a "status" or "accounting sheet" is manually filled out and placed in the envelope along with the cards. If you receive many envelopes, only one "status" sheet is included.
The status sheet shows you:

• the number of cards sent to you
• the funds you have on hand at the bureau
• the number of envelopes with postage and the value of that postage you still have available
• the amount and value of the extra postage you have in your account

I will write a note on this sheet if there is any information I think you need to know, such as that you need to purchase address labels or a priority envelope. The *Excel* data sheet is changed to reflect the postage used in this mailing and the number of cards sent to you. Then additional postage is affixed to the envelope, if it is needed. Once this is completed, the envelopes are sealed and delivered to the Post Office. The bureau has a schedule as to when cards are to be mailed out and every effort is made to adhere to this schedule.
Mistakes are inevitable with the volume of cards going through the bureau and your understanding is asked for the occasional error. Every effort is made to correct these errors as soon as they are brought to our attention. Please keep your account current with the purchase of envelopes, postage and address labels for your particular activity level.

Pinching Penny (Stamps)

It is time consuming for a sorter to have to notify a station by e-mail or post card that they need something. You may get envelopes with different denominations of postage on them as we try to use any old stamps you may have in your account to save you as much money as we can. The Post Office has changed their postage and imposed envelope restrictions so often, that it is very difficult to keep up with them. The bureau donates many 1 and 2 cent stamps to keep your cost down.
Many stations that have a low volume of cards only have very old postage on hand. This really complicates shipping these cards at minimum cost. You may receive an envelope with two 23 cent stamps on it when the postage is 44 cents as this is the only way to send the cards with the postage you have on hand. The Post Office won't trade old stamps for new ones or refund the postage to purchase current stamps. We do not want to waste the old postage denominations in your account, so we send the stamps with the extra postage. Unfortunately, the various denominations are not multiples of each other and the postage is changing so fast, it is not possible to use the old postage economically. The bureau now purchases "Forever" stamps when they are available.
I have sent envelopes with up to 8 stamps of various denominations on them. I bet this drives the post office computers crazy. The envelopes are comical looking with all those stamps but the post office doesn't want to trade old postage and we don't want to waste your postage so we add up the various stamps to meet the post office's newest requirement.
All the sorters donate many hours of their labor and they do this as a service to the amateur community. I hope this article gives you an idea of the effort needed to get your DX cards to you.

New TenTec Radio-Eagle...$1799 without tuner, $1999 with tuner

Ten-Tec has created a transceiver combining simplified controls and ease of operation with the excellent performance of a low first IF 160-through 6-meter ham-band architecture in a compact, mobile-friendly structure. The analog portion of the radio is double conversion with IF frequencies of 9.0015 MHz and 22.5 kHz. A third conversion to zero-frequency IF is accomplished in the DSP processor.

Coast Guard Radio Frequency listing

Channel	Transmit MHz	Receive MHz	Use
01A	156.050	156.050	Port Operations and Commercial, VTS.
05A	156.250	156.250	Port Operations or VTS in the Houston, New Orleans and Seattle areas.
06	156.300	156.300	Intership Safety
07A	156.350	156.350	Commercial
08	156.400	156.400	Commercial (Intership only)
09	156.450	156.450	Boater Calling. Commercial and Non-Commercial.
10	156.500	156.500	Commercial
11	156.550	156.550	Commercial. VTS in selected areas.
12	156.600	156.600	Port Operations. VTS in selected areas.
13	156.650	156.650	Intership Navigation Safety (Bridge-to-bridge).
14	156.700	156.700	Port Operations. VTS in selected areas.
15	—	156.750	Environmental (Receive only). Used by Class C EPIRBs.
16	156.800	156.800	International Distress, Safety and Calling.
17	156.850	156.850	State Control
18A	156.900	156.900	Commercial
19A	156.950	156.950	Commercial
20	157.000	161.600	Port Operations (duplex)
20A	157.000	157.000	Port Operations
21A	157.050	157.050	U.S. Coast Guard only
22A	157.100	157.100	Coast Guard Liaison and Maritime Safety Information Broadcasts.
23A	157.150	157.150	U.S. Coast Guard only
24	157.200	161.800	Public Correspondence (Marine Operator)
25	157.250	161.850	Public Correspondence (Marine Operator)
26	157.300	161.900	Public Correspondence (Marine Operator)
27	157.350	161.950	Public Correspondence (Marine Operator)
28	157.400	162.000	Public Correspondence (Marine Operator)
63A	156.175	156.175	Port Operations and Commercial, VTS.
65A	156.275	156.275	Port Operations
66A	156.325	156.325	Port Operations
67	156.375	156.375	Commercial.
68	156.425	156.425	Non-Commercial
69	156.475	156.475	Non-Commercial
70	156.525	156.525	Digital Selective Calling (voice communications not allowed)
71	156.575	156.575	Non-Commercial
72	156.625	156.625	Non-Commercial (Intership only)
73	156.675	156.675	Port Operations
74	156.725	156.725	Port Operations
77	156.875	156.875	Port Operations (Intership only)
78A	156.925	156.925	Non-Commercial
79A	156.975	156.975	Commercial. Non-Commercial in Great Lakes only
80A	157.025	157.025	Commercial. Non-Commercial in Great Lakes only
81A	157.075	157.075	U.S. Government only - Environmental protection operations.
82A	157.125	157.125	U.S. Government only
83A	157.175	157.175	U.S. Coast Guard only
84	157.225	161.825	Public Correspondence (Marine Operator)
85	157.275	161.875	Public Correspondence (Marine Operator)
86	157.325	161.925	Public Correspondence (Marine Operator)
88A	157.425	157.425	Commercial, Intership only.

The Bunny From Hell
By
Eric P. Nichols, KL7AJ

Phil Leggett peered through the porthole in the side door of the Nyquist's garage. As usual, Ratchet was at his father's workbench, hunched in utter concentration over his latest dubious experiment, oblivious to the world around him. Phil knew he was taking his life in his hands just being near the guy, but at least he wasn't boring. He wasn't sure if he should frantically pound on the door first and scare Ratchet out of his wits, or sneak into the garage and creep up behind him and scare him out of his wits. Either way, it would be entertaining enough.

Phil couldn't quite make up his mind. He decided to flip a coin—if he could find one. He reached into the pocket of his jeans. Nothing. He thrust his hands into his jacket pocket. Still no coin.

Something better. Something much better. A string of firecrackers!

Phil didn't know how long they'd been in his pocket; probably they were all pretty stale by now. But at least it was worth a shot. He patted his jacket again, and to his even further delight, he discovered disposable green plastic butane lighter, probably from the same era as the firecrackers. Life couldn't get any better!

