



Ottawa Amateur Radio Club

Groundwave

P.O. Box 8873, Ottawa, Ontario, Canada, K1G 3J2

CLUB EXECUTIVE

President

Diane Bruce VA3DB
(H) 225-9920
va3db@rac.ca

Past President

George Roach, VE3BNO
(H) 234-0885
ve3bno@rac.ca

Vice-President

Dave Green, VE3TLY
(H) 728-8606
ve3tly@rac.ca

Secretary

Richard Hagemeyer, VE3UNW
(H) 225-5310
ve3unw@rac.ca

Treasurer

Janice Neelands VA3PAX
(H) 236-9291
va3pax@rac.ca

Directors

Brian Campbell, VE3ZRK
(H) 737-3933
ve3zrk@rogers.com

Ernie Brown, VA3OEB
(H) 225-7798
va3oeb@rac.ca

Wayne Getchell, VE3CZO
(H) 225-7989
Getch@magma.ca

Ian Jeffrey, VE3IGJ
(H) 837-7393
ve3igj@rac.ca

Harrie Jones, VE3HYS
(H) 739-9365
hjones@chumottawa.com

Check out our Web Page: www.oarc.net

February 2006

The **Canadian Ski Marathon** (the biggest 2-day net in the year) is coming up February 11 and 12. Don't forget to volunteer if you have time.

A reminder that **Home Brew Night** is fast approaching so be sure to get your projects ready to show.

I would like to thank my **regular columnists** Mike Kelly, Ernie Brown, and Richard Hagemeyer for their regular contributions to the Groundwave. I would also encourage everyone else to send me their contributions. It's the first step to a Pulitzer Prize.

February's speaker is Greg Milley, VA3ITB, whose presentation is entitled **Tower and Antenna Installation and Safety**. See you at the meeting.

Ian Jeffrey, VE3IGJ



FEBRUARY MEETING 7:30 pm, February 8th in the Honeywell Room at Ottawa City Hall

In This Issue....

Club Information	2	WWII Interception of Enemy Wireless	6
December Meeting Minutes	3		
Dates to Remember	3		
Odds and Ends	4		
mk's Words	5		

Membership

Ernie Brown, VA3OEB
(H) 225-7798
va3oeb@rac.ca

Groundwave Editor

Ian Jeffrey VE3IGJ
(H) 837-7393
ve3igi@rac.ca

Delegated Examiner

Mike Kelly, VE3FFK
ve3ffk@rac.ca

Coffee Guy

Brian Campbell, VE3ZRK
(H) 737-3933
ve3zrk@rogers.com

Historian

George Roach, VE3BNO
(H) 234-0885
(Fax) 567-2372
ve3bno@rac.ca

Webmaster

Dianne Bruce, VA3DB
(H) 225-9920
va3db@rac.ca

IRLP Manager

Cary Honeywell, VE3EV
(H) 590-9873
ve3ev@rac.ca

Repeater

Harrie Jones
(H) 739-9365
Hjones@chumottawa.com



Ottawa Amateur Radio Club

Groundwave

Articles may be submitted for use in this publication provided that they portray events or activities that promote Amateur Radio. Letters and comments are also welcome. Submissions may be made by mail addressed to the Editor care of the OARC, or by e-mail to "ve3igi@rac.ca". Deadline for submissions occurs three days after the regular monthly meeting of the OARC.

Please support your local radio organisations. They support you!

Club Information

The Ottawa Amateur Radio Club Inc. is an association of Radio Amateurs devoted to the promotion of interest in Amateur Radio communications in the National Capital Area and to the advancement and achievement of club members.

Regular Meetings of the OARC Inc. are held on the second Wednesday of each month (except July and August) in the Honeywell Room (2nd floor of the Old Teacher's College) of Ottawa City Hall (formerly Regional Municipality of Ottawa Carleton Headquarters) on Lisgar Street. Meetings commence at approximately 19:30 hours. Further details about each meeting is elsewhere in this publication.

Executive Meetings of the OARC Inc. are normally held on the first Wednesday of each month at 19:30 hours. Contact the President to confirm the date, time and place of the next meeting.

