

The Hamilton Amateur Radio Club PO Box 91215, Effort Square PO Hamilton, ON L8N 4G4 Est. 1932 Inc. 1956 http://www.hamiltonarc.ca/

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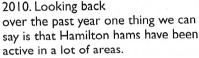
The Hamilton Amateur

The Hamilton Amateur Radio Club Newsletter - 77 Years of Amateur Radio 1932 - 2009

President's Remarks

By President, Mike Krebs, VA3WXS

I would like to take this opportunity to extend my best wishes for a joyous holiday season and a happy new year in



Several of our members have operated portable stations while away from home and have tried to contact local members, in some cases with success, and others not. John VE3CXB from Muskoka, Jack VE3WBT from Thunder Bay, Roger VE3UFZ from the Atlantic, and Bob NP4B from Puerto Rico, have all tried to contact local hams when they were away at various destinations.

The annual events like Field Day, our October Hamfest, the Contest Group Bar-B-Q, and the Christmas Party have been well attended and successful. The past year has seen a great Home Brew night in May, improvements to our impressive web site, and representation at events like the Guides On The Air special event, and the annual Maple Syrup Breakfast at the Erland Lee Museum where local hams operated a station.

The contest group has had an active program at the contest site and for two days a group of us activated a lighthouse on the Burlington Ship

Canal during the Lighthouse Lightship Special Event weekend. That is an event that I have been pleased to arrange with the City for several years running.

The CANWARN weather watching group is active and there is also an ARES group with a web site that is organized and holding regular meetings.

And finally, there are two groups going to the Warplane Heritage Museum on a regular basis, Tuesdays and Thursdays, So, there has been lots of opportunity to be active for those who would like to join in.

A big function of our club is to coordinate this type of activity, to promote it and facilitate it, and to act as an official body that can communicate to and communicate on behalf of local hams. This we try to do.

We are looking for someone to be Treasurer of HARC, and someone who would provide refreshments at our monthly meetings. In addition we could reactivate the Swap net if a willing person would step in on Tuesday evenings after the check-in net and take on that job, Incidentally, that is not a small job.

When you look back like this we are an active group and there are things going on. It has been a good year. Looking ahead I hope the coming year is just as good or even better. It's the members that make it work. So we look to you to keep it rolling and make 2010 another great year for amateur radio devotees.

Club meetings – 3rd Wednesday each month – 7:30 pm (except July and August) at Hamilton District Christian High School, 92 Glancaster Road, Ancaster, L9G 3K9, corner of Rymal Road (Hwy. #53) and Glancaster Road. Parking on location. Complimentary refreshments.

Minutes for the General Meeting, 18 November, 2009

by Mardy Eedson, VE3QEE

Mike VA3WXS introduced the guest speaker Mardy Eedson VE3QEE talking about his



experiences over 16 years building kits and homebrew equipment for amateur radio.

Following the talk and social break the business meeting began at 9:05 PM

Approval of the Minutes. The minutes of the last meeting were adopted as circulated in the newsletter.

Treasurer's Report. Fred VE3GCP reported that the Hamfest earned for the club a net profit of \$1,411.67. That income plus the membership fees comprise our operating funds for the year. The Directors invest some of that money in a short term note, the proceeds from which are put toward our ongoing expenses. Our club operating expenses include the following fixed expenses: monthly charges for the telephone connection at the repeater, annual charges for the club post office box, service charges for our bank account, rental for space at the repeater site, rental for our meeting room at the Christian High School, liability insurance with AXA inc. purchased through RAC, expenses to print and mail the monthly newsletter, membership in e-qsl, membership in WNYSORC (the repeater council), cost of maintaining our internet address < hamiltonarc.ca>, the cost of renting a hall for the annual Hamfest, and some variable expenses for activities like: field day, and the annual Christmas party, engraving awards, health and welfare expenses, maintenance of the repeater equipment, and incidentals. The club Directors make the financial decisions and seek club ratification for anything major.