Phil shook the lighter, and discovered there was still a dribble of butane left, which was all he needed. He peered in the window again; Ratchet was still in deep concentration.

With utmost care, Phil quietly opened the door, just wide enough to slip the string of firecrackers in. He flicked the butane lighter a few times, to no avail.

"Crap!" he whispered under his breath. Just before he tossed the lighter into the flowerbed in disgust, he decided to try it one more time. Success!

Phil touched the sputtering flame to the fuse of the first firecracker in the string, and quietly pulled the door closed, calmly waiting for World War III to erupt inside.

The echo of the rapid-fire explosions had to have been deafening inside the hard-walled garage; it was loud enough to wake the dead even outside. However, after the racket died out, one thing that was oddly missing. No screams, yells or cursing from Ratchet! Phil immediately panicked; certain that he had given Ratchet a heart attack!

His heart pounding with remorse, he quickly opened the door to investigate; his nostrils burned from the smell of burnt gunpowder, as a gray haze filled the garage. To Phil's utter astonishment, Ratchet was calmly soldering away at something on the bench.

"Most of my friends just knock," Ratchet said evenly, not even bothering to lift his eyes off his project.

"Next time it will be a M-80!" Phil grumbled to himself.

Ratchet stuffed his soldering iron into its holder and stretched. "Now that you've had your little giggle, would you care to do something useful?"

"Useful is my middle name," Phil said, cracking his knuckles.

Mr. Nyquist entered the garage through the kitchen door, stopped and sniffed the air, curiously. Ratchet turned around on his swivel stool.

"Oh, hi Dad." "Greetings, next generation. Give me a reason to hope for the future." He pressed the electric garage door opener by the kitchen doorjamb.

Ratchet lifted his "device" off the bench, and placed it on his knees. "Funny you should mention that, O Paternal Unit. As a matter of fact, this is going to make us all rich. It's a robotic control for a lawnmower."

Mr. Nyquist peered out the open garage door toward the somewhat overgrown front lawn. "Evidently, it's not quite ready for prime time yet. Alas. Your unbridled optimism had me on the very precipice of turning in my two-week notice."

Ratchet took the not-too-subtle hint. "I'll take care of it, Dad. By the way, are you by any chance going by Selectronix today?" "I could probably deign to darken their door."

"Cool. Could you pick me up a multimeter? Just get one of those El Cheapos by the counter. I fried my old one."

Mr. Nyquist shook his head in mock disgust. "Why can't you boys just do drugs like normal teenagers? Why, when I was your age..." his words tapered off as he entered the minivan and started the engine. As he backed out of the garage, Phil stared at Ratchet in astonishment. "Your dad was a druggie?!"

Ratchet laughed. "I don't think so. He was more of a nerd than you and me put together. He still is."

"Yeah, I sort of gathered that. I wonder what my dad would have been like. Sometimes I think even a butthead of a dad would be better than a dead one."

Ratchet lowered his eyes to the robot on his knees. "Yeah, that sorta sucks." He lifted his head. "But you can borrow my dad whenever you want. He needs another hobby, anyway."

"Thanks. I'll keep that in mind. Speaking of other

hobbies, how's 75 meters?"
Ratchet shrugged. "Why do you give a rip about 75? It's just a bunch of old farts talking about their gums and prostates."
Phil snapped his fingers with an evil glint in his eye. "Precisely. How would you like to give the Periodontal and Prostate Procedure Discussion Net something to really talk about?"
Ratchet narrowed his eyes toward Phil. "It's not illegal or anything; is it?"
"Define illegal."
"Uh...huh. I figured as much."
"Listen, Ratch. There's a little loophole. This would fall under scientific devices. The worst they could do is tell us to quit. If they could ever figure out who 'us' is in the first place. Which they won't."
"Well, whatever devious plan is rattling around in that gourd on your shoulders, you have my curiosity glands going anyway," Ratchet admitted, reluctantly. "What do you have on? Your mind?"
"I propose we build the Bunny from Hell. Remember that 80 meter bunny hunt we did about 6 years ago?"
"Yeah. What about it?"
"I still have the transmitter. We could retune it to the 3866, where the gum and prostate guys hang out. I've got an auto-keyer chip. I can set it to transmit the letter J at random intervals, whenever the PPPD Net is in session. Forever."
Ratchet remained skeptical. "80 meter DFing is a little tricky, but it's not THAT hard. Even the old farts will eventually find it. But it could be fun for a few days anyway."
Phil shook his head. "Haven't you ever heard of NVIS? Have you ever tried to DF a signal that's coming from straight overhead? Especially if there's no ground wave."
Ratchet lit up. "Oh, you are an evil man." And then his countenance suddenly fell. "Uh...Just one thing. How do you propose to eliminate the ground wave?"
"Haven't you ever heard of a cavity back dipole?"
Ratchet shifted his eyes suspiciously. "For 80 meters? Do you know how big that would have to be?! You'd need a cavity the size of an Olympic swimming pool!"
"You mean like an empty Olympic swimming pool? An abandoned empty Olympic swimming pool. An abandoned empty Olympic swimming pool surrounded by cheap plastic pink flamingos? An abandoned empty Olympic swimming pool surrounded by cheap plastic pink flamingos that was manufactured by lining an Olympic sized pit with wire mesh over which was sprayed three inches of concrete? That kind of Olympic swimming pool?"
A grin of understanding spread across Ratchet's face. "Oh, you are indeed an evil person! You've been thinking about this for a while, haven't you?"
Phil shrugged. "It's what I do."
*****
The next Saturday morning, the Bunny from Hell was ready for deployment. They drove out to the decrepit Paradise Hotel, which had been abandoned by its cash-strapped developer halfway through its construction, some fifteen years earlier. It had been an eyesore ever since, but both Phil and Ratchet had always been soft touches for eyesores...especially if they could be redeemed in any remotely ham radio related fashion.
Phil strung an 80 meter dipole end-to-end across the pool, just below gutter height, while Ratchet fitted the transmitter with a pair of marine duty deep cycle batteries, freshly charged the night before. He calculated that the little 5 watt transmitter would run about two months without a recharge, with its intermittent duty cycle. A styrofoam cooler chest was purchased in which to house the devious device. The radio and cooler was placed atop the drain, and the coax run up to the center of the dipole.
After the installation was completed, Phil and Ratchet stood at the edge of the pool to admire their handiwork.
"She's beautiful, isn't she?" Phil remarked, gazing down at the cooler.
Ratchet shrugged and gave Phil a slug in the arm. "It's what I do."
*****
That evening, Phil and Ratchet migrated to Phil's house, where he had set up his station in the spare upstairs bedroom where his older sister had once lived. He had managed to squeeze a fairly decent station into the dormer of the room. It was a bit cramped but effective.
Ten minutes before gum and prostate net time, Phil spun the dial on his Tempo One to 3866, and twiddled his Ultimate Transmatch for maximum noise. A few long-haul stations were heard in the noise, which would soon be buried under the gum and prostate net.
After a couple of minutes, a single letter J chirped from the speaker at six words a minute; it was a good 5 over S9. Phil and Ratchet gave each other a rowdy high-five. Certainly enough signal to make its presence known to the old geezers.
At the appointed time, the PPPD Net members began