The CAPITAL CITY FM Net meets every Monday at 20:00 hours on the club repeater **VE2CRA** to pass traffic and to make announcements of interest to Amateurs in the National Capital Region.

The SWAP Net is a service provided and conducted by Ed Seib, VA3ES. This feature appears on the Capital City FM Net. To list items and make inquiries, call Ed at 613-738 8924 or e-mail him at va3es@rac.ca. Also available on the web: <http://www.igs.net/~swap>.

The POT-HOLE Net is a SSB/HF net sponsored by the Ottawa Valley Mobile Radio Club and is conducted every Sunday at 10:00 hours on **3.760 MHz**. All amateurs are welcome to check in.

The POT-LID CW Net is an informal slow-speed CW net sponsored and conducted by Ed Morgan, VE3GX, and meets every Sunday, except during July and August, at 11:00 hours on **3.620 MHz**, to promote interest in CW and CW procedures.

The QCWA CHAPTER 70 Net meets every Thursday evening at 20:00 hours on repeater VE3TWO **147.300+**. You do not have to be a QCWA member to participate.

The Ottawa Valley VHF/UHF SSB Net is sponsored by the West Carleton ARC. Look for it every Tuesday night (except the first Tuesday of the month) around 21:00 on **144.250**, (roll calls after net on 50.150, 432.150, 222.150, and 1296.100.) Horizontal polarization is preferred.

The Ottawa Amateur Radio Club bulletin "Groundwave" is published and distributed to club members by mail. Publication dates may vary but it is hoped that the bulletin arrives at its destination before the events listed in it have expired. The bulletin is not published for July and August when meetings do not occur. Every effort is made to provide accurate information in the bulletin, however we are all human and mistakes can be made. The OARC accepts no responsibility for any damages that may result from this. The opinions expressed in this bulletin are only those of the author.

Voice (VHF) 146.94/146.34 100Hz output tone
(UHF) 443.300/448.300

VE3TVA Amateur Fast Scan Television Repeater
Video/audio beacon & input 439.25 MHz (audio sub. 443.75)
Video/Audio output 914 MHz (FM)

IRLP Node 2040 146.94/146.34 (VE2CRA/VE3RC)
(Code 411 for info) (Code 204 for activity)
(Code 88 for time)

For further information please contact the Repeater Chair.

Note: The IRLP link is not connected to ECHOLINK. Please do not try to connect using the alpha keys on your keypad. It just confuses the operator.

Note: The IRLP link is disabled during the Capital City Net each Monday. It is disabled from 2000 to 2145 Mondays except for May to August when the link is disabled from 2000 to 2020.

VE3TEN

Tuning in the beacon so that it makes sense requires you tune to **28.175** on cw and read the tone that is there . The spaces between the elements are the higher tone. If that doesn't work, tune to **28.175.28** on lower sideband for better results.



Minutes

Corrections to the December minutes.

1. Al VE3ZTU won a \$10 gift certificate to Radio HF.
2. Diane announced that Sydney VE3GVI will be holding his annual Christmas Day net at 9:30 a.m.
3. If you want to name the two top teams, they were / *The Heat Sinks* and *Four O.F.'s Plus One Y.F.*
4. Richard won \$18.50.

The **OARC monthly meeting** was held at January 11th, 2006 at Ottawa City Hall, Ottawa, ON and was called to order at 19:31 by President Diane, VA3DB. About 22 were present including 1 guest (who joined up).

Diane, VA3DB called the meeting to order; there were no guests (at the start).

Diane then solicited corrections for the last minutes; there were none.

Announcements:

The Emergency Measures Radio Group (**EMRG**) is holding their next meeting on **January 28th** at Fire Training Centre.

A letter was received from the **Ottumwa Amateur Radio Club in Iowa**. They would like to twin with other clubs which share the OARC acronym.

Dave Scobie, VA3AE walked in late and introduced himself as a guest. That status didn't last long as he filled out the membership form. Welcome back Dave!