We are looking for a volunteer to take over the job of Treasurer starting in January. Please contact a member of the executive (listed on page 2 of the newsletter) if you have questions about this position.

The treasurer's report was accepted as delivered.

Membership Report. Sherry VE3DCU, reported that we have 52 primary members and 7 family members paid up at the present time. If you know someone who has not renewed their membership for this year please encourage them to mail a cheque to the club address on the newsletter or bring it to the next meeting.

Christmas Party. Anita VA3ANI, reported that planning for the Christmas party is going well. John Hudak's wife has volunteered to help Anita with preparations. Anita has tickets to sell or mail out, or you can contact her to make arrangements. Again, a reminder that the party this year is being held in the more comfortable (smaller and warmer) Dofasco Dome room at the Warplane Heritage Museum. Guests will be welcome to visit the museum which will be open, but the party itself takes place in the Dome.

Health and Welfare. Mary VE3OGQ, reported a silent key. Bob Matheson, VE3OCQ, recently passed away. Bob was a member of the club in the '80s. Bob was a well recognized personality on our 2 meter repeater, and his call, "VE3 oooooo cccccc and a Q" was familiar to all who listened. Bob's obituary appeared in the Spectator, but no mention was made of his connection to amateur radio. RAC has been notified of his passing.

A sympathy card was sent to the family of Renzo Conz VE3NYX, who lost his father-in-law, Pelino (Peter) DiBenedetto on October 29th. Mr. DiBenedetto, owner of the farm on which the contest site is located, graciously permitted our group to use his land for contesting activities since the 1980s.

HARC 2009-2010 Executive

President

Mike Krebs VA3WXS
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Past President

David Bruton VE3DWJ 905-383-9808

<ve3dwj@hamiltonarc.ca>

First Vice President

John Hudak, VE3CXB 905-383-9808 <ve3cxb@hamiltonarc.ca>

Second Vice President

Mike Christmas, VE3XMS ve3xms@hamiltonarc.ca

Secretary

Bob Zimmerman, VE3RKZ < ve3rkz@hamiltonarc.ca>

Interim Treasurer

Fred Robinson, VE3GCP < ve3gcp@hamiltonarc.ca>

Director

Brian Bowie, VA3BMB <ve3bmb@hamiltonarc.ca>

Mary recommended that the Club thank Renzo for his contribution to the club in some tangible way. A few ideas were discussed and Fred VE3GCP suggested that this recognition take place in the form of a plaque that could be displayed at Renzo's station and would be inscribed with something like "thank you for your contribution and efforts that have made the Hamilton Amateur Radio Club more enjoyable for a number of years ..." This suggestion was supported by members and the details were referred to the executive for implementation. Rick Danby VE3BK volunteered to provide any information necessary regarding name, call, and other details.

Repeater Report. John Vandenbeg VE3DVV, reported that there have been no changes at the repeater since last month. John and Mike Christmas, VE3XMS, will have a proposal for the executive to consider regarding possible upgrades at the site.

Contest Report. Rick VE3BK reported that a suggestion was made to our executive that HARC sponsor a plague for awarding in the Ontario QSO Party, a contest in which we participate, and a contest which our group has won a number of times. Contest Club Ontario, (CCO), now runs the contest. This sponsorship suggestion recommends that the plaque we sponsor be awarded for the category of: single-operator, phone only, low power. This would mean that any individual ham operating from a home station could qualify to win this award. Our Club station, VE3DC, has won an award in this contest at least 7 times in the past. For HARC to sponsor a plaque would be good public relations for our Club.

In Google, if you type in Contest Calendar, you will get a list of the upcoming contests in which any ham can participate. Rick encouraged members to look up these contests on the web and participate from their home stations. Incidentally, regarding our Field Day, Rick Reported that VE3DC was mentioned in the Recent issue of QST Magazine (from ARRL) and VE3DC placed number 1 in Canada on Field Day. Congratulations to all who helped out on Field Day.