checking in. As always, Ted, K6TSQ was the master of ceremonies. After the last member identified, as if on cue, the letter J chimed in again.
It was heard.
“Ted, did you hear that?”
“Hear what?”
“Sounded like some lid trying to check in on CW. Kind of down in the noise on this end. Anyone here still copy CW?”
“Not me.”
“Not me.”
“Nope.
“I’ll give it a try. The CW station, come again.”
Silence.
“QRZ the CW station.”
More silence.
“Well, guess he’s not hearing us too well.”
“Hey Ted.”
“Ye-e-e-eah?”
“How’s your gout been?”
“About the same. Doctor’s going to try a new diet.”
“Why don’t YOU try a new diet?”
“Ha ha.”
The letter J chimed in again. This time Ted heard.
“This is a phone net, OM. We don’t do CW here. QSY down 200. You might find someone down there.”
“That’s telling ‘im, Ted.”
“Something J is all I got out of it. Kinda puny here, too.”
“Came in like a ton of bricks down here.”
“!@#$%^&&&*()!”
The profanity and irritation level of the gum and prostate club escalated with each random transmission of the letter J. The little transmitter remained singularly immune to the threats and curses that ensued.
“Well, isn’t this fun!” Phil commented.
“Yeah, but I’m afraid if this goes on for too long, one of the old geezers might have a stroke or something. Nobody’s had gout for the past hundred years. I’d hate to push someone over the edge.”
“Well, if they don’t like it, they can just spin the dial down 200!” Phil observed.
Ratchet laughed. “I don’t think any of these guys HAVE dials!
“Ha! I think you’re right. 3866 has been in use since the Civil War. I think they’ve worn ruts in the ether.”
“Ratchet scratched his head. “I wonder if our J will wear ruts in the ether too. Maybe we should change the letter once in a while...like when we recharge the battery or something.”
“Good call. Maybe we could use a Cyrillic letter. Or one of those punctuation symbols nobody uses, like a right parenthesis. Or maybe that new symbol for the “at” thingy. Forgot what it was. Keep ‘em guessing.”
Ratchet peered thoughtfully out the dormer window for a moment, and then turned to Phil.
“Did it ever occur to you that maybe we need a life? In forty years do you think you and me will be talking about our gums and prostates? I mean, maybe those old farts used to be interesting when they were our age.”
Phil stared at Ratchet for a moment. “You think so?”
After an awkward silence, Phil and Ratchet turned away from one another, and simultaneously uttered the same thought

A Beginners Guide to Repeaters,Questions and Answers...*By Kevin K. Custer W3KKC*

What is a Repeater?
A repeater, in concept, is not really a complicated device. A repeater is an automatically controlled transmitter and receiver that simply transmits what the receiver hears simultaneously. Imagine having a receiver on one channel, and a high power transmitter on the other, and then holding the microphone of the transmitter in front of the speaker of the receiver. Now make the operation fully automatic. Any user that can be heard by the receiver has the effectiveness of the high power transmiter at his control.
In general, repeater systems are usually located in places of high elevation (on tall towers, on top of mountains or tall buildings) and are equipped with large and efficient antennas, extremely low loss feedlines, and a transmitter and receiver that is very durable, rated for continuous duty, and built to be as immune as possible to interference.
The end result? People using a repeater get much greater range from their radio equipment than would be possible talking from radio to radio. This is how an individual with a portable walkie-talkie (handheld) transceiver can communicate with people many miles away with good clarity.
Repeaters are used in police, fire and ambulance service communications (commonly called “Public Safety”), Commercial (Business) Communications, Federal, State and Local Government agencies, Emergency Communications, and by Amateur Radio Operators. Repeaters can be powered by the regular

commercial power lines, or they can be connected to multiple sources of power, including batteries and/or generators for when commercial power is lost. Repeaters can be built that are extremely power efficient, and may run exclusively from batteries; recharged by solar, wind or water power.
Here's a link to a solar powered amateur repeater: http://www.polkcounty.org/ham/repeater.htm

What is Simplex?

Simplex is point to point communications without the use of a repeater. Simplex operation utilizes the same frequency for receive and transmit, like a CB radio. I.E. Portable to Portable or Mobile to Mobile. The commercial 2-way world calls Simplex operation 'Talk Around" because you are talking around the repeater, not through it.
There are such things as Simplex Repeaters. These machines listen on the frequency for activity, when it recognizes something it will begin to record that activity for a pre-determined time; usually 1 minute. A slang term for these is a "parrot repeater". After the activity ceases or the time has expired, the unit will repeat what it has recorded. This method of communications is somewhat cumbersome over a conventional repeater; because you are forced to listen to what you said earlier in time and the channel usage is problematic as you never know when someone else is recording; however it should not be discounted as these types of systems can be very beneficial.

What is Duplex?

The simple explanation of full duplex operation is like the telephone, where both people can talk at the same time. In contrast, a pair of handhelds operate in half-duplex mode because only one person can talk at a time. Since the 'repeater' listens and talks at the same time in relaying your message, it operates in full duplex mode. Here is another explanation.

How does a Repeater work?

At first glance, a repeater might appear complicated, but if we take it apart, piece by piece, it's really not really so difficult to understand. A basic repeater consists of several individual pieces that, when connected, form a functional system. Here's a simple block diagram of a repeater:
The collection of the antenna, the feedline, the duplexer, and the interconnecting cables is frequently called the "antenna system".

Antenna -

Most repeaters use only one antenna. The antenna simultaneously serves both the transmit and receive RF (Radio Frequency) signals that are going in to and out of the repeater. It's generally a high performance, durable, and very efficient antenna located as high on a tower or structure as we can get it. Antenna systems of this type can easily cost $500 or more, and that's not including the feedline. On the other hand, when properly installed and maintaned they can last from 10 to 25 years.

Feedline -

The feedline on most repeaters isn't just a piece of standard coax cable, it's what's called Hardline. This stuff is more like a pipe with a center conductor than a cable. It's hard to work with and very expensive. So why do we use it? Performance! The signal loss is much lower in hardline than in standard cable, so more power gets from the antenna to the receiver and weaker signals can be received. A hard rule is that once any percentage of a received signal is lost that you can't get it back - ever. Remember, the signal at a repeater site doesn't just travel a few feet to an antenna like in a mobile rig. It may go hundreds of feet up the tower to the antenna. Just for fun check out the specs on a roll of coax some time and see how many dB of loss you'll get from 200 feet of cable, and remember 3db is 1/2 of your power, and 10db is 90% of your power. Hardline also tends to be more durable than standard cable, which increases reliability and helps us minimize the financial expense, and the tower climbs to replace it.