RAC Winter Contest: (this is a bit out of order, George, VE3BNO came in late). George is missing one log, but the score looks good. The deadline for log submission is the same as the Groundwave dead-

Dates to Remember

2006

- | | |
|------------|-----------------------------|
| Feb. 11,12 | Canada Ski Marathon |
| Apr. 12 | Homebrew Night |
| Jun. 14 | OARC AGM and Elections |
| Jun. 24,25 | Field Day |
| Jul. 1 | RAC Canada Day Contest |
| Sep. 2 | OARC Hamfest and RAC Forum |
| Sep. 30 | Membership Renewal Deadline |
| Nov. 1 | Joe Norton Award Subm. Due |
| Dec. 30 | RAC Winter Contest |

line, so the results should be published.

We are still looking for a person to take the job as **Hamfest Manager**. Greg would also work with a small committee, so please let Greg or any member of the executive know if you are interested.

Haves and Wants. None tonight.

Dave, VE3TLY introduced **Ernie, VE3OEB**.

Ernie gave an informative and fascinating tale about his days at the radio monitoring station at the (current) Experimental Farm.

Station MMA was Ernie's. It was coil #4 and dial 320, somewhere between 6 and 8 MHz.

Richard, VE3UNW showed off the **2M radio** which was part of the Judy Kemp donation. This radio is being delivered to Ralph, VE3BBM who will install it for a **white-caner**.

Richard, VE3UNW reminded members to use our new **QSL card** as business cards to invite hams to our meeting.

We finished with coffee but no 50/50 (Janice and our tickets were absent). The meeting adjourned at 20:40.

Richard Hagemeyer, VE3UNW

Secretary.

Odds and Ends

Canadian Ski Marathon

"This year marks the 40th anniversary of the Canadian Ski Marathon. Radio Amateurs have been providing communications support to CSM operations and safety for 32 years and we show no signs of slowing down for the 33rd year! Although sponsored by the Ottawa amateur Radio Club, clubs and individuals in Montreal, Ottawa and all points between support this challenging event each year. Find out why "Winter Field Day" is so much fun!

The Canadian Ski Marathon is just around the corner, February 11th-12th, 2006! If you would like to volunteer this year, please send an email to radio1@admin.ca. If you are unable to participate, perhaps you would consider lending equipment to a newer ham without the appropriate radio or antenna.

Interested? Please visit <http://radio.admin2.ca> and see what kinds of jobs are available. You can also email Richard, VE3UNW at radio1@admin2.ca"

73 de Richard

Thanks to Mike Kelly for finding an error in the article on **Wilderness Protocol**. The 2-meter frequency should have read 146.520.

2005 RAC Winter Contest Results for VA3RAC

418 QSOs for a total claimed score of 114,208. Thanks to George Roach, VE3BNO, for assembling the logs.

"There are 10 types of people in the world.
Those who understand binary and those who don't!"

New Guide on Lightning Protection

The Institute of Electrical and Electronics Engineers (IEEE) has released a new lightning protection guide: *How To Protect Your House and Its Contents From Lightning: IEEE Guide for Surge Protection of Equipment Connected to AC Power and Communication Circuits* By: Richard L. Cohen, Doug Dorr, James Funke, Chuck Jensen, and S. Frank Waterer. This is a 52 page illustrated guide written by the IEEE Surge Protection Device Committee. It covers lightning hazards, integration of the various components of a lightning protection system, AC and signal surge protectors, multi-port protectors for equipment connected to signal and power lines, and grounding methods. It is written in plain technical language, and is an excellent guide for all amateurs concerned about protecting their antennas, shack and homes from the effects of lightning. The guide is available at no cost as a 1.1 MB pdf file (61 pages) from the following URL: [http://omegaps.com/Lightning%20Guide_FINALpublished version_May051.pdf](http://omegaps.com/Lightning%20Guide_FINALpublished%20version_May051.pdf)

Loss of 220—222 MHz

Effective 25 January, 2006, despite the protests and the efforts of Radio Amateurs of Canada, the Canadian Amateur Service will lose the 220 - 222 MHz portion of the 220 - 225 MHz band. Details are contained in Canada Gazette Notice DGTP-004-05, "Proposals and Changes to the Spectrum in Certain Bands Below 1.7 GHz" available on the Industry Canada web site at: <http://strategis.ic.gc.ca/epic/internet/insmt-gst.nsf/en/sf08494e.html>



Mk's Words

It seemed like a good idea at the time... Or at least it didn't seem like a bad idea. Into my email box arrives a note. "Do you know anyone who can do a talk on Morse code for a few Brownies in Barrhaven?"

