

Ottawa Amateur Radio Club

# Groundwave

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

November 2019

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A presentation on bicycle mobile is the focus of November's meeting. Norm VE3LC, Dave VE3TLY, and Arthur VA3BIT will describe their bicycle mobile setups and experiences. Arthur will also describe his motorcycle mobile setup.

See you at the meeting.

Ian Jeffrey, VE3IGJ  
Editor



Check out our Web Page: [www.oarc.net](http://www.oarc.net)

**Next Meeting 7:30 pm, Wednesday, November 13h  
in the Colonel By Room at Ottawa City Hall**

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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 "ve3igj@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 Colonel By Room which is on the second floor of Ottawa City Hall, formerly Regional Municipality of Ottawa Carleton Headquarters, on Lisgar Street. Meetings commence at approximately 19:30 local. Further details about each meeting are noted elsewhere in this publication.

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

**The CAPITAL CITY FM Net** meets every Monday (except some holidays) at 20:00 local on the club repeater VE2CRA (146.940-, 100 Hz) to pass traffic and to make announcements of interest to amateurs in the National Capital Region.

**The Rubber Boot Net** runs week days at 07:30 local on VE3MPC (147.150+, 100 Hz CTCSS tone) hosted by Mike, VA3TJP. The Rubber Boot net has been running since the early 1980's and is popular for the early risers and the go to work crowd.

**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 that 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 Monday evening at 19:30 local on repeater VE3MPC (147.150+, 100 Hz) 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 local on 144.250, (roll calls after net on 50.150, 432.150, 222.150, and 1296.100.) Horizontal polarization is preferred.

**The Phoenix Net** meets Tuesday evenings at 20:00 local on VE3MPC (147.150+, 100 Hz CTCSS).

The regular **OVMRC net** meets Thursday evenings at 20:00 local on VE3TWO (147.300+, 100 Hz CTCSS tone) analogue FM.

*The Ottawa Amateur Radio Club bulletin "Groundwave" is published and distributed to club members. 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 those of the author.*

Voice (VHF) 146.940/146.340 100Hz CTCSS required  
 (UHF) 443.300/448.300 100Hz CTCSS required

VE3TVA Amateur Fast Scan Television Repeater  
 Currently off the air and looking for a new home.

IRLP Node 2040 146.940/146.340 (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 Monday night Capital City FM Net from 20:00 to about 21:45 .

## 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.



## October Minutes

October 9, 2019

19:35 Meeting started by Vice President Greg VE3Ytz

Greg commented that our president, Dave VE3BOW, is out of town on business.

Guests  
VE3DTT Ron

Roger, VA3EGY, is accepting new membership forms. Roger also has ID badges from last year.

**Radio in the Park (Arthur VA3BIT)**  
Despite drizzly weather, about a dozen participants showed up. Only two stations were set up though, perhaps because of the lack of tables. We had the gazebo reserved this year, and it did not come with any tables or chairs. Arthur promised that for next year, he would reserve the picnic shelter which does have picnic tables. Overall, a success despite the shortcomings.

**Joe Norton Award (Greg VE3Ytz)**  
Candidates should apply for the \$500 award prior to November 1.

**Rally of the Tall Pines (Mike VE3FFK)**  
Need lots of hams to man all the closed roads and lanes as the rally cars could go off course and crash on any of them anytime. More info on how to volunteer can be found in the October Groundwave.

**Canadian Ski Marathon (Neil VE3PUE)**  
The 54th running of the event will be happening on February 8-9 with some setup on Friday, Feb 7. This year will again run from Mont Tremblant to Montebello to Lachute. For Neil, this is his 30th year! Again this year, the primary radios will be private digital, with ham radio as backup and some checkpoint functions. Need at least 18 hams and probably more. Volunteers needed for both days, but if you're only available for either Saturday or Sunday, we can use you too!

## Dates to Remember

- 2019**
- Sep. 7 OARC Hamfest
  - Sep. 14 Radio in the Park
  - Sep. 30 Membership Renewals Due
  - Nov. 1 Joe Norton Award Subm. Due
  - Nov 21-23 Tall Pines Rally
  - Dec. 28 RAC Winter Contest

- 2020**
- Feb. 8-9 Canada Ski Marathon
  - Apr. 8 Homebrew Night
  - May 15-17 Dayton Hamvention
  - Jun. 10 OARC AGM and Elections
  - Jun. 27-28 Field Day
  - Jul. 1 RAC Canada Day Contest

Website is hambone.ca but the sign-up is not yet available due to a technical glitch. It should be available soon.