Duplexer -

This device serves a critical role in a repeater. To make a long story short, the duplexer separates and isolates the incoming signal from the outgoing and vice versa. Even though the repeaters input and output frequencies are different, the duplexer is still needed. Why? Have you ever been in a place where there's lots of RF activity, and noticed the receive performance of your handheld radio degrades to some degree? This is called desensitization, or desense, and it's a bad thing on a repeater. The receiver gets noisy or gets desensitized to the point of total deafness from the strong RF signals being radiated in its vicinity and confused about which signal it should receive. The result is poor receive quality, or in extreme cases, complete lack of receive capability. Keep in mind that in this example, the radios are picking up radiated power from one another and that's enough to cause trouble. Now imagine how much trouble there will be if you not only have the transmitter and receiver close together, but connect them to the same antenna!

Transmitting only a few hundred kHz away in frequency would blow away the input to the receiver if the equipment was simply connected together with a Tee. That's where the duplexer comes in; it prevents the receiver and transmitter from 'hearing' one another by the isolation it provides. And the more isolation the better.

A duplexer is a device that is referred to by several different names like cavities or cans. A duplexer has the shape of tall canisters and is designed to pass a very, very narrow range of frequencies and to reject all others. There is some loss to the system because of the duplexer (called the "insertion loss"), however, the advantage of being able to use a single antenna and a single feedline usually outweighs the drawbacks.

Receiver -

Receives the incoming signal. This receiver is generally a very sensitive and selective high performance one which helps weaker stations to be heard better by the repeater. It's also where CTCSS (Continuous Tone Coded Squelch System) or "PL" decoding takes place. More on this later.

Transmitter -

Most machines have a transmitter composed of two parts: an 'exciter' and a power amplifier. The exciter created low level RF energy on the proper frequency and then modulates it with the audio. The power amplifier stages simply boosts the level so the signal will travel further. Transmitters come in two types: intermittent duty and continuous duty. One that is rated for continuous duty is preferred.

The "Station" -

The term "Station" is used to describe a stationary two way radio set; which includes the transmitter, receiver and sometimes the control circuitry. One example is the dispatch radio for a fire department. A 'Repeater Station' is a station designed to be used as a duplex repeater.

Controller -

This is the brain of the repeater. It handles station identification (through either CW or voice), activates the transmitter at the appropriate times, controls the autopatch, and sometimes does many other things. Some machines also have a DVR (Digital Voice Recorder) for announcements and messages. The controller is a little computer that's programmed and optimized to control a repeater. The various models of controllers have different useful features like speed-dial for phone patches, a voice clock, facilities to control a remote base or linking, etc. The controller gives the repeater its 'personality'. Whenever you're using a repeater, you're interacting with its controller. In the early days of repeaters the controller was a large chassis full of relays and timers. These days a controller is most often a microcomputer based unit.

What is a Phone Patch or Autopatch? AKA "The Patch"

Many repeaters have a feature that allows you to place a telephone call from your radio. Phone calls are generally restricted to the local calling area of the repeater to avoid long distance charges to the repeater's sponsors. If in doubt, ask if the repeater has an *open patch* and how to access it. When using the patch it is common courtesy to announce your intentions, e.g. "This is N3XZY on the patch". This may help to prevent anyone from keying up while you are trying to use the function. In most areas when you are finished with the patch the accepted protocol is to announce it, e.g. "This is N3XZY clear the patch".

DVR -

A DVR is a Digital Voice Recorder, or in modern terms a "voice mail" system for the repeater. Usually it's an option that is installed into the controller.

Repeater Operation -

Operating using a repeater isn't difficult. A good source of info is the ARRL Repeater Directory. It's an inexpensive book with repeater listings all over the US. It contains frequency, offset and whether the repeater is + or - in shift (see "offset" below), whether or not it requires a PL tone, and other features (like an autopatch, or repeater-to-repeater linking).

What is Offset?

In order to listen and transmit at the same time, repeaters use two different frequencies. On the 2 meter ham band these frequencies are 600 kc's (or 600 kilohertz) apart. As a general rule in the USA, if the output frequency (transmit) of the repeater is below 147 Mhz then the input frequency (listening) is 600 kilohertz lower. This is referred to as a negative offset. If the output is 147 Mhz or above then the input is 600 kilohertz above. This is referred to as a positive offset. However in any given area the offset rules can be different.

Virtually all ham radios sold today set the offset once you have chosen the operating frequency. As an example one repeater output is 145.270 Mhz. The input, or the frequency it listens on is 144.670 Mhz (600 kilohertz below). If you have your radio tuned to 145.270 Mhz with the offset enabled, when you push the PTT switch (Push-To-Talk) your radio

automatically transmits on 144.670 Mhz. When you release the PTT to listen, the radio reverts back to 145.270 Mhz to listen on the repeater's output frequency.

Standard Repeater Input/Output Offsets

Band	**Offset**
6 meters (50-54 MHz)	No real nationwide standard, it varies widely.Most common are -500 KHz, -600 KHz or -1.0 MHz
2 meters (144-148 MHz)	Up and down 600 KHz, depends on frequency
1.25 meters (222-224 MHz, also called "220")	Down 1.6 MHz
70 cm (440 MHz, also called "UHF")	Up or down 5 MHz, depends on local area usage
33 cm (900 MHz)	-25 MHz
23 cm (1200 MHz)	-20 MHz

Note: There are exceptions to the above so check local repeater listings.

Why do Repeaters use an Offset?

To use a repeater a user station must use a different transmit frequency than receive frequency. This is a *form of duplex*, or two frequency operation. It is known as *half-duplex as you do not receive and transmit at the same time but normally use the push-to-talk button on your microphone to switch between the two.*

Most repeater installations use the same antenna for transmit and receive. Without having an offset the repeater would simply hear itself when it was transmitting on the same frequency it was listening on. Even with the offset, the two frequencies are close enough that *antenna system isolation* is required. Again, this isolation is afforded by the duplexer.

What is Carrier Access, Tone Squelch, CTCSS or a PL Tone?

Carrier Access, or Carrier Squelch means that the repeater is looking for a carrier on the receiver frequency to open the squelch. A circuit called a Carrier Operated Switch senses the squelch opening, and tells the repeater that there is a carrier on the input. The controller keys the transmitter, thereby repeating the signal.

