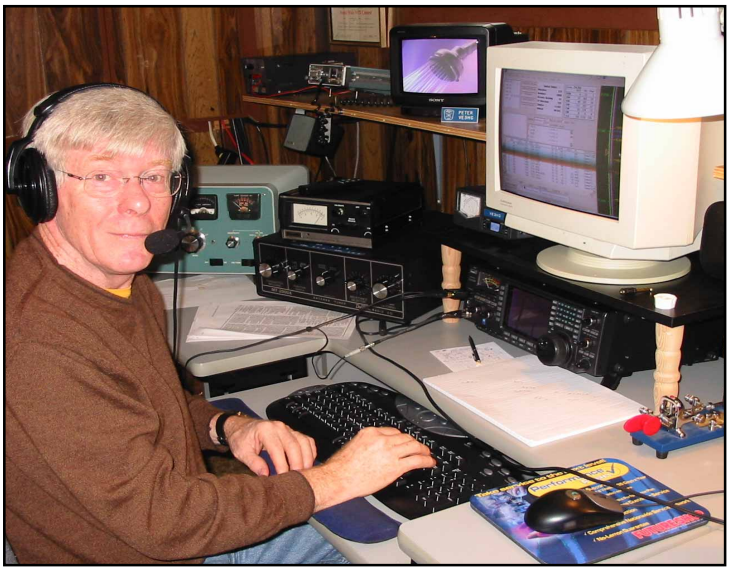
Hot Bananas

Oakville Amateur Radio Club April 2003

Shack of the Month



VE3NZV at VE3HG

John, VE3NZV, tried his hand at contesting during the CQ WW WPX Phone challenge the weekend of March 28/29 at the VE3HG contest station. Band conditions were up and down.

The HG station includes an ICOM 756 driving a heavily modified Heathkit SB-220 2KW amp through a 3 KW Dentron tuner up to a TH-3 at 15 meters and an Alpha Delta Sloper for 160/80/40, a G5RV-Jr and R-5 vertical. Note the lack of TVI on the little TV monitor next to the computer screen.

Key to contesting is the Writelog contest software on a new Toshiba laptop. An attempt at interfacing Rigblaster Pro between the computer and the rig was abandoned Friday so the station went without a voice keyer (to call CQ).

The Oakville Battling Beaver Contest Crew (VA3EC, VE3RZ, VA3GGF and VE3HG) are always looking for new converts to contesting. Why not try your hand?

This article was supplied by ED, VE3TAS, who was cleaning the shack. Thanks, Ed.

HF Skywave Propagation

by Dave Miller NZ9E, Radio Fun, July 1995

Most people, especially when they are first starting out, probably don't really want long drawn-out textbook explanations of radio signal propagation theory. They just want to know if they'll be hearing any DX today or tomorrow to help pick up a couple of "new ones" for their DXCC certificate, or if they'll have a reasonable chance of talking to their friend in some faraway spot.

Understanding the factors that influence how well our signals travel or propagate around the globe is a complicated matter, isn't it? Yes it is-not even all of the experts agree on the specifics-but we can understand the basics of what is important and how to roughly predict when HF short-wave conditions will be reasonably good or essentially poor, and not get too deeply into quantum mechanics and other theoretical exercises. There are really only a few factors to keep in mind to accomplish this, and it isn't all that tough.

Propagation Factors

We won't be getting deeply into the concepts of MUF (Maximum Usable Frequency), LUF (Lowest Usable Frequency), Optimum Frequency, Critical Frequency, etc.

Continued on page 2.

V E 3 H B

The Oakville Amateur Radio Club meets on the second Monday of the month at 7:30 p.m. from Sept. to June at the Red Cross, 167 Navy St. Guests are always welcome.

There is an informal gathering 7 a.m. most Saturdays at Angel's Diner at 369 Speers Rd. and a Friday 10:30 a.m. coffee session at Tim Horton's on Cross Road.

All are welcome.

*****

VE3OAK - 147.015 +.600 (131.8Hz CTCSS)
VE3OAK - 444.325 +5 MHz
VE3OAK - APRS - 144.390 MHz

Net - Mondays at 7:30 p.m. (except meeting nights and holidays on 145.015.)