Awards Committee. Casey VE3CVP, brought in the Award Of Merit to show members. This plaque contains the names of past winners, but traditionally no year is inscribed. It is interesting to see all the names on this award. The most recent name on the award is that of Don Grisenthwaite, VE3DDQ, who was unable to attend tonight. Fred suggested that the committee consider presenting the award to Don at his home. Another suggestion was made that photographs of the awards and pertinent information be

maintained on the web site. This would be good because the awards are no longer displayed in a training room as they used to be.

Web Site Report. Anita VA3ANI, asked members to consider the merits of having a silent key section on the web site. Records have been maintained for a number of years and there is considerable information that could be made available on the web site. Members agreed that an addition like this would be worthwhile and a good indication of our heritage and the dynamic nature of our club.

Adjournment: The meeting was adjourned at 9:31 PM.



HARC Sponsoring an OQP Award

Announcement from the executive.

The Hamilton Amateur Radio Club will be sponsoring an award in the Ontario QSO Party starting in April 2010. The Ontario QSO Party is a contest which takes place annually on the third full weekend of April. It is administered by the Contest Club Ontario (CCO)

The upcoming OQP will be the weekend of April 17 to 18, 2010. This is the contest which takes an overnight break so operators can get some sleep. Times in 2010 will be 1800Z April 17 to 0500Z April 18, and 1200Z to 1800Z April 18

The HARC award will be given for 1st Place Single Operator Mixed Mode - Low Power (Under 150 Watts) and will be so inscribed, along with, sponsored by the Hamilton Amateur Radio Club VE3DC.

OQP is our own Ontario contest. Under the rules, stations outside Ontario make as many contacts with Ontario amateur radio stations as possible. Ontario stations contact as many amateur radio stations as

HARC 2009-2010 Chairs

Awards Chairman Casey VanBroekhoven VE3CVP 905-385-8724 <ve3cvp@hamiltonarc.ca>

Contesting Manager/Property Rick Danby VE3BK 905-544-3253 <ve3bk@hamiltonarc.ca>

Hamfest. Coordinator Mardy Eedson <ve3qee@hamiltonarc.ca>

Volunteer Examiners Lorraine MacPherson VA3NZ 905-389-7653 <va3nz@hamiltonarc.ca> Roger Pimm, VE3UFZ, 905-560-2628 <ve3ufz@hamiltonarc.ca>

Field Day Co-ordinator Jack Gauthier, VE3WBT 905-979-7747 <ve3wbt@hamiltonarc.ca>

Repeater Chairman John Vandenberg VE3DVV 905-692-3802 <ve3dvv@hamiltonarc.ca>

Health & Welfare Chairperson Mary Urbanski VE3OGQ 905-388-8383

Hospitality

Membership Chair Sherry Goeller VE3DCU, <ve3dcu@hamiltonarc.ca>

Newsletter Editor Mardy Eedson VE3QEE, 905-648-0187 <ve3qee@hamiltonarc.ca>

Public Liaison Neil Galloway VE3VNG 905-383-6986

Swap Net Controller

Communication Michael Krebs VA3WXS 905-523-9005 <va3wxs@hamiltonarc.ca>

Web Master Anita Thomas VA3ANI, <va3ani@hamiltonarc.ca> and Emsley Mitchell VE3JAI / VA3QI <ve3jai@hamiltonarc.ca> possible both in Ontario and worldwide.

Any individual can participate from their home station. For further information about OQP and complete contest rules see the web site at: http://cco.ve3xd.com/oqp/



Website Updates

A message from web designer Anita, VA3ANI.

I've started adding information about silent keys to our site and I am about halfway through the book that Frank Love and Stan were maintaining.

On the site you'll find a link to SK list in the left side navigation panel, or you can access the direct url as follows:

http://hamiltonarc.ca/silentkeys

When an obituary contains a photo, I have included that as well.

The silent keys can be browsed as a list displaying all entries, or they can be grouped alphabetically. The displayed list can also be sorted by name or year of death.