November meeting (Greg VE3Ytz)  
+ A presentation on bicycle mobile is the focus of November's meeting. Norm VE3LC, Dave VE3TLY, and Arthur VA3BIT will describe their bicycle mobile setups and experiences. Arthur will also describe his motorcycle mobile setup.  
+ An update on OARC's donation to the Diefenbunker to assist in the erection of a tower onsite.

RAC Winter Contest (Dave VE3TLY)  
+ Saturday, December 28. Operating from the Diefenbunker during normal museum opening hours.  
+ Will be looking for operators and loggers as well as interpreters for chatting with visitors to the museum.  
+ Dave will apply to use VA3RAC again this year.  
+ Mike VE3FFK asked about antenna work at the Diefenbunker. Dave replied that he's still working on that, and will have an update at the meeting in November.

*(Continued on page 4)*



## mk's Word

Funny how some projects go together. After a Capital City Net, I was talking with someone about single and dual paddle styles. At the same time, I noticed a cutting board that I had bought quite a while ago as a cheap source of polypropylene stock. It wasn't long before the hacksaw came out and the drill press got turning and a paddle was in the works.

As a "ready, fire, aim" kind of guy my projects seldom work out the way they were headed at first. This one, for some reason, stayed on track. Being designed for portable operation, the base is long enough to rest the heel of the hand on it, so it can be used without needing one hand to operate the paddle and another one to keep it from slip sliding away. The hardest part was finding suitable springs for the thing, but I found some that are "close enough for now" in the junkie box. I'm still not a hundred percent happy with the springs, but they are a good start. As a single lever paddle, it isn't my cup of tea, but with any luck the guy on the other end of the QSO that started all this has fun with it. Maybe more of that cutting board will find its way into a straight key or something soon.

When not messing up chunks of plastic, there was yet more work on the 160m contest antenna, this time getting the vertical section of the folded inverted L up a bit higher, and taking the horizontal part a bit higher and shorter. It didn't do anything for the SWR or bandwidth, but it should hear DX just a tad bit better this winter.

Coming up, TLY has announced that we are on for another Canada Winter Contest at the Diefenbunker. That means we have some antenna work to do out there, again. With any luck we will be able to get that done before the snow falls. December 28 is coming up fast.

November 23 marks the Rally of the Tall Pines, as mentioned in last month's Groundwave. I'm already starting to think about what to pack, and what to leave behind for that event. They are always short of operators, so see if you can clear your calendar for that weekend.

Last month I mentioned that the bike wanted to go out and play, and it did, a bit. Today I decided to put it away until next year. It was one of those cold, dark, rainy miserable days that knocks the enthusiasm out of me. I hope we get more sunshine than rain out of November.

73 mk  
VE3FFK

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**Two Rivers Rendezvous Simulated Emergency Test (Jeffrey VA3PEW)**

+ At Pinhey's Point on Saturday, Oct 5. For exercise purposes, a major earthquake had hit the Dunrobin area.

+ Many volunteer emergency response organizations including several ground search & rescue agencies, CASARA, St Johns, Salvation Army and the Red Cross, as well as several ARES groups. The ARES volunteers were divided into two groups: overall organization management, and individuals that integrated with the first responders. Jeffrey commented that ad-hoc, on-the-spot organization could use some work, but that overall EMRG learned some good lessons, particularly interoperability with the first responders.

+ Roger commented about assisting some K9 searchers with radio communications.

+ Arthur commented on NVIS during the event. He was able to establish communications with Jocelyn VE3JCT in Quebec City, and several NVIS participants in Granby and Drummondville. Arthur commented that he was also able to establish NVIS comms with VA3QV in Kingston the following day, during the Pot Hole Net, so feels that NVIS has a place in emergency situations such as demonstrated in this exercise. Jeffrey further commented that while EMRG was involved with Rendezvous SET in Dunrobin, a similar exercise was occurring across the Ottawa River in Quebec and Ontario. Jeffrey described how he received a request to contact the Quebec ARES hams on a split repeater. Using both bands of a dual band radio, Jeffrey managed to contact the Quebec group and passed a simulated message regarding a search aircraft. He heard later that RadioCan-

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ada wanted to record the communication for their evening broadcast.

#### Haves & Wants

Roger VA3EGY needs a PL259 to BNC female adapter. He was informed that such adapters are common both at Gervais and at amazon.ca.