Web Site: www.oakvilleamateurs.net

Hot Bananas

Hot Bananas is published 10 times per year from September to June and is distributed to all members of the OARC. Articles may be reproduced without additional permission provided credit is given to ***Hot Bananas*** and the Oakville Amateur Radio Club.

Submit story ideas, feedback, comments, articles or artwork to ve3hg@cogeco.ca or mail to:

Hot Bananas
The Oakville Amateur Radio Club
PO Box 69615
109 Thomas St., Oakville, Ont.
L6J 7R4.

Editor:
Peter West, VE3HG

Publisher:
Oakville Amateur Radio Club
President Jack Livingston, VE3ITM

Continued from page 2.

Although these are all worthwhile concepts to know and, hopefully, to be able to ascertain at any given instant in time, they're beyond the scope of this article's promise as simplified. Very brief explanations of them are given in the sidebar (at the end of this article) for those who might want to go a little bit deeper.

As a brief refresher, short-wave radio signals are propagated to nearby receivers via ground waves and to more distant locations- over 100 miles away- through their interaction with the ionosphere (that is what we call skywaves). They can be reflected by the ionosphere, refracted by it, or ducted for some distance within it and then bent back to earth, all by their interaction with the ionized layer above our planet that's known as the ionosphere.

The ionosphere always seems to be there, in one form or another; it's just that at times it's a better propagation medium than at other times. That is an important point to keep in mind.

Sunspots and Solar Flares

We all know that there are good times for radio signal propagation, and there are bad times. The good times occur mostly when we find ourselves at the sunspot maximum; i.e., when the 11-year sunspot cycle is at its peak number of spots.

Alternatively, the worst times for propagation are when the sunspot cycle is at its ebb –fewer spots on the sun. These are the basics of the 11-year cycles, but there is a bit more to it than that –nothing particularly difficult to remember, though.

Here, then, is the first thing to keep in mind: Sunspots are good news. And, the second thing to remember: Solar flares are bad news.

Spots and flares are completely different animals, though they're sometimes interrelated. But it is important to remember that spots are good, flares are bad.

Sunspots are just that, spots or blemishes on the sun's surface that come and go without complete predictability, but that occur much more often during what we call the peak of the 11-year sunspot cycle.

Sunspots produce low energy X-rays and ultraviolet radiation that fuels the development of the ionosphere, thus making it a better medium for propagating our HF short-wave signals.

That is why I termed them as good. In general, the greater the number of sunspots, the better amateur HF radio propagation will be.

Continued on page 3.

CQ CQ CQ

Executives & Coordinators

Club Executive 2002-2003

President	Jack Livingstone	VE3ITM
Vice President	Denny Zidek	VE3OKD
Secretary	Greg Foster	VA3GGF
Treasurer	Carvell Pelkey	VE3CPQ
Director	Russ Schwandt	VE3JUZ

Club Coordinators

Membership	Russ Schwandt	VE3JUZ
Program	Denny Zidek	VE3OKD
	Russ Schwandt	VE3JUZ
Emerg. Coordinator	Rick Harrison,	VE3YRH
Assistant E. C.	Jack Livingstone	VE3ITM
	Russ Schwandt	VE3JUZ
Help Committee	Harry Kosterman	VA3EC
VHF net activities	Denny Zidek	VE3OKD
Repeater	Greg Foster	VA3GGF
	Gary Hetherington	VE3TGH
	Harry Kosterman	VA3EC
Web site	Michael Willems	VA3MVW
Training-Basic & Advanced	Jack Livingstone	VE3ITM
Examiner	Jack Livingstone	VE3ITM
Public Relations	Doug Smith	VE3RG
Equipment/Shack	Mike Brown	VA3GRL
	Jack Livingstone	VE3ITM
DX Interest Group	Ron O'Reilly	VE3FII
Club Bulletin	Peter West	VE3HG

Continued from page 2.

Additionally, the more spots, the higher the usable frequency will be –10 meters can be a great international band during the sunspot maxima.