Well, I know a little bit about Morse code, but Brownies in Barrhaven? - isn't there anyone closer? Anyway, I volunteered. For those of you who don't have granddaughters or kids that age, they are girls about 7 and 8 years old, with an attention span measured in seconds. This could get pretty chaotic pretty fast. "So, how many?" I asked. "Twenty" "Twenty! How much time?" "About 15 minutes, maybe a bit more" Now I know kids these days are pretty bright, but that isn't enough time to learn the alphabet, so lets just give them a taste of old Charlie Whiskey and see if it sinks in. How many of you got bitten by the CW bug before your age was into double digits? As you know, the memory of those times can sink down a long way, only to re-surface later. Now, how many keys and oscillators can I round up? ..OK, how many can I build between now and then? Time for another plan. Maybe the dollar store has something I can use. Perfect... until I get them home, and find the alarms I found for a buck all have an integrated circuit that produces a warbling tone. At least the batteries, speakers and cases are useable. A few hours later a working oscillator comes off the bench. The others should (must) go together quicker. Remember that lead is a no-no for kids these days, so all the solder joints have to be covered in some way. Next step is to get the confuser to talk to the projector, so I can put stuff up on a screen big enough for all the kids to see it at once. Then I can try to get the CW send and receive software to work with all that. Finally everything is ready. Soooo, how did it go? I'll tell you next month. I still have to get through another two days at Collegetville, and an EMRG exec meeting before I get to Barrhaven. I can take care of those two agenda items after I get this column in to Ian.

Speaking of that, I don't know how he gets the Groundwave out so fast. Every month, my deadline is the

Monday after the meeting. It is set that way so I can get the events of one more weekend into the column. The trouble is that after a weekend I usually have a days worth of stuff to catch up on around the house before I can play radio again. Monday stretches into Tuesday. To get it to him, I usually have to head out to the library, find an available computer (preferably one that is working) and do that internet thing. Even with me dragging the deadline out to the last second, it seems that the mailman is putting the hard copy of the Groundwave into my mailbox as I am walking back from the library. Like I said, I don't know how he does it. [Magic. -Ed]

Coming up between now and the February meeting are the items I mentioned above, plus the VHF contest on the weekend of the 21st. On the 28th there is a General meeting of the Emergency Measures Radio Group a.k.a. EMRG or Ottawa ARES. At the same time there will be another attempt to burn a hole in the ionosphere on 160 metres at the VE2OJ contest location during the CQ 160 CW contest. I expect there will be a Ski Marathon meeting in the first week of February as well. Did I mention that there is also a car rally going on during the weekend of the 28th? Something has to give.

So what are you doing this winter?

73 - wish me luck with the Barrhaven bunch.