Continuous Tone Coded Squelch System, or CTCSS, is an a radio communications industry standard signaling scheme. It provides an electronic means of allowing a repeater to respond only to stations that encode or send a very precise audio tone at a very low level superimosed on the transmitter along with the microphone audio. The CTCSS system is used to prevent the repeater receiver from responding to unwanted signals or interference (it's looking for both the carrier and the tone before the signal is considered as valid). If a repeater is "in tone mode" that means it requires a CTCSS tone to activate the repeater. If it is in "Carrier mode" then it is ignoring the CTCSS decoder, if there is one. Modern repeater controllers offer a way to switch back and forth, even automatically, between the two modes. Originally there were 32 standard tones, now there are 37. Some moanufacturers offer more, but most repeaters use one of the original 32 so as to allow the older radios to use the system. Aftermarket tone generators from several differnet manufacturers allow any station to be set up to transmit a CTCSS tone.

PL, an acronym for Private Line, is Motorola's proprietary name for CTCSS. General Electric uses the name "Channel Guard" or CG for the same system. Other names, such as Call Guard, Quiet Channel or Quiet Tone are used by other manufacturers.

In days of old, repeaters that used PL were considered to be closed or private. This is no longer the case as tone operation has become more the rule instead of the exception. Uninformed people use CTCSS to "solve" interference problems. It doesn't. It just covers them up, or hides them. The unwanted signal is still on the repeater input, the tone decoder simply prevents the repeater from making it obvious.

A later system using digital bit streams followed CTCSS. Motorola uses the name Digital Private Line, or DPL for this. Other manufacturers use different names. DPL does not have the wide use the way PL does, since only a few radios have the DPL encode function.

How do you call someone on an Amateur Repeater?

First, listen to make sure that the repeater is not already in use. Then listen some more. If you are a new ham that has never used a repater before it might pay to listen for a week or so and see what goes on, who seems to be the "regular users", and if you know any of them, perhaps from the local ham club meeting. When you are satisfied that the repeater is not in use, begin with the callsign of the station you are trying to contact followed by your callsign. e.g. " W3ABC this is N3XYZ". If you don't establish contact with the station you are looking for, wait a minute or two and repeat your call.

If you are just announcing your presence on the

repeater it is helpful to others that may be listening if you identify the repeater you are using. e.g. " This is N3XYZ listening on 6-2-5". This allows people that are listening on radios that scan several repeaters to identify which repeater you are using (and therefore which microphone to pick up to answer you).
If the repeater you are using is a busy repeater you may consider moving to a simplex frequency (transmit and receive on the same frequency), once you have made contact with the station you were calling. Repeaters are designed to facilitate communications between stations that normally wouldn't be able to communicate because of terrain or power limitations. If you can maintain your conversation without using the repeater, going "simplex" will leave the repeater free for other stations to use.

Repeater Etiquette

The first and most important rule is LISTEN FIRST. Few things are more annoying than someone that "keys up" in the middle of another conversation without first checking to make sure the repeater is free. Saying that your volume control was down too low and you didn't hear any conversation is no excuse - it just says that you didn't chack your own station before you used it. If the repeater is in use, wait for a pause in the conversation and simply announce your callsign and wait for one of the other stations to acknowledge your call.
When you are using the repeater leave a couple of seconds between exchanges to allow other stations to join in or make a quick call. Most repeaters have a "Courtesy Tone" that will help in determining how long to pause. The courtesy tone serves two purposes. Repeaters have a time out function that will shut down the transmitter if the repeater is held on for a preset length of time (normally three or four minutes). This ensures that if someone's transmitter is stuck on for any reason, it won't hold the repeater's transmitter on indefinitely.
When a ham is talking and releases the push-to-talk switch on their radio, the controller in the repeater detects the loss of carrier and resets the time-out timer. Many of the modern computerized controllers allow the owner to program a "beep" to indicate that the timer is reset. This beep is called the courtesy beep, or the courtesy tone. If you wait until you hear this beep (normally a couple of seconds) before you respond, you can be sure that you are pausing a suitable length of time. After you hear the beep, the repeater's transmitter will stay on for a few more seconds before turning off. This is referred to as the "carrier delay", or the "hang in timer". The length of the delay will vary from repeater torepeater but the average is about 2 or 3 seconds. You don't have to wait for the transmitter to drop off the air before keying up again, but you should make sure that you hear the courtesy tone before going ahead.
Note: If you don't wait for the beep the time-out timer to may not reset. Some repeater clubs have a rule that if you time-out the repeater you get to buy a round of coffee at the next ham club meeting.

What is "Doubling" ?

When two stations try to talk at the same time the signals mix in the repeater's receiver and results in a buzzing sound or squeal. When you are involved in a roundtable discussion with several other stations it is always best to pass off to a specific person rather than leave it up it the air. e.g. "W3ABC to take it, this is N3XYZ" or "Do you have any comments Fred?, this is N3XYZ". Failing to do so is an invitation to chaos and confusion.
It is for this very reason that when groups hold scheduled Nets (network of hams meeting on air at a predetermined time), they assign a Net Control station. The Net Controls job is to make sure there is an orderly exchange and that all stations get a chance to speak. Listen to a local net and you will get an idea of the format and how the Net Control juggles the various stations and traffic. It's a job almost anyone can handle, but as you will discover, some are much better at it than others. And if you try your hand at being Net Control for a night, you will discover just how hard it can be! (and you will gain a lot of respect for those that have the knack to do it and make it sound easy). A well run net is both informative and entertaining!

What is a Control Operator?

The Part 97 of the FCC Rules requires all stations in the Amateur Service that are capable of operating unattended must be monitored for proper operation while in the unattended mode. This monitoring function is accomplished by a control operator. The Control Op can be the licensee of the station or anyone he or she chooses. In many cases, he or she also ends up being the person that answers questions about the repeater.

What is White Noise?

White noise is a term used to describe a spectrum of broad band noise generated in a receiver's detector and sampled to control the receiver's squelch. When you

open the squelch control and hear the rushing noise from the speaker, this is white noise. When the receiver is in carrier squelch mode the squelch circuit uses the presence of that noise to decide that the signal has gone away and it should mute the receiver speaker. When the receiver is in tone squelch mode it uses the abscence of the tone AND the presense of the noise to indicate loss of signal. The “squelch tail” is that burst of white noise that you hear that starts when someone unkeys and ends when the squelch circuit actually mutes the receiver audio (some people mistakenly use the term to refer to the carrier delay mentioned above).
I hope this article has explained the Repeater in enough detail that you understand what it is and how to use it. If there is any part of this article that seems vague or confusing, please write me and I’ll do my best to explain it better....

CAARA HOLDS ANNUAL MEETING AND CONSTITUTIONAL CONVENTION !!!