Solar flares, on the other hand, produce high energy X-rays and high energy proton clouds that can disrupt the formation and/or the stability of the ionosphere, so they are bad for propagation. There is much more to the actual physics of it than just these relatively simple descriptions imply, but that's really all you need to keep in mind for right now. You're welcome to explore the process more deeply, of course, but again, I promised that this would be a simplified approach. One other thing you should know: Flares also upset the earth's magnetic field to some extent, because the proton cloud created by the flare carries with it some of the sun's own magnetic field. When that cloud reaches earth, it will have varying degrees of effects on our normal magnetic field; thus it's the source of what we term magnetic storms. The severity of the magnetic storm produced by this proton cloud –or solar wind- can create HF radio propagation disruptions that vary from minor to major levels, because the uniformity in the formation of the ionosphere is dependent upon the stability in the earth's magnetic field. During times of high sunspot numbers, a solar flare may not cause big, long lasting disruptions in the ionosphere- -because of the higher ionization levels at that time- but in times of low sunspot activity, it's effect can be very noticeable. Amateur HF propagation paths can be shortened considerably and the higher frequency bands can become unusable for long distance communication.

Propagation Forecasts

You can follow these solar "events", and their effects on our ionosphere, in a couple of different ways. Perhaps the easiest for the beginner would be to listen to the ARRL propagation forecasts on W1AW. Current and near future expected propagation conditions, as well as solar alerts, are broadcast over the ARRL's bulletin station, W1AW, daily. Another approach would be to listen to the National Bureau of Science and Technology's radio station WWV, at 18 minutes after each hour, for their radio propagation forecast and magnetic storm report.

When you first hear the WWV propagation forecast figures, you will find that they are somewhat cryptic in their content, but after awhile you will begin to get more and more out of the information that they contain.

Continued on page 4.

Continued from page 3.

WWV will mention a current “solar flux level”, a solar activity summation (“very low”, “low”, “moderate”, “high”, or “very high”) an “A” index and a “K” index. They will also give a “geomagnetic field” activity report such as “quiet”, “unsettled”, or “active”. If a geomagnetic storm is in progress, they will tell you if it’s minor or major. I’ll try to give you a brief, non-technical description of what those terms mean to us as hams looking for some DX. Again, this is a practical, rather than an in-depth, treatment of the information to be found on WWV.

First, the solar flux levels, or solar flux index, as it’s called. This is a measure of how much good energy is being radiated by the sun to act as fuel for the ionosphere –good from a radio propagation point of view, at least. The higher these levels are the better. During a sunspot maximum, the solar flux index will go up to 200 or beyond, whereas during the ebb of the sunspot cycle it may drop into the 60s. The solar flux index provides a rough benchmark of where we are in the 11-year sunspot cycle and whether there is enough of the good solar radiation to support long distance communications circuits. Now, having said that, it isn’t always true! Solar flares, the bad guys, will also inflate the solar flux index, so you should listen to the rest of the report as well. There’s always a catch, it seems.

Next is the ”K” index; I’m skipping the “A” index because the ”K” index generally tells you more of what you will need to know from a practical standpoint.

The “K” index is a measure of the earth’s general magnetic field activity, and a low number is the best for radio propagation. A “K” index of zero or 1 means that there is little outside disturbance to the earth’s normal magnetic field – good news. A “K” index of 3, 4, or higher indicates that a flare has probably occurred and that the earth’s magnetic field and the ionosphere are both in for a rough time for a while. Long distance communications may be disrupted or greatly curtailed during high “K” index times. By the way, high “K” indices can make for some interesting localized propagation conditions; you may be able to work closer-in states that you’re normally unable to hear on certain bands. So don’t give up and turn off the radio completely –it may be a good opportunity to fill in some blank spots on your all-band WAS certificate application.

You will also be told that the geomagnetic is in “minor storm” or “major storm” conditions when you hear a high “K” index announced. That gives you some idea of the extent of disruption and perhaps how long you can expect it to go on. They will also give a prediction for the next 24 hours, and that will probably reinforce your own conclusions from the 24-hour figures. Once you become used to listening to the WWV propagation forecasts, you actually will have the ability to draw some meaningful conclusions.

Here is something else that is kind of interesting: The sun rotates (turns around) at about a 27- to 28-day cycle (the sun doesn’t rotate as nicely and neatly as a solid mass like our earth does). This means, however, that disturbances on its surface will face the earth for several days each 27 or 28 days, if those disturbances are of a long lasting nature. Long lived flares, especially when we are at the ebb of the sunspot cycle, will come around to play havoc with our ionosphere roughly once a month, so you can sometimes time your QSO schedules around them.