mk VE3FFK

WWII Interception of Enemy Wireless at Ottawa Monitoring Station

In January of 1942 I reported to Department of Transport Headquarters in the old Hunter Building in downtown Ottawa. A technician drove me out to the Monitoring Station on the Experimental Farm, where I was introduced to Ed Davey, the Officer in Charge, and Buster Doubleday VE3NF, who would be my shift supervisor. *[Both gentlemen now deceased]* Buster showed me into a room with a large number of operating positions, and set me at the position next to his desk. The HRO receiver was tuned to the German Coast station MMA, and my job would be to copy everything I heard. The messages were in five-letter code groups and I had no trouble copying the automatic sending at 15 to 20 wpm. I was told to be alert for any signals with different tone and with hand sending, and to identify them as 'mobiles', that is U-Boats, sending reports. When such a signal was heard there was an intercom at each position to a Direction Finder hut out in the field. By saying "MOBILE ON MMA" into the Intercom, we would alert the DF operator to take a bearing as quickly as possible on the signal, which would normally be a short message of just 5 letters. I will tell you more about the DF Operator later. At first I copied all messages by hand, but soon graduated to using the typewriter, or 'mill' [a typewriter with all capitals and numerals] provided at each position. There were 16 operating positions, each tuned to a different frequency, or station. There was also a teletype position where all messages we copied were sent on to Naval Headquarters, or 'Admiralty'.. Some were quite active with a steady stream of messages as with MMA, while others had little or no traffic, but the frequency had to be monitored in case the enemy started using the frequency. The Direction Finder was located in a separate small building.

We monitored the frequencies requested by Naval HQ, and forwarded all messages copied to 'Admiralty' via teletype. The operator on the teletype alternated with the operator in the Direction Finder each time they came on duty. The Naval Service also had monitoring stations where the searching or scanning of frequencies

was done, and they advised us when to change frequencies, or to cover new frequencies.

Origins of the Monitoring Station

Around 1935, Ed Davey was the operator at VAA, the Ottawa communications station for keeping in touch with the Northern stations in the Hudson's Bay and Straits, in the Eastern Arctic, and on the East and West coasts. He had also been asked to use the frequency measuring equipment to check the broadcast station frequencies, since their transmitters were using MOPA [Master Oscillator Power Amplifier] which were prone to drifting in frequency with temperature changes. The broadcast stations had no Frequency standard of their own at that time. Operations began in the Radio Test Rooms on Wellington St., but interference from street cars and other electrical equipment generated a lot of noise in the receivers. Space was found in a greenhouse on the experimental farm, but the high humidity caused problems, so the equipment was moved to vacant rooms in the T. R. Booth farmhouse [ref. 1 on the map] near the corner of Baseline Rd. and Prescott Hwy. [Now Prince of Wales Dr.] Only the barns of that farmstead are still standing. Other monitoring stations were set up at Father Point on the East Coast, at Strathburn in SW Ontario, at Forest, near Rivers, MB, and at Point Grey in Vancouver BC.

With War in Europe threatening, there was an understanding between Departments that the Department of Transport Monitoring stations would provide the basis for a monitoring service to intercept enemy communications. In 1939 two operators were added to the staff and some frequencies to monitor were assigned. Naval HQ requested more coverage and the build-up of staff began. Very soon the bedrooms of the Booth farmhouse were fully occupied with receiving positions, and overflowing to the hallways and the living room. There was no Direction Finder in Ottawa at the time, but a DF at St. Hubert in Quebec was connected to the Ottawa station by a dedicated line for an intercom. All mobiles were reported to St. Hubert. In the summer of 1941 a new building was erected at location 2 on the map, to accommodate the VAA operator, the frequency measuring



(Continued from page 6)

equipment, and 16 operating positions, as well as a teletype room, and offices.

A phased move of operators from the Booth farmhouse to the new station took place from October to December of 1941. The Direction Finder was installed at the same time at location 3 on the map. The station staffing grew to a peak of 125 before the end of the war in Europe, and this included a large number of women radio operators in 1944-45.

In the fall of 1942 I was assigned to learn the DF operating procedures, working with a senior operator who was soon to leave for a posting to a Northern station, and before long I was the DF operator. Early in 1943 there was a call for volunteers to serve on the Radio Range Stations of the Northwest Staging Route through Northern BC and the Yukon. I put my name in, and was among the first group of operators transferred to the West. At the end of hostilities in Europe, some of the Ottawa staff were assigned to learn the Japanese 'KANJI' code, and were transferred to Vancouver. Others were assigned to tours of duty on northern stations, or were transferred to the growing number of Radio Range stations being installed in the Western Provinces. Station VAA and the Frequency Monitoring function remained at the Ottawa station for many years.