On Wednesday September 15 th at 8 PM the CAARA membership convened at the clubhouse on 6 Stanwood Street and held it‘s Annual Meeting and a Constitutional Convention. The meeting began with 28 club members in attendance listening to outgoing President Curtis Wright AA3JE with the Presidents Annual state of club address. He stated that the club is in good financial footing with a stable lease until 2011 on the clubhouse. He mentioned that CAARA is considered by the ARRL to be one of the more active clubs in the area. He was proud of the membership of how they all have come together in the past few years to make CAARA an active club with many events and a educational club as well. The membership then moved on to the Constitutional Convention where a spirited discussion took place of some tweaks to streamline the clubs Constitution.The membership then voted on these changes and they were approved. A new version on the CAARA Constitution will be made available shorty to the members on the club‘s website and in the club newsletter.
We then moved onto the changing of the guard with the membership voting on a new President and Vice President as well as a few new Board of Director positions as well.Stan Stone W4HIX was nominated as President and Dick Macphereson WB1W was nominated as Vice President.Both Positions were approved by a 27 to 0 vote. The membership then voted on the new open Board of Directors positions. Don Swenson KB1TRP, Ruth Hodsdon WW1N and Dick Ober K1VRA were all nominated and voted in on 2 years BOD terms by a 27 to 0 vote.
Congratulations to all those voted into the CAARA Officer and Board of Director positions.
73‘s - Dean Burgess KB1PGH

Near Vertical Incident Skywave (NVIS) Antenna

Display

A feature of the ionosphere is its ability to reflect radio waves. However, only radio waves within a certain frequency range will be reflected and this range varies with a number of factors.
The most widely used instrument for ionospheric measurement is the ionosonde. The ionosonde is essentially a high frequency radar which sends short pulses of radio energy into the ionosphere. If the radio frequency is not too high, the pulses are reflected back to earth.
The ionosonde records the time delay between transmission and reception of the pulses. By varying the frequency of the pulses (typically 1-22MHz), a record is obtained of the time delay at different frequencies. This record is referred to as an ionogram. The highest frequency which the ionosphere will reflect vertically is called foF2. These foF2 measurements from various sites can be used to create a map of foF2. The data used to produce the map of the USA region are from USAF observing sites and obtained from Space Environment Centre, Boulder Colorado.
Please see “NVIS Propagation Display” in the LINKS section for current maps that are generated from this method.
One item that some who write for QST fail to understand is that these maps give you an accurate indication of which band/s is/are open for NVIS work. As you can see in the maps here on 11/19/07 at 13:00Z the US experienced a rather full range of bands that could have been used. It ran from 160M on the West to 75M in the mid section to 60M on the East coast. Notice that 40M was **NOT** open above 30 Degrees North ANYWHERE in the world. That would exclude the vast majority of the United States for 40M NVIS work, on that day. Further, since the time that snapshot was taken, 40M has continued to be unusable for NVIS work on - every - check I have made for the last eighteen months, above 30 degrees North.
Anyone that makes a blanket statement that you can use 40M NVIS during the day and 75M NVIS at night, has not fully researched their “information”. It varies significantly with the sunspot cycle and where (how far North or South of the equator) you live.

Antenna

The Near Vertical Incident Skywave (NVIS) antenna is one that provides the majority of its radiation at an extremely high angle. That is to say the major lobe is between 75 and 90 degrees to the earth’s surface. This will provide excellent omni-directional communication for a distance of 300 to 400 Kilometers. The maximum frequencies involved will be as low as 1.8 Mhz under very poor conditions to as high as 14 Mhz under excellent conditions (which we have not seen in several years), with the average being between 3.5 Mhz (80M) and 7.3 Mhz (40M).
I find it amazing the number of people that can read the previous paragraph and not understand it. One individual wrote to ask of 440Mhz would work for NVIS - **NOT**.
When I first started looking at the NVIS antenna for “local” communication the consensus seemed to be that it was a dipole-type antenna, near 1/8th wave at the operating frequency, above the ground. If you are running the military, non resonant antennas, that seems a fair description. The difference is that many, if not most, horizontally oriented antennas have an NVIS component in their radiation.
How then do we determine what NVIS antenna will best suit our needs? The answer to that question is both simple and yet quite complex. Let me begin by addressing specific parameters that have significant effect in antenna performance. Before we get there, let me say that this is information on how to make it work, NOT a graduate degree treatise on the theory of NVIS.

Height above ground

The antenna height above ground seems to be the single most controversial subject in discussion of NVIS antennas. Some say anything below 1/4 wave works. Others say anything below 1/8th wave and yet others - myself included - say ten to fifteen feet works very well. You will note that there is negligible difference in antenna gain between 1/8 wave and 1/4 wave height. There is however a significant difference in the logistics of placing an antenna at 70 some feet in the air versus 35 feet in the air.
L.B. Cebik (W4RNL) in his page on NVIS height shows in the chart at about mid web page that the height, in the 1/8 to 1/4 wave length above ground, has very little difference in gain. In fact, if you roll in the

next parameter, ground (detailed below), height can easily have much less effect than ground.
The Near Vertical Incident Skywave (NVIS) antenna is a half-wave dipole antenna mounted not over 1/8th wave above ground (at the highest operating frequency). While 1/8th wave works reasonably well, better coverage is obtained if the antenna is mounted at about 1/20th wavelength above ground. A second advantage of lowering the antenna to near 1/20th wavelength is a lowering of the background noise level. At a recent S.E.T. communication on 75 Meters was started with a dipole at approximately 30 feet. We found communication with some of the other participants to be difficult. A second 1//2 wave dipole was built and mounted at 8 feet off of the ground. The background noise level **went from S7 to S3** and communications with stations in the twenty-five and over mile range were greatly enhanced. Simply stated, you want as much of your signal going up as possible and ten to fifteen foot height has shown to function **very** well.
I have had many people write to tell me about the results they obtained simply by lowering an existing antenna to the ten to fifteen foot level. ALL are consistently amazed at how much better the “local” (less than 300 miles) signals are. Most comment at how much stronger local signals are when others are also using NVIS antennas.
A specific example is a friend who lives about 160 miles away, with the Continental Divide between us (many mountains in the 12 to 14 thousand foot elevation). Steve built an NVIS antenna to compare with the G5RV he has at 30 some foot height. The signal reports **went up by about 15db**. No other change, just went to an NVIS at fifteen feet and the signal went up considerably. It works!
Any horizontally polarized antenna will have an NVIS component in its radiation. To maximize the NVIS component, you need to run the antenna at ten to fifteen feet above the ground. Will it work if lower? Yes it will, reference WA6UBE tests. Will it work if it is higher? Yes, but the NVIS efficiency goes down. Field tests have proven that the best NVIS efficiency is obtained at the ten to fifteen foot height for frequencies in the 40M to 75M range.