Over the next month I should have this list, based on the information we currently have in the book, completely transferred over to the site. The records I am working from have one as far back as 1953, a

couple from 1960, and more as we progress through the decades.

In other site news, and partially because of this new addition to our navigation, I've now placed our navigation menu items into groups to make it a bit easier to find what you're looking for.



Rememberance Day at the Warplane Heritage Museum Nov. 11, 2009.

Report and pictures by Rick Danby VE3BK

The radio crew that usually goes on Tuesdays to operate and volunteer at the Warplane Heritage Museum's radio station VA3CWM had decided to go out on Rememberance Day instead. This year it fell on a Wednesday. We had been talking to Doug Last VE3NBL on the Thursday before and he had said that we better get there early, because there would be 1500 people there. We showed up just before 9 AM and the parking lot was filling up already. We parked



Important Points

Executive Meetings

HARC Executive committee meets each month, except July and August. Members are invited to attend. The meetings are on the Tuesday following the club General Meeting each month. Ask an executive member for the location.

<u>VE3NCF 146.760 - & 444.075 + using tone 131.8</u>

HARC operates VE3NCF repeater, located atop the Niagara Escarpment. It's open for use by all Amateurs. Special features are a privilege of membership.

Nets

HARC "check-in net" is held every Tuesday evening at 7:30 p.m. HARC "swap net" follows at 8 p.m. All contacts are welcome.

Examinations

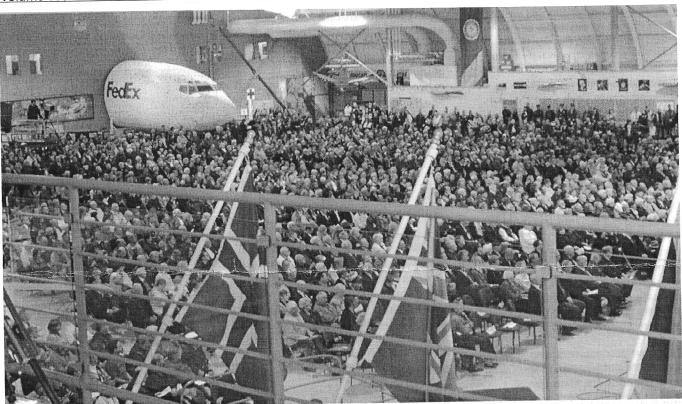
Amateur radio license examinations are conducted the second Wednesday of each month, except July and August. Contact the voluntary examiners to make an appointment. There will be a fee for each examination.

Membership Information

Club membership, including all privileges, is \$25 per person, per year, Sept 1 to Aug 31. Additional membership, for immediate family living in the same home, is \$1 per person. One newsletter sent to each address.

The Hamilton Amateur

The Hamilton Amateur is published ten times each year (not in July or August). Deadline for article submission is the last Saturday of the month for the next month's issue. Preferred format is .txt file. Articles will be checked for spelling and grammar, but the author is responsible for factual content. Email submissions to Editor, Mardy Eedson, VE3QEE, <ve3qee@hamiltonarc.ca>



at the back with the CHCHTV crew vehicles. Those guys were everywhere and did a great job of showing the Ceremonies in real time on Channel II.

Different people have told me what a great job the TV people did showing the Ceremonies. We were on the balcony beside a young lady camera woman for the festivities, and could see her big red light going on and off on the top of her camera when they were actually using her footage. They were able to show the flyover of the Lancaster Bomber and about 7 other craft, but we were only able to hear them, right at 11 AM, silence for 2 minutes and then they came booming overhead again.

There was reported about 2000 people there, but I think it could have been more, as we could see everone from our lofty perch by the radio room and there were many standing. The whole service was very impressive, with the Redeemer University College Concert Choir, mixed in with the Senior Choir of McNab Presbyterian Church and the Meadowlands Salvation Army Band. The Colours (flags) were brought out

by Veterans and members of the CWH to the bagpipe lament of the Pipe Major of the Paris and Port Dover Pipe Band. Very impressive indeed with the "Last Post" played by a trumpeteer from the Salvation Army Band.