#### Contacts

- + Bryan VE3QN made contact with WW0WWV, the amateur radio station established to commemorate the 100th anniversary of WWV in Colorado.
- + Bryan also contacted the DXpedition in Liberia A82X using cw on 17m and A82Z using FT8.
- + Norm VE3LC also contacted Liberia on FT8 on 20m as well as a DXpedition at St Pierre and Miquelon on 160m, 80m, 40m and 20m cw Norm commented that the DXpedition was also on phone, but not much FT8.
- + Norm did manage to work the Tokelau Islands (ZK1) (near Samoa). He tried 40m cw, but no luck; he finally managed to contact them on FT8 on 40m.
- + Paul VE3ICV contacted 7Q6M Malawi a few weeks ago
- + Dave VE3TLY mentioned after a QSO with a new ham on 80m, other VE3 stations joined the conversation, effectively elmering the new ham.
- + Neil VE3PUE: Annabelle made her first contact on DMR

#### APRS in Perth (Ron VE3YXY)

Ron said he plans to implement a new APRS digipeater/gateway in Perth.

#### Presentation by Bryan VE3QN

##### "The Importance of Showing Up"

Radio regulations are changed by consensus by the International Telecommunications Union (ITU) during World Radio Conferences (previously known as World Administrative Radio Conference - WARC) that take place every few years. The next WRC will be happening later this year. Among the many items on the agenda this year are spectrum allocations for 5G and wireless charging for transit vehicles. Bryan described the processes for amending the radio regulations across the globe,

particularly those agenda items concerning amateur radio.

Greg thanked Bryan and pointed out that Ed VE3WGO will be presenting on 5G at the February meeting.

Meeting ended at about 21:30.

#### Pre-meeting announcements

- + New Ham? Sign up for your free OARC membership!
- + Renew your membership by seeing Roger VA3EGY
- + Joe Norton Award: Applications accepted until Nov 1
- + Nov 22-24: Rally of the Tall Pines in/near Bancroft
- + Feb 7-9: Canadian Ski Marathon website up: hambone.ca
- + From VE3GTC: Gervais/Active Electronics now on Industrial Ave and looking well stocked. New hours: Mon-Fri: 08:30-17:30, Sat: 09:00-17:00
- + Dec 28: RAC Winter Contest at the Diefenbunker (during regular opening hours during the day; volunteers wanted!)

Minutes taken by VA3BIT.

#### Subsurface Antennas

Subsurface (*buried or submerged*) antennas have obvious military and espionage advantages. In addition to stealth invisibility, they are relatively hardened against nuclear blasts compared to above-surface designs. The comparative-merits of many designs have been studied theoretically and in practical tests, but most of that is classified. There have been several cycles of amateur interest over the past 90 years. A number of websites currently have information about buried antennas, but a large part of that is pure nonsense. The bottom-line is that optimally-designed subsurface antennas do not work as well as typical above-surface designs, but they work better than most people would expect and they can be used both for transmission and reception of LF, MF, HF, VHF and UHF signals over considerable distances.

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## A Brief History of the Microwave Oven

### Where the “radar” in Raytheon’s Radarange came from

As World War II came to an end, so did the market for the magnetron tubes that had been used to generate microwaves for short-range military radar. Magnetron makers like Raytheon eagerly sought new applications for the technology.

It was well known that radio waves would heat dielectric materials, and the use of dielectric heating in industrial and medical contexts was fairly common. The idea of heating food with radio waves wasn’t new either: Bell Labs, General Electric, and RCA had all been working on variations of the technology for some time. Indeed, at the 1933 World’s Fair in Chicago, Westinghouse demonstrated a 10-kilowatt shortwave radio transmitter that cooked steaks and potatoes between two metal plates. But nothing came of these culinary adventures.

Raytheon engineer Percy Spencer took it further. A 1958 article in Reader’s Digest described Spencer’s accidental discovery that microwaves could quickly heat food:

One day a dozen years ago [Spencer] was visiting a lab where magnetrons, the power tubes of radar sets, were being tested. Suddenly, he felt a peanut bar start to cook in his pocket. Other scientists had noticed this phenomenon, but Spencer itched to know more about it.

He sent a boy out for a package of popcorn. When he held it near a magnetron, popcorn exploded all over the lab. Next morning he brought in a kettle, cut a hole in the side and put an uncooked egg (in its shell) into the pot. Then he moved a magnetron against the hole and turned on the juice. A skeptical engineer peeked over the top of the pot just in time to catch a face-full of cooked egg. The reason? The yolk cooked

faster than the outside, causing the egg to burst.

In 1946 Spencer filed for patents on the use of microwaves for cooking food. One of his patents even illustrated the popping of popcorn, cob and all.