Direction Finding at the Ottawa Monitoring Station

The Direction Finder antennae were four vertical masts in the Adcock configuration. [see photo]. The masts acted as if they were loops, with each pair of diagonally opposite towers connected to one winding of the goniometer fixed coils. The goniometer is an arrangement of two fixed coils, oriented at 90 degrees to each other, wound on an insulated form, with a smaller rotatable coil within that form, connected to an external receiver, in this case an HRO receiver. The effect was a reproduction of the electromagnetic field, sensed by the external masts, within the goniometer. A signal from a distant transmitter would be reproduced within the goniometer, and the rotor would sense a null signal in the direction of arrival, that is, pointing toward the transmitter. [See the DF schematic diagram.]

The DF operator had to memorize the HRO receiver coil number and dial setting for the most active frequencies in use by the Germans. [The HRO used plug-in coils, each covering a range of frequencies, to tune to different portions of the RF bands. The 'band switch' in later receivers accomplishes this function.] When the call on the intercom said "MOBILE ON MMA", the operator changed the coil if necessary and spun the dial to the setting for MMA, and on hearing the signals would rotate the goniometer dial looking for the null. The dial was calibrated in degrees from North, and virtually all signals came from the NE quadrant, that is the North Atlantic. We were lucky to get one swing through the null, giving a Class C bearing, before the transmission ended. If the message was longer and a second swing of the dial gave a better indication of the null, that would be a class B bearing. A class A bearing would have been three or more confirmations of the null bearing, which we hardly ever achieved, since the messages were so brief. We had charts for frequency versus coil number and dial settings for all monitored frequencies, but the operators memorized the coil numbers and dial settings for the most active stations only. I do not recall the frequencies, but believe they would be around the 6 to 8 Mc [40m] band.

Summary of Monitoring Services

Ottawa was not the only Monitoring Station participating in the Interception of Enemy Wireless traffic. Department of Transport had stations at Strathburn, ON.; Hartlen Point, NS.; Rivers [or Forest] MB.; and Point Grey at Vancouver, BC.

RCN had Wireless Station CFF located on the Experimental Farm [site 4 on the map].

CFF provided communication with their ships at sea as well as monitoring enemy communications. During the war they added many stations to intercept enemy wireless signals, and the WRENS provided the operating staff.

(Continued on page 8)



CQ

Where Did "CQ" Come From?

Allen Pitts, W1AGP, and Rich Moseson, W2VU, did some research and found:

The term goes back to the telegraph days preceding radio. Around 1903, ships in the trans-Atlantic trade were starting to be equipped with wireless telegraphy. The operators were usually transposed landline telegraphers who went to sea with the new field of radio. Morse code and many of their telegraphic abbreviations came with them including "CQ", which had been used to attract attention of all the operators along a wire.

CQ seems to have first been used immediately before the official time signal at 10 a.m. and also notices of general importance. This use continued at sea and it became a general call to all ships.

Not long after, the Marconi Company recognized the need for a universal distress signal and issued the following general order: "It has been brought to our notice that the call CQ (All Stations) while being satisfactory for general purposes, does not sufficiently express the urgency required in a signal of distress. Therefore, on and after the 1st of February, 1904, the call to be given by ships in distress, or in any way requiring assistance, shall be CQD."

Unfortunately, no one seems to know which ship had apparently been in distress and had been ignored when it just sent "CQ". But why the letters CQ? -They're from the French, *sécurité*, (safety or, as intended here, pay attention). French still is the official language for international postal services, and the word *sécurité* is used to mean 'pay attention'. "CQ" said in French sounds like *sécurité*. Note: CQD was later changed to the better known SOS.

Extracted from *ARRL Contact*

(Continued from page 7)

RCCS operated No 1 Canadian Special Wireless Group at Leitrim, to provide communications as well as interception of enemy wireless signals. I believe there were many more such stations.

Bletchley Park in the UK was the centre for decryption of enemy communications, and so far as I know this was the destination of all traffic we copied and forwarded to 'Admiralty'. A book written about the exploits of Bletchley Park gives the impression that they operated alone, but in fact a very large network of stations were intercepting all kinds of signals and forwarding the flow of signals into their decryption system.