Oh Canada, was sung, the laying of wreaths and other Ceremonies, including singing God Save the Queen before retiring of the colours on the procession out. Many dignitaries were there too, for the presentations.

One of the things that happened early in the Ceremonies was that there was these loud voices coming from the Radio Room. Everone was looking at the Radio Room and were wondering who had the nerve to talk so loud when the Rememberance Day Service had already begun. Jack VE3WBT, and myself were on the balcony outside the Radio Room. We had locked the door to the Radio Room but these loud voices were cutting through all the noise and could be heard by many. Jack had the key, jumped up and into the Radio Room to turn the 2 meter radio off. It was quiet when we left the room

and we had inadvertently left the radio on with the volume rather loud. It was kind of humorous at the time, but I think that many that were distracted at the time, didn't think so. It was 2 of the local Hams that were on there yacking......they know who they are (I already told them).

Included here are some pictures of the crowd. Dan had tried to get pictures of the flyover, but they came from the South and surprised him when he was taking pictures of all the planes that were put outside to make room for the festivities. We were there after the Ceremonies as well, we had a few visitors to the Radio Room (one was a former Executive and Examiner at the Hamilton Amateur Radio Club, Keith Johnson VE3DKJ). Jack VE3WBT worked a Special Veteran's Day Station on a Fletcher Class Destroyer in Baton Rouge, speaking with Russ at W5KID, who was celebrating their Veteran's Day while we were celebrating Rememberence Day. It was a great service, I was glad I went for the Rememberance Day Ceremonies and like Jack said "good thing we went early" because there was a lot of people there (more than

they planned on I think) and we also had a chance to play radio at VA3CWM and had fun doing it.

LEST WE FORGET (From the Ceremonies at the CWHM, Rememberance Day)

This is a time to honour those who served and fought, and died for our country. They fought to oppose tyranny, restore peace, and avert war. They fought for freedom.

2009 marks the 90th Anniversary of the end of the First World War, the 65th Anniversary of D-Day and the Battle of Normandy and the 85th Anniversary of the RCAF. The courage of our Veteran's, their dedication and their sacrifice helped to make us a nation and take up our place in the civilized world.

Like their predecessors who stormed the beaches of Normandy and contributed to the liberation of Europe from the forces of evil, today's Canadian Forces build upon this honoured, sacred legacy.

This is a time to honour and recognize the contributions of the valiant men and women of today's Canadian Forces who carry the torch, contributing to the international peace and security around the world and at home. Every one of them who has returned from and operational deployment is a Veteran.

Let us never forget.

Jack VE3WBT operating at the VA3HWM station contacting USS KIDD on Remembrance Day / Veterans' Day



The USS Kidd Amateur Radio Club is an adjunct of the Baton Rouge Amateur Radio Club, Inc. They maintain a permanent amateur radio station on board the USS Kidd, DD-661, a restored World War II Fletcher class destroyer.



They run between 70-100 (ssb & cw) watts to a random wire which is approximately 150 feet long in the ship's rigging. Much of this antenna is the ship's original HF wire antenna. CW operation is occasionally done at QRP power levels near the QRP calling frequencies.

The ship is berthed in the Mississippi River at Baton Rouge, Louisiana.

Operating events: 9 am - 5 pm Central Time, November 11 -Veteran's Day is just one of the operating events.

Hi from Bob NP4B in Puerto Rico

When Bob Zimmerman said goodby to us at the last HARC meeting he was flying out that Friday with a minimal HF station bound for Puerto Rico. Bob took along his TEN TEC Scout 555 a 50 watt HF rig, his 20 meter emergency antenna, (the one he built for Home Brew), a short feed line, a power/swr meter, two reworked microphones, and a small gell cell battery, all packed for travel.



The very portable Ten Tec Scout transceiver, Output is 50 watts SSB or CW on 20 meters.



Adapted earphone and microphone.



The portable 20 meter constant current dipole packed in its case.