And yet the Reader’s Digest claim that Spencer’s discovery led directly to the commercialization of the oven isn’t exactly supported by other accounts. In 1984, for example, Raytheon researcher John M. Osepchuk wrote about his and other colleagues’ recollections of that work in “A History of Microwave Heating Applications” for IEEE Transactions on Microwave Theory and Techniques:

Legends exist about a serendipitous discovery of microwave cooking by Percy Spencer... [Spencer’s subordinates] all remember the discovery as a gradual process involving chance and deliberate observations by many individuals, e.g., feelings of warmth near radiating tubes, experimenting with popcorn, etc. Still, Percy Spencer was in a position to trigger the company into exploiting the discovery and his participation was a key contribution.

Despite the potential for near-instant snack food, the first commercial Radarange microwave ovens unveiled by Raytheon in 1946 were intended for use in restaurants (as in the photo below, which shows a prototype called the “Raydarange”) and for reheating meals on airplanes. They were massive, expensive appliances built around 1.6-kW magnetron tubes that had to be continuously water cooled.

By 1955, Raytheon had begun licensing its microwave technology, and the first microwave oven designed for consumers went on sale from Tappan. The Tappan RL-1 was wall mounted and cost US \$1,295 (almost \$11,000 today), putting it out of the reach of most people.

Ten years later, Raytheon acquired Amana Refrigeration, and the first Amana Ra-

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daranges started showing up on household countertops in 1967 for a more affordable \$495.

As microwaves became more common throughout the 1970s, concerns arose about the effects of microwave radiation on humans, as the New York Times described in 1974:

After testing 15 microwave ovens... Consumers Union warned in March, 1973, that none could be considered “completely safe,” in part because there was no solid data on safe levels of radiation emission.

Government and industry soon answered. [Food and Drug Administration] officials testified to the reliability of their standards before the Senate Commerce Committee's radiation control hearings, while microwave oven makers proclaimed the safety of

their products in publicity campaigns....

All this has not shaken the resolve of Consumers Union by one milliwatt. “We see no reason to change our minds, but we are always open to changing it when additional data comes in,” said Leonard Smiley, chief of the appliance division there....

For consumers, he said, the temporary solution to the complex problem is to beware the microwave oven.

Fortunately, here in the present, we have RF radiation safety figured out. Mostly.

By Evan Ackerman

This article appears in the October 2016 print issue as “When Nuking Food Was Novel.”



In 1946, Raytheon unveiled its new Radarange microwave oven, a new use for the company's magnetron tubes. The prototype shown here was called the Raydarange.



In 1955, Tappan introduced the RL-1, a wall-mounted microwave oven that sold for almost \$11,000 in today's dollars.



## Build a Long-Distance Data Network Using Ham Radio

### Send data via IPv4 up to 300 kilometers with easy-to-assemble hardware

I have been a hobbyist and maker for almost 15 years now. I like inventing things and diving into low-level things. In 2013, I was looking at a protocol called NBP, used to create a data network over amateur radio links. NBP was developed in the 2000s as a potential replacement for the venerable AX.25 protocol [PDF] that's been in use for digital links since the mid-1980s. I believed it was possible to create an even better protocol with a modern design that would be easier to use and inexpensive to physically implement.

It took six years, but the result is New Packet Radio (NPR), which I chose to publish under my call sign, F4HDK, as a nom de plume. It supports today's de facto universal standard of communication—the Internet's IPv4—and allows data to be transmitted at up to 500 kilobits per second on the popular 70-centimeter UHF ham radio band. Admittedly, 500 kb/s is not as fast as the megabits per second that flow through amateur networks such as the European Hamnet or U.S. AREDN, which use gigahertz

frequencies like those of Wi-Fi. But it is still faster than the 1.2 kb/s normally used by AX.25 links, and the 70-cm band permits long-distance links even when obstructions prevent line-of-sight transmissions.

Initially, I considered using different frequency bands for the uplink and downlink connections: Downlinks would have used the DVB-S standard, originally developed for digital satellite television. Uplinks would have used a variation of FSK (frequency-shift keying) to encode data. But the complexity involved in synchronizing the uplink and downlink was too high. Then I tried using a software-defined radio equipped with a field-programmable gate array (FPGA). I had some experience with FPGAs thanks to a previous project in which I had implemented a complete custom

CPU using an Altera Cyclone 4 FPGA. The goal was to do all the modulation and demodulation using the FPGA, but again the method was too complex. I lost almost two years chasing these ideas to their dead ends.

The modem is principally a microcontroller attached to a radio transceiver.

Then, in one of those why-didn't-I-think-of-this-earlier moments, I turned to ISM (industrial, scientific, and medical) chips. These are transceivers designed to operate in narrow radio frequency bands that were originally allocated for noncommunication purposes, such as RF heating. However, the ISM band has become popular for communications as well because typically a license is not required for its use. In Africa, Europe, and North Asia, there is an ISM band lying inside the 70-cm ham radio band at 434 megahertz, so commercial ISM chips are available for this frequency.