“Great”, you might be thinking, “but what does this tell me about whether or not I can keep my sked today with my friend in California?” After you get used to listening to the WWV reports and reading the ARRL propagation bulletins, it will probably tell you a lot.

You will begin to get a feel for how well a particular circuit will work, partly from other times you’ve talked successfully with your friend under certain solar flux and ”K” index conditions, and partly from the numbers themselves. Nothing and no one can guarantee you will have a good QSO today with California, just as no one can guarantee you will arrive at work safely in your car, but knowing the route and the general conditions on the way will help you considerably in having a successful trip!

That’s pretty much the bottom line: Knowing driving conditions or knowing propagation conditions can serve you by allowing you to make intelligent choices in both of those activities.

You may want to re-read this information several times to make it part of your conscious thinking when operating the bands; it normally takes a while before it becomes second nature. Also, keep in mind what I mentioned earlier, that even the experts don’t agree on everything when it comes to propagation theory, because it is just that, a theory or our best guess as to how the mystery really unfolds!

Future discoveries may alter some of the concepts we now hold to be true, and that’s an area in which perhaps some of us can make a difference. It may very well be that we know less about HF propagation than the current wisdom on the topic presupposes. There are still mountains to climb and frontiers to tame.

So, you might want to begin listening to WWV at 18 minutes after the hour, and copying W1AW’s bulletins whenever you can. With all of our contributions, little by little the radio propagation “mystery” will become less mysterious.

Further Information about HF Skywave Propagation

The Ionosphere Layers

The D layer is basically an absorptive layer. It absorbs all frequencies, but will normally not allow frequencies below about 3 MHz to penetrate it. Fortunately, the D layer only exists during daytime hours. It forms rapidly at sunup at a height of about 35 miles and dissipates rapidly right after sundown. It's the reason that some commercial AM broadcast stations must either shut down completely oat sundown, reduce power, or change antenna patterns. Once the D layer disappears, ionosphere skip is likely even as low as the AM broadcast band. The E layer is a reflective layer for signals within the 3 to 8 MHz ranges and is the main propagation layer for these frequencies during daylight hours. It resides at a height of about 70 miles. The E layer density is reduced during the night, but still does exist to varying degrees at all hours.

The F1 and F2 Layers

The F1 layer may be as low as 140 miles above the earth, while the F2 layer forms at about 250 miles up. The F2 layer is mainly responsible for long-distance communications for frequencies above 8 MHz both during daylight hours and into the night. At some point during the night, the F1 layer combines with the F2 layer at an intermediate height of about 200 miles above the earth. Thus, during periods of darkness, only two layers exist: a considerably less dense E layer, and the merged F layer. At some point after sunrise, the F layer again separates into the F1 and F2 layers, and all four layers (F1, F2, D and E) begin increasing in density once again. It's also possible to experience ducting between (within) the F1 and F2 layers (i.e., signals bouncing between these two layers) for some indeterminable distance. That phenomenon can open up areas not normally accessible by "normal" skip distance predictions.

The sporadic E layer is a very dense patch of highly ionized particles that appears only at times, in relatively small patches, and at about the same height as the normal E layer. It's been associated with both intense thunderstorm activity and wind shear at the upper altitudes of the atmosphere. It's very sporadic (occasional) in its development, but when and if it forms, it can support interesting long-distance communications paths as high as the amateur 2 meter band, though normally its effects are seen primarily only on our 6 meter and 10 meter bands.

There are other propagation possibilities, other than those mentioned, but these are the most commonly encountered means of long-distance communications.

Ionosphere Frequency Selectivity

MUF (the Maximum Usable Frequency) is the highest possible frequency that can sustain communications between two specific areas on the earth's surface. The MUF will be usually-but not always- highest at midday, and also highest during the 11-year sunspot cycle peals; it can exceed 50 MHz during those sunspot cycle peaks.