On four days this past week a number of us have been talking to Bob on 14.172 MHz at 2:45 PM local time, which happens to be an hour later in Puerto Rico.

Rick VE3BK, and Fred VE3GCP, have had the best copy using their beam antennas. Doug Last VE3NBL and John Vandenberg VE3DVV had excellent copy using the beam antenna at the Warplane Heritage Museum Mardy VE3QEE, Jack VE3WBT both got good signal reports from Bob who could hear quite well, but the copy at this end was hard with some QSB.

Bob and is friend will be conducting a DXpedition transmitting from Coffin Island south of Puerto Rico later in the month. This location is designated as IOTA NA-099



Coffin Island NA-099

Volume 77, Number 4 Dec. 2009

Station for Sale

Exclusive offer for HARC members.

Local Amateur of many years is selling station equipment. The items for sale are the Drake TR-4 transceiver with the AC4 power supply which has the built-in speaker along with the 7075 desk mic and the manuals. The package includes the Drake L4-B linear amplifier which has a pair of 3-500Z tubes. The seller has had this gear since it was almost new and it is still in use today. The asking price for the package is \$1,000. The seller will consider selling the transceiver or linear separately but not the power supplies. For more info and to arrange to see this gear please contact Fred Robinson VE3GCP at (905) 575-5197 or FredRobinson@MountainCable .net. Please make the subject line read "Ham Gear for Sale".

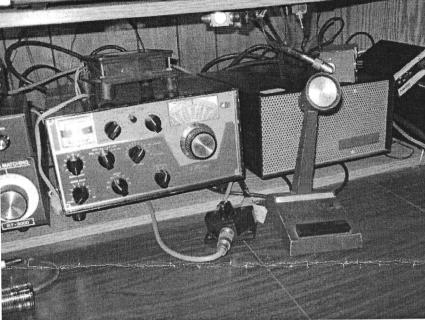
Fan Dipole Antenna

by Vince d'Eon VE3LKV

In response to a request from Mardy, VE3QEE who showed great interest in a fan dipole I have been using on HF here is an article and pictures to explain how the antenna is constructed.

I am happy with what I've achieved although I'm a novice when it comes to antenna construction and theory. After doing a lot of reading (ARRL Handbook, ARRL Antenna Handbook) and wanting the greatest number of bands for the least cost, I settled on something called a Fan Dipole. I started off with a 80m and 40m dipole which was purchased at a flea market and recently added a bit of wire for 20m.

It is currently configured as a 3 element dipole with elements tuned for sweet spots at 3800kc, 7150kc and 14150kc. Refer to the table showing bandwidth and SWR measurements. The antenna is fed with LMR400 that is attached at the feedpoint with a 1:1 balun. Measurements





were taken at the transceiver end of the 50' feedline with the antenna hoisted 33' up (rope and pulley). I use LMR400 for it's low-loss

Band	2:1 swr bandwidth		
80m/75m	3702	3778 swr 1.6:1	3858
40m	7043	7143 swr 1.6:1	7214
20m	14000	14165 swr 1.4:1	14375
17m	18068	18093 swr 1.7:1	18120
15m	21275	21450 swr 1.7:1	Out of band
12m	swr from 2.4 to 2.9:1 on this band		
All band	ls above fully tu	inable with antenna	transmatch

characteristics as my shack is at one end of my home and the antenna is not near the shack.

I had planned on just 80m/40m/ 20m and a bit of 15m (3rd harmonic of 40m) but as you can see I also have some bonus WARC bands unexpectedly. Why? As I write you this note I don't know, and I need to research this further to learn. Ham Radio is lifelong learning, right?

The construction is based on two articles, one found at http://

www.hamuniverse.com/
multidipole.html and the other at
http:/www.audiosystemsgroup.com/
LimitedSpaceAntennas.pdf along
with an older manual written by
W9INN (sk). The last was written
for his trapped multiband fan dipole,
showed an interesting way to attach
spacers to elements. In the end I
took a bit of this and a bit of that,
combined it with tenacity and am on
the air with it.