I chose to build my hardware around the Si4463 [PDF] ISM transceiver: It's cheap, flexible, and available in many modules and breakout boards, and it can handle a raw data rate up to 1 megabyte per second. It's designed for short-range applications, so the radio part of the chip is not optimal, but it works. In order to reach reasonable distances, you need an amplifier to provide more RF power. For my NPR plan, I needed an amplifier that can also switch very rapidly between transmitting and receiving. I found some widely available external 20-watt amplifiers for handheld radios designed for the European-developed Digital Mobile Radio (DMR) standard, which was ratified in 2005. In the DMR standard, radio equipment must be able to handle a complete transmit/receive cycle within 60 milliseconds. I established a minimum of an 80-ms-long cycle time for NPR with this bound in mind.

The ISM transceiver is connected to an Mbed Nucleo STM32 L432KC microcontroller, which uses an Arm Cortex CPU.

This microcontroller is in turn connected to an Ethernet interface, and it takes care of all

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the details of running the NPR protocol. Any connected PC or network sees the radio link as just another IPv4 connection with no need to install specific NPR software. The NPR modem can be configured over this link or via a USB connection. The total cost of the hardware is about US \$80, and a partner, Funtronics, will be making kits available for purchase online. If you want to build a modem yourself from scratch, detailed instructions and the NPR protocol software are available from my Hackaday project page.

The NPR protocol is based on a hub-and-spoke model, in which a central modem links several client modems. Currently there can be as many as seven modems, although I plan to expand this to 15. The theoretical maximum distance between a client modem and the central modem is 300 kilometers. This limit arises because NPR uses a managed time-division multiple access (TDMA) technique, in which the central modem and the clients each transmit on the same frequency but at different times, with the central modem dictating when each client can transmit, and making scheduling adjustments to account for time delays due to distance. The complete transmit/receive cycle is between 80 ms and 200 ms, depending on the exact type of modulation and data rate chosen.

The creation of the NPR protocol was a very fun part of the project for me: deciding how data should be packed and arranged inside radio frames and how the NPR modems should interact with each other. But after two more years it was time to stop working alone, so I shared NPR with my local ham radio community in France. By the end of 2018, we began testing it in real-world conditions. We have already achieved distances over 80 km, and I am now getting help from the global amateur community, especially in Germany. Currently, NPR is primarily being used to access existing local high-speed amateur radio networks from places that cannot have the line-of-sight radio links required for 2.4- and 5.6-gigahertz signals.

Although it's usable, I would be the first to admit that NPR is a young technology and probably not totally mature. In addition to increasing the number of clients that can be supported by a central modem, I have a number of enhancements in mind, such as adding support for QoS (quality of service) prioritization, so that NPR could be used to transmit digital voice; allowing Ethernet frames to be transported directly; and separating downlink and uplink frequencies.

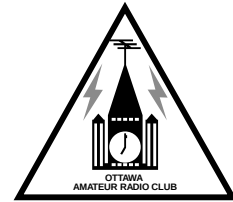
By F4HDK



# OARC Membership Application/Renewal

Ottawa Amateur Radio Club Inc., Box 8873, Ottawa, ON, K1G 3J2, Canada

- Single \$25 (\$20 after February 1)
- Family \$30
- Junior \$15 (under 18 years of age)
- New Ham \$0 (licensed in current membership year)
  
- Emailed Newsletter \$0       Mailed Newsletter \$10



Name	<input type="text"/>	Phone	<input type="text"/>
Callsign(s)	<input type="text"/>	Year Licensed	<input type="text"/>
<input type="checkbox"/> Basic	<input type="checkbox"/> Honours	<input type="checkbox"/> Advanced	<input type="checkbox"/> Morse <input type="checkbox"/> RAC Member
Email Address	<input type="text"/>		

Name	<input type="text"/>	Phone	<input type="text"/>
Callsign(s)	<input type="text"/>	Year Licensed	<input type="text"/>
<input type="checkbox"/> Basic	<input type="checkbox"/> Honours	<input type="checkbox"/> Advanced	<input type="checkbox"/> Morse <input type="checkbox"/> RAC Member
Email Address	<input type="text"/>		

Postal Address

Membership year is September 1 through August 31. Paying members who are in good standing by the December General Meeting will be eligible for a free one-time name badge. Members who wish to purchase additional replacement badges may do so through the club for \$10 each. Ordered badges will be available in January. All prices are listed in Canadian Dollars (CAD).

First Name on badge       Callsign on badge

First Name on badge       Callsign on badge

Notes