The Critical Frequency is the highest frequency that will be reflected from the ionosphere from a signal that's sent straight up toward the ionosphere layers. It may be as low as 2 MHz at night or as high as 13 MHz during midday. It's a good measure of the relative density of the ionization of the ionosphere. Frequencies transmitted at an angle other than straight up, however, can be of considerably higher frequencies than the Critical Frequency, and still be reflected or refracted by the ionosphere. So the Maximum Usable Frequency is normally higher than the Critical Frequency. That's because signals arriving at an angle are easier to reflect than those coming from directly below. It's fairly safe to assume, then, that the angle of incidence with the ionosphere can be an important factor in determining the Maximum Usable Frequency at any particular time. This is why you have probably heard that the angle of radiation from an antenna in the HF bands can be an important consideration. Vertical antennas usually have a lower angle of radiation, and horizontal antennas (beams or wire antennas) must be quite high off the ground for lower take-off angles.

OWF (the Optimum Working Frequency) is usually about 15% below the Maximum Usable Frequency for communications between any two specific areas. It's the frequency that sustains the least amount of absorption by the atmosphere for a particular path. As the frequency is raised beyond the Optimum Working Frequency, we soon pass through the Maximum Usable Frequency, and propagation disappears. As the frequency is lowered from the Optimum Usable Frequency, ionosphere absorption progressively increases until the path is no longer usable. It's an unfortunate fact that every ionosphere layer that a signal passes through absorbs some of the energy contained in our signals, and some is even absorbed in the layer that is reflecting our signal! The LUF Lowest Usable Frequency) is therefore the frequency where incoming noise covers up the readability of a signal of a particular frequency. This can vary with the location of the receiving site and is partly dependent upon background atmospheric noise and local static at that particular site.

Interestingly, the Optimum Working Frequency phenomenon is the reason that signals above 14 MHz will often dramatically increase in strength just before the band is about to fade out. The band is going through the Optimum Working Frequency (as signals improve) and then passes through the Maximum Usable Frequency (as signals disappear) a short time later.

The maximum Usable Frequency is different at different points in the 11-year solar cycle: During a sunspot cycle peak period, the MUF may vary from greater than 50 MHz during daylight hours to under 5 MHz during periods of darkness. During a sunspot cycle minimum, the MUF varies much less dramatically, going from perhaps 15 MHz during daylight hours down to only 10 MHz during periods of darkness. It's interesting to note that the MUF may actually be higher at night during sunspot cycle ebb than when the cycle is at its peak.

The global fellowship

Everybody knows that ham radio is a hobby, which creates new friends. I can attest to this theory. Last year I met Czech operator Jiri - George, OK1XTB. After our initial contact, we exchanged two e-mails telling each other a little bit about our interest in radio. But life goes on, and we did not have much time to communicate. Unfortunately, not even on the bands.

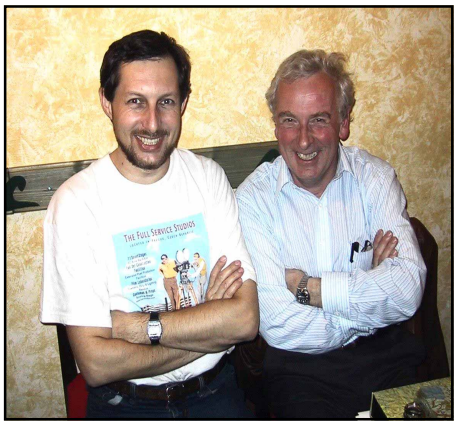
This spring my family decided to spend some time with the relatives in Prague. Shortly before we packed our luggage, I sent an e-mail to George, asking if we could meet. My idea was to get together in one of many Prague pubs, have a beer or two and talk about our hobby. For couple of days nothing happened and then, literally a few hours before our departure I checked my e-mail one more time and there was a message from George. I was invited to an informal meeting with a whole group of Czech amateurs. Of course it was in a pub! Hastily I packed a couple issues of Hot Bananas, some information about our club and then it was time to go to the airport.

Visiting family in a far away country is always a hectic time. Old aunts and uncles wanted to invite us for dinner and old friends and girlfriends wanted to talk to me over a glass of wine. That would all be just fine, if only I could stretch each day to 30 hours and not sleep. Well, I managed and even found the time for the meeting with radio amateurs. The meeting was in a very nice pizzeria in the old section of the city. The Czech guys meet there in the same fashion as we get together for our Saturday breakfast. To my surprise – all the guys were quite young, in their thirties and early forties. My gray hair was too bright for that company!