USA got into the activity also, and on one web site, found under a search of HF DF, they stated that by the end of the war in Europe, more than 40 US, British and Canadian DF stations were providing bearings on U-boat signals.

This account honors the memory of the hundred of Radio Operators who participated in the Interception of Enemy Wireless signals during the War years.

[See also pictures on page 9]

Ernie Brown, VA3OEB

Calculators

Looking for a calculator, check this web site out.

http://www.rfcafe.com/references/calculator_links.htm

The Engineering Calculators & Converter Applet Website has every type you will ever need from antenna's to PC boards to VSWR and more.

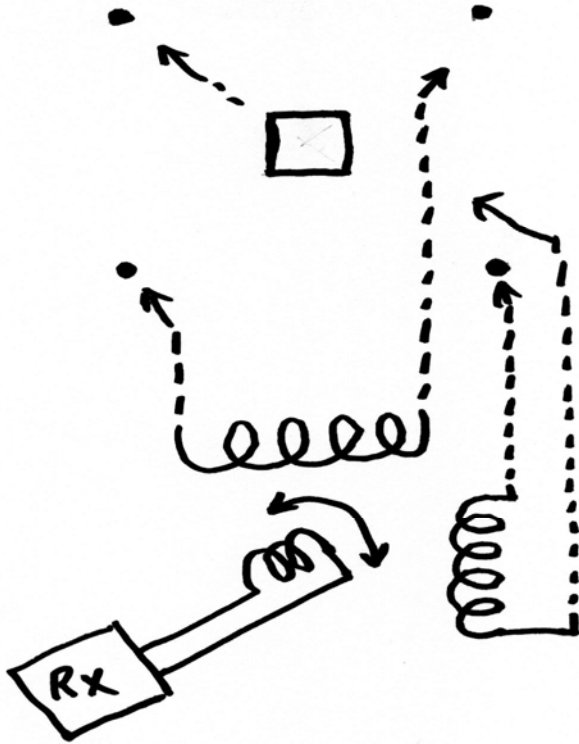


Ottawa Amateur Radio Club

Groundwave

February 2006

HF-DF



HF Direction Finding Hut

Goniometer-Tower Connection

Monitoring Station—Summer 1942



MEMBERSHIP APPLICATION / RENEWAL

Ottawa Amateur Radio Club, Inc.

Box 8873 Ottawa, Ontario K1G 3J2

- Renewal New New Ham (FREE if licensed in current membership year)
 Single (\$25, \$20 after Feb. 1) Family (\$30) Junior (\$15)
 Emailed PDF Copy Mailed Copy *Add \$5.00 for mailed copy of Groundwave.*

(Please note: membership year is September 1 to August 31.)

Family Name: _____ First Name/Initials: _____

Address: _____

City: _____ Prov: _____ Postal Code: _____

Home Phone: _____ Work Phone: _____ Ext _____

E-mail address: _____ @ _____ (For Groundwave mailing)

Callsign(s): | _____ | | _____ | | _____ | Fax: _____

Qualifications: Basic Advanced Grandfathered

Year Licenced: _____

Other Family Members

Name: _____ Callsign(s): | _____ | | _____ | | _____ |

Qualifications: Basic Advanced Grandfathered

Year Licenced: _____

Name: _____ Callsign(s): | _____ | | _____ | | _____ |

Qualifications: Basic Advanced Grandfathered

Year Licenced: _____

Name: _____ Callsign(s): | _____ | | _____ | | _____ |

Qualifications: Basic Advanced Grandfathered

Year Licenced: _____

Interests: _____

Comments/Suggestions: _____

KENWOOD

TS-480HX/TS-480SAT

HF/50MHz All-Mode Transceiver

KENWOOD
NETWORK COMMAND SYSTEM
with Voice over Internet Protocol capability



Bytown Marine Limited
Unit B1, 2212 Gladwin Crescent
Ottawa, ON, K1B 5N1

(P) 1-613-723-8424
(F) 1-613-723-0212
(E) gwalker@bml.ca