Ground

Yet another consideration is the “quality” of the ground below your antenna. By this I mean the conductivity of the ground you are operating above. For any given height (1/4th wave length or less) poor conductivity will attenuate up to 3db more of your signal than high conductivity soil. A very specific example is the ARES installation in Longmont, CO at the Emergency Operations Center. That antenna is mounted ten feet above a flat roof. The base for the roof is a grounded steel plate. This antenna consistently performs as well or better than any other in the state. The reason is simple. A full sized resonant dipole antenna mounted ten feet above an excellent ground.
A specific example of how well the Longmont EOC antenna works is one Sunday when we were testing the antenna, a friend tried his Yaesu FT-817 running on the internal battery pack. As most know, that configuration produces 2.5 watts PEP maximum output. At that power level we received a signal report from NCS in Colorado Springs (90 miles South) of **S9+10db, on 75M** just before the net started.
Another example of how the conductivity affects your signals comes from my area where we regularly use NVIS antennas on 60M to communicate across the Continental Divide. Doing this on a twice weekly basis for several years now we have established a base-line for comparison. The week of 9/23/04 we had a slow moving rain storm that put down more than one inch of rain spread almost evenly over about 36 hours. For those of you that have thirty to fifty inches of rain per year, that would not be much. Here in Colorado that is one-fifteenth of our total annual precipitation. After the rain, under less than optimal band conditions, signals were **UP 6 to 10db!**
The chart in L.B. Cebik’s (W4RNL) web page shows that any NVIS above excellent ground out performs an antenna above good ground at optimal height! Humm, does that imply that we have found the single most important parameter in NVIS?

Ground mounted Yagi?

One other consideration may be the addition of a “ground” wire positioned to operate as a Yagi type reflector below the driven element. The problem there is that the recommended spacing is .15 wave lengths or about 34 feet for 75M. As noted above reducing the antenna height from 30 feet to 8 feet reduced the background noise level by 4 “S” units thus while the reflector may increase the efficiency of the transmit signal, it reduces the usable signal strengths of received signals. A received signal of S6 would work fine with the antenna at 10 feet but not be heard with

the antenna at 30 feet - in the S.E.T. example above.

Ground wire

Yet another approach is to run a “ground” wire at the surface where the antenna is mounted. A good discussion on this is found at an Australian site by Ralph Holland. He did some research on 160M and found that a ground wire at .02 to .06 wave lengths below the driven element produced the best gain. That translates to about 5 to 15 feet at 75M which would be consistent with the heights that we have seen produce the best NVIS performance. Others that I have talked with claim at least a 6db improvement with this same approach.

I have completed some trials with a ground wire (actually two) under the random length wire antenna detailed below. I ran two parallel wires on the surface of the ground, connected to a ground rod at the house end, separated about twelve inches and approximately centered under the random length wire antenna. This configuration produces more than 6 db improvement on the transmit signal and a slight improvement on receive. Well worth the effort.

As a side note to the above statement, I also notice an improvement if I “water” my ground rod just prior to operation. I actually pour about one gallon of water on the ground around the ground rod. If it seeps in very quickly, I go get another gallon. This has made a noticable improvement in both transmit and receive signals. (Tells you how really dry some parts of Colorado are, doesn’t it.)

Over the winter I noticed that the signals (transmit and receive) seemed to be deteriorating. Once Spring thaw came I went out to check the ground wire under my random length wire antenna. It turns out that the ground wire was in about five pieces. I pulled out all of the pieces and installed a new loop of grounded wire, with the expected results. The antenna is now back to full performance.

I am working on a “ground” wire connected to the mounting bracket for the “Ham-stick” dipole (below) running down the side of the mast. The results of preliminary tests were inconclusive because 40M has not been open for NVIS for months thus I discount the transmit results. I did notice a few interesting items while doing the setup. With a ground wire running from the bracket, down the mast and connected to various lengths of wire laying on the pavement, the resonant frequency of the antenna changed slightly (10 Kc shift) and the SWR varied slightly, from 1.5:1 to 1.6:1 to 1.4:1 - depending on the length of wire below the antenna. The lowest SWR was from a half wave length long wire 11 feet below the antenna. Gee, does that imply resonant antennas provide a better matched load? ;-)

Modeling

At a local Radio Club meeting one of the Engineers did a presentation on antenna modeling using the NEC software. During this presentation he modeled a 75M dipole first in free space, then at one wave length above ground and then at ten feet above ground. The software showed that *at ten feet the radiation pattern closely resembled a round ball sliced in half and mounted at fifteen degrees above the horizon.* This is a direct correlation to field observations! Man-made noise will tend to be received in the low ten to fifteen degrees above the horizon, thus the lowering of background noise. We have also observed consistent omnidirectional coverage with the signals from NVIS antennas in the ten to fifteen foot height.

Location

Where you live/work in the US has perceptible effect in what results you get with NVIS. By that I mean that the further North you live the lower the maximum frequency you can successfully use for NVIS. This becomes much more evident and important when the sun spot cycle is at or very near the minimum. Add to that the effects of seasonal changes which amplify the sunspot effects and you can see at least one full band difference in NVIS usable frequencies. During the Winter and under sunspot lows you can easily see two band differences.

The sage “wisdom” tell us that you use 75/80M at night and 40M during the day. **NOT** true during the sun spot minimums. There are significant portions of the US that have not had 40M open for NVIS propagation since 2005. How can you use a band that is not open? You can’t. Additionally the same “wisdom” tells us that 75M will go away early in the day. During sunspot highs I’ll easily believe that. During sunspot lows 75M is very often open for NVIS until well past noon, local time. - - Almost like real estate it’s location, location, location.

What works?

The differences in performance between various antenna configurations seem to fall into the following

approximate rankings (best performance to least efficient).

Full wave length loop (not practical for most of us)
Half wave length dipole with the feed point lower than the ends yet about fifteen foot height.
Half wave dipole - inverted V configuration (approximately **-4.5db** below the "saggy" dipole above!)
Random length wire
"Dual Ham-stick" dipole
Antenna below 4 feet high

Each of the antenna configurations above (with the possible exception of the last) **WILL** be enhanced with a good ground wire below them. Any full length wire will enhance performance but resonant lengths and good ground connections will - naturally - provide the best performance gains.

There are many configurations that will work well. I will detail those that seem most useful as I am able to verify the results. Each will either be a link or details of what really works. I have come across far too many claims of extraordinary performance that no one else seems to be able to duplicate. Thus this section.