Our initial introduction was very informal and soon we were talking like old friends. All of them are engineers, so the technical knowledge of the topics discussed was quite impressive. As a group, they mainly communicate on VHF and UHF bands. Of course, distances between countries in Europe are much shorter than what we are used to. So it is possible to talk to the hams in other countries with the VHF radio. Well, provided your QTH is located on top of the mountain and the antenna is directional. And there you have it! These guys pack their radios, antennas and batteries into their backpacks and go for a short weekend expedition somewhere in the mountains to brave the weather and have fun. I have seen some of the pictures from those trips and I was short of breath just to look at it, without climbing the hill.

There are many diplomas issued by different organizations for high achievements in communication on VHF frequencies. And that is what these amateurs are after.
Speaking of diplomas! George, OK1XTB is definitely a champion in collecting those. Attached picture shows his collection. To name just a few – DXCC, WPX, DIG. He is also entering contests from his cottage QTH in southern Bohemia, where he has space for a whole array of antennas, no QRM and no neighbors to complain. What a place!
It is always interesting to talk to other hams. We found that we are encountering the same problems and the same pleasures in our hobby. To buy some of the equipment in Czech Republic is usually quite expensive. So, if people are technically inclined, they build the devices by themselves. But I have to admit, that most of these radio amateurs have good and modern radios. Discussion also turned to club activities and hamfest, mainly the Mecca of all – Dayton. I have also done a little bit of promotion to Canada's natural beauties and fishing opportunities. George is an enthusiastic fisherman.
As usual, when the fun is at its best, we were told that the pub is closing in ten minutes. So we quickly finished our discussion with the promise that we will continue some day on the band.
What to add? Thank you guys – Jiri, OK1XTB; Stepan – OK1CSS; Pavel – OK2IRO; Tomas – OK1TLT and David – OK1TDU
It was really a perfect evening!

George, OK1XTB



The world-wide fellowship of ham radio is indeed one of the greatest aspect of a wonderful hobby. Where else can you travel to virtually any country and find friends? Do you have any international ham radio stories to share? Thanks to Denny for this interesting insight into the international fellowship of ham radio.

Upcoming meetings

The next meeting of the club will be held on April 14, 2003. Michel Willems VA3MVW will have a presentation about his experience with ham radio in Hong Kong. The second part of presentation will be related to the internet applications in the ham radio environment. The details of his presentation are being hammered out at this time.

The following meeting - May 12, 2003, we will have an interesting speaker from Burlington, Herb Hilgenberg. His presentation will be related to weather reports communication. Herb is interpreting and transmitting meteorological data for the Coast guard and other ships in the Atlantic region.

For this meeting we are planning to invite members of Burlington Radio Club again.
All club members will be informed about the further details of this meeting in the next bulletin.

QRT by VE3HG

Don't call me, I'm cruisin'!

Next month, I am planning a QRP issue. I tend to run QRO during contests but there's lots of interest in QRP operating. Running 5 watts are less is a great challenge and some guys even run QRP during contests.

Speaking of contests, we had a great weekend introducing contesting to several members who dropped by the station during the CQ WW WPX Phone contest the last weekend in March. Conditions were tough but that's to be expected as we enter the long dark slide into the pit of the sun spot cycle. Because the high bands (10, 15 and 20) are noisy and propagation sucks, it means we need to concentrate on better antennas (and grounding) for the low bands of 160, 80 and 40.

I'm volunteering to lay a new lawn in our backyard. Marion can barely contain her enthusiasm that I'm actually going to do some work around the house. What I haven't told her is I'm planning on laying a ground plane system under the new grass.

Once I've got the radial system installed under the lawn, I'll see if I can sell Marion on the concept that a low-band vertical wouldn't be an eye-sore. I mean isn't a 33-foot vertical a thing of beauty?

By the way, the club table at the Brampton Flea Market was a big success, at least as far as I was concerned. I sold everything I brought and. of course, immediately went to the Radio World booth and dropped a bundle on the computer-rig interface system by RigBlaster Pro. I had hoped to get RigBlaster up and running before the contest but all was not to be. I was using a new laptop and found that they don't have serial ports anymore. I did get a USB to serial adaptor but RigBlaster didn't like it.

Oh well: There's always the next contest. Anyway, by the time most of you read this, I'll be crusing the Caribbean (and yes I'm taking a handheld) . See you next month.

73, Peter, VE3HG