The basic construction uses 14 gauge stranded copper with ceramic insulator ends. Elements are cut roughly using the 468/f formula + 2' then adjusted as required with my antenna analyzer. Spacers are 3/16" fiberglass rods cut and drilled as required. 14 gauge solid copper wire holds the spacers to the elements where required, a simple, strong and effective technique gleaned from the notes of W9INN. The 80 and 20m elements each have a short stub hanging down used as a tuning stub.

I did have a challenge getting my elements to the desired length after I did the basic math and measured my wire. I could not find the following advice from the ARRL Handbook when I needed it most. As a result I spent far too much time pruning, and I shall never forget this formula hi hi.

Here's the advice from the ARRL Handbook: "Most dipoles require a little pruning to reach the desired resonant frequency. Here's a technique to speed the adjustment.

How much to prune: When assembling the antenna, cut the wire 2 to 3% longer than the calculated length and record the length. When the antenna is complete, raise it to the working height and check the SWR at several frequencies. Multiply the frequency of the SWR minimum by the antenna length and divide the result by the desired frequency. The result is the finished length; trim both ends equally to reach that length and you're done.

Loose ends: Here's another trick, if you use nonconductive end support lines. When assembling the antenna, mount the end insulators in about 5% from

the ends. Raise the antenna and let the ends hang free. Figure how much to prune and cut it from the hanging ends. If the pruned ends are very long, wrap them around the insulated line for support."

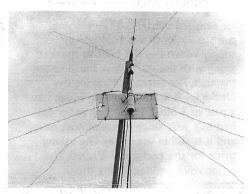
An example -- if you wanted an antenna that resonates at 3800kc. follow your formula of choice (insulated vs. uninsulated wire, etc.) and determine it's length. I used 468/ f Mhz and arrived at 123.16'. Once it was in the air we can imagine the SWR low point is 3750kc. Following the formula above: 3.800 X 123.16 = 468.008. 468.008 divided by 3.750 = 124.80'. I would need to adjust the element by the difference between the actual length (123.16') and the calculated length, 124.80 - 123.16 = 1.64'. Remembering that lowering the frequency lengthens the antenna (lower=longer), I would need to lengthen the element by 1.64' to achieve my target frequency.

The white backer board seen in the photos is an Ikea plastic cutting board about 3/8" thick. Feedpoint has the elements separated by a few inches thanks to use of UV resistant tywraps. Endpoints all have ceramic eggs then are tied off to the spacers. The 40m element has a rope at each end for added mechanical strength and to stop it flapping in the wind. Still to be done in a couple of weeks is to solder all the endpoints up and ensure that the ropes are still securely anchored as this will allow the wire to stretch out. Centre support is 1.5" fence pipe (later on will be a tower) and end supports are trees.

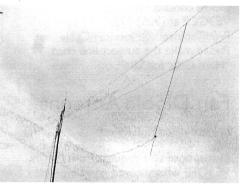
There is lots of room for improvement. The longest element should be made from 12 gauge or even 10 gauge wire for physical strength. Pulleys in trees would be nice too. The cutting board should be oriented one-quarter turn so that the elements have proper 5" spacing at the feedpoint. Ropes should be heavier so they don't wear out quickly.

The design is flexible enough that you can use simple items like ribbon cable, 300 ohm twinlead or just about

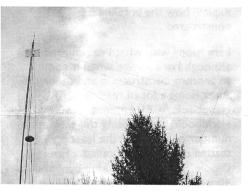
anything else as the radiator. The only thing to remember is that the closer the elements are to each other, the more interaction and trimming heartache you will have.



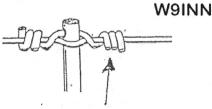
Feedline and balun at the distribution point.



Three elements and a spreader.



Right hand half of the fan dipole.



RUN ELEMENT PAST SPREADER AND SECURE WITH TIE WIRE THROUGH HOLE IN SPREADER.