Last update:

- **Random wire**: An LDG 4:1 balun feeding 112 feet of number 14 wire with an average height of ten feet works quite well. Please note: It will NOT work with a few auto tuners, (some MFJ autos are very picky) but a good manual tuner will produce good to excellent results. The LDG Z11 Pro is one that works quite well. Make <u>sure</u> you have a very good ground! A ground at the balun and at the rig may not be sufficient. One at the balun, one at the tuner and one at the rig work well (can't tell you why it made a difference, but it did). This is multi-band (75M, 60M and 40M) NVIS and is acceptable for general use on other bands. See the comments above about running a grounded wire underneath this antenna for better efficiency.
- **Dual Ham-Stick**: This is a portable antenna that does well under ARES/RACES operating conditions. One person can put this up and have it operational in <u>under</u> five minutes! A side advantage of this antenna is its comparatively small size. It is only sixteen feet in length, which makes it much more reasonable for temporary installations.

  Take two mono-band mobile antennas and mount them base to base with one being the driven element and the other being the ground side. Use care in tuning this configuration that the elements are the same length. In testing this configuration it is interesting to note the change in resonant frequency as the antenna is raised above ground. There was a shift of 50 Kc (higher frequency) in raising the antenna from five feet to ten feet. Raising the antenna above ten feet made no noticeable difference in resonant frequency.

  The two monoband mobil whip antenna talked about above has been field tested with excellent results. The 75M version was tested and then we switched to the 40M version. In both cases we found that the twin mobile antennas delivered a signal of 1 to 2 "S" units (read that about 10db) down from a full sized wire dipole at the same height. This is consistent with what you would expect from a loaded antenna. The great part is that the signal on 40M (from the plains of Eastern Colorado to a mountain town behind Pikes Peak - about 100 miles away) was an **S9+10db** from a 100 watt PEP radio.

  The ones I used are available at HRO. Antennas are Ironhorse IHF75's and IHF40's (two each) and the Ironhorse IH-DAK-AD adapter. Total cost for four antennas and the mounting bracket is $117.96 including sales tax. I also use Radio Shack tripod and five foot mast sections for simplicity.
- Quick and Easy NVIS from your vehicle. Thanks to K6SOJ.
- I have continued to work on the multi-band NVIS with good results. I have single elements that tune up to 1.5:1 on 75M (the worst SWR), with 60M and 40M well below that. I then combined the 40M and 75M elements with almost no change in resonance and minimal change in SWR (they both went up by .1:1). The starting point for this is • a Multi-band NVIS but details show significantly different leg lengths than I am using. The second source for information was a PowerPoint presentation from • N7NVP and W6QJI. Mine end up being 219/ F(Mhz)=length(feet) for each leg for mono or dual band operation (with no tuner). Tri-band operation require either a tuner or 1) lengthen the 40M and 60M elements slightly 2) shorten the 75M elements slightly.
- I have another version of the tri-band antenna (just above) that is almost one half the size shown above but exhibits about -1 db compared to the

NVISfan. I will detail full results here as soon they are available.

- Gary Wilson, K2GW - the SNJ SEC, sent me copies of his writeup on a multi-band NVIS based on the BuddiPole antenna. He calls it the • N-Vee.
- Gary, K2GW, has another multi-band NVIS plus 2M! This includes 2 pictures at the bottom of the page. • K2GW NVIS.
- Do you have input? • Let me know.

Enhancements to Existing Designs

I think every one of us has come across an antenna design that can be improved upon. This segment is to document those enhancements that have proven to be well worth the time. The modifications included here have been received via E-mail and are presented with the Name and Call of the author.

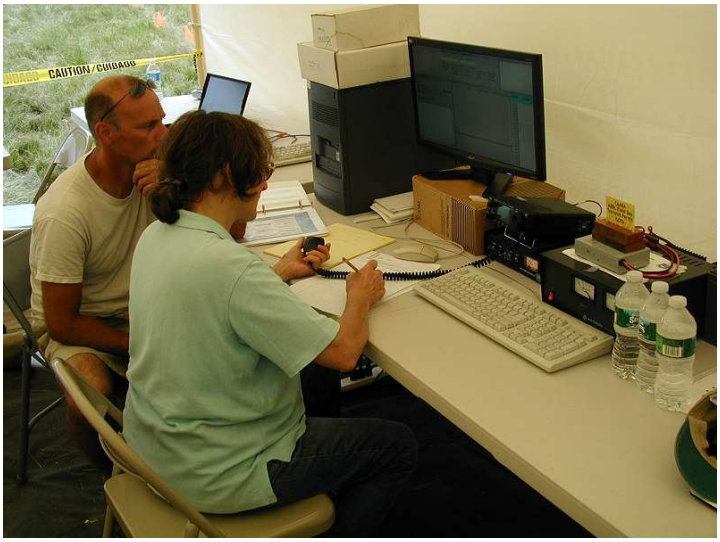
What works but is average at best

The classic G5RV, 102 feet long - fed with 35 feet of 450 ohm twin lead, is average at best. Least you now have steam coming out of your ears, let me explain why. The inventor - I think you know him as G5RV - created a **gain antenna for 20 Meteres**. Many people find that the G5RV antenna design functions well as an all band antenna if you use a tuner. How does it do that? Very simply, it uses the 450 ohm twin lead as a portion of the radiating element on bands such as 75M, which introduces vertical as well as horizontal polarization to the transmitted signal. If you care to look more closely about why, we find that the (approximate) feed point impedance is 50 ohms, producing a current maximum and voltage minimum. As usual, maximum radiation occurs in areas of maximum current, thus more of the signal is radiated in the vertical portion of the antenna than the horizontal portion which reduces the NVIS efficiency. In addition, you will have the height at 35 feet or more. Since efficient NVIS radiation occurs at ten to fifteen feet above the ground, the 35 (or more) foot height also reduces the NVIS efficiency of the antenna.

The G5RV antenna was designed as a gain antenna for **20M**. Many people have found that the G5RV works on many other bands but the design, used at other than 20M, is a compromise. As with virtually all compromises, it loses efficiency when operated outside of the design criteria. Does that mean or imply that it is bad? No, only that there are more efficient NVIS antennas that would allow you to do the same job with less power. If you only have room for one antenna, the G5RV is a reasonable antenna. Please see W8JI's information page for more detail on the G5RV.

Links to other NVIS information

- • **NVIS Propagation display.**
- A good description of the NVIS and how it functions is at
- http://www.qsl.net/wb5ude/nvis/index.html
- Tactical application information is at
- http://www.tactical-link.com/field_deployed_nvis.htm
- L.B. Cebik, W4RNL, has excellent theory information at
- http://www.cebik.com/radio.html



2010 FIELD DAY PICTURES

CAARA 2010 Field Day Emergency vehicle

Generator setup at Field Day