



# Emergency Measures Radio Group Ottawa ARES

- Two Names, One Group, One Purpose -  
Service de liaison radio en cas d'urgence



## Near Vertical Incident Skywave (NVIS) Dependable HF Coverage Within 400 km

We usually think of HF as a long range communications solution which is impacted by sun spot activity, time of day and weather. To ensure somewhat reliable or consistent communications, beam antennas and amplifiers are required and even then there are no guarantees, some locations may hear but others will not. For shorter range communications we think of VHF/UHF mobile radios and repeaters. Depending on the repeater location, stations 100 km apart can communicate while mobile.

But what about situations where there is no repeater, repeaters have failed or the existing repeaters just don't link the two locations that need to communicate.

### How would you communicate, from a fixed location or mobile;

- across the City (100km) without a repeater?
- from the East end of Prescott - Russell to Ottawa?

### How would you ensure that the communications is reliable throughout the day?

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## NVIS INTRODUCTION

Near Vertical Incident Skywave (NVIS) has been around for a long time (since W.W.II) and has applications in military and commercial communications. Some civilian emergency management organizations also use it and there are a few amateurs across North America that use and experiment with NVIS. So what is NVIS?

"Near vertical incident skywave means forcing your radio signals to travel straight up (i.e., 80-90 degrees) and back down. This achieves radio coverage in circle having a radius of 300 miles and more. Stop and think about that for a moment. Complete coverage within such a circle on frequencies between 2 and 10 or 12 Megahertz. Some readers may wonder what's so good about this. We are talking about dependable local area high frequency communications -- the type we need for tactical public safety communications in the Radio Amateur Civil Emergency Service. In tactical communications we don't want DX."

Copied from [www.sedata.net/nvis.html](http://www.sedata.net/nvis.html), an excellent introduction to NVIS.

"NVIS , short for Near Vertical Incident Skywave, utilizes high-angle skywave paths between stations instead of ground wave or surface wave in order to communicate via HF radio. NVIS was originally evaluated by U.S.

Army Forces in Thailand during the Vietnam conflict in the mid-1960's It was found that Mobile stations, using whip antennas bent parallel to the ground, could communicate more reliably with their base-stations. Signal strengths would be weaker using high-angle skywave but communications would be more reliable, less subject to fading, and consistent between stations. This was because the intervening terrain was less of an absorber of signals. Terrain obstructions between stations, such as hills, mountainous areas, jungle growth, built-up areas with tall buildings, no longer become path obstructions with stations when NVIS techniques are employed. For distances out to 400 miles between stations, one F-layer hop, at vertical angles of 45 degrees or higher are used. It is not necessary to have high power transmitters. Typical 100 watt power levels are fine. It is necessary that all stations on an NVIS radio network use antennas that are parallel to the ground and the frequencies used are chosen via a radio propagation prediction program in order to have best results."

Copied from a background on NVIS By Patricia Gibbons WA6UBE: [www.ci.san-jose.ca.us/oes/races/hfradio.htm](http://www.ci.san-jose.ca.us/oes/races/hfradio.htm)

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## **NVIS FREQUENCIES & ANTENNAS**

### **Frequency**

NVIS operation is best in the 2 MHz to 10 MHz range, which makes 80m & 40m prime frequencies, with 30m having some possibility. With the new 5 MHz (60m) allocation in the US and UK, this could provide another useful frequency if the allocation were available in Canada. The importance of having a range of frequencies, is to ensure consistent communications regardless of time of day or other conditions. The operating frequency must change during the day and night periods.

### **Antennas**

For mobile use the choice seems to be a 16 ft whip, which is pulled down near the end, so it is parallel with the roof of the vehicle, making the signal go vertical. There are variations of this for permanent mobile antennas. It is recommended that the antenna be fully horizontal when not moving, if possible for best operation.

Fixed stations seem to have two options;

- 1) Dipole antenna for 40m & 80m with a 15 ft insulated mast in the centre.

Design Guide: <http://www1.vcars.org:8040/CARL/NVIS.html>

Same design, but more details on the mast: [http://webpages.charter.net/w9wis/NVIS1\\_nn4.html](http://webpages.charter.net/w9wis/NVIS1_nn4.html)

- 2) Wire antennas located very close to the ground, either fed from the vehicle antenna mount or from a portable radio

Long wire fed from vehicle: <http://www.emcomm.org/svares/projects/nvis.htm>

Examples with user results: [http://www.tactical-link.com/field\\_deployed\\_nvvis.htm](http://www.tactical-link.com/field_deployed_nvvis.htm)

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## **EMRG & NVIS**

The Emergency Measures Radio Group (EMRG), also known as Ottawa ARES, provides communications for the City of Ottawa. From side to side or corner to corner, that is over 100 km, just within the City boundary. Since emergencies don't understand Municipal boundaries, it is possible that EMRG would need to communicate with neighbouring Municipalities or EMRG members may be assisting in a neighbouring Municipality, reliable medium range communications is important.

While some people only worry about preparing for "the big one", EMRG is focusing on solutions that provide short and medium range coverage, based on the assumption that it is extremely unlikely that a disaster will

destroy all phone communications over more than 200 km. This would assume for example that if ALL phone communications has failed in the entire City of Ottawa, there will most likely be working communications systems in Cornwall, Brockville, Kingston, Arnprior, Renfrew or Hawksbury. We don't need to communicate directly with Vancouver on HF, we need to get information to a location that has normal communications systems working. Long range HF is a nice to have, but it is less likely to be needed and there are hundreds of amateurs who have HF and VHF stations at home that are willing to act as relays in an emergency.

The Ice Storm in 1998 is an example of a disaster that impacted phone coverage in some areas, but most phone communications within 20 km of an outage was working. Amateur repeaters were all working, but mobile coverage for the Red Cross was not available everywhere due to the coverage areas of the repeaters. While there are many repeaters in or around Ottawa and they have different coverage areas, there are still portions of the City that have poor or non existent mobile coverage. NVIS provides an opportunity to fill the coverage gap within the City and extend direct communications beyond the City boundaries.

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## **NEXT STEPS FOR EMRG**

There is lots of information available on the internet, so the next step is to apply the information in Ottawa in order to understand how NVIS really operates and to determine if and how it can be applied here. We now have someone interested in exploring NVIS operation and the plan is to get a few more people interested so several stations can be operated in order to evaluate operation.

The neighbouring ARES group, Prescott Russell also has someone investigating NVIS, so the opportunity to work on this together exists, which also allows greater joint group testing. Any EMRG members who are interested, should send a note to [ve3bqp@rac.ca](mailto:ve3bqp@rac.ca) to get involved with the NVIS team.

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## **LINKS**

UK NVIS Information	<a href="http://www.raynet-hf.net/HFNVIS.html">www.raynet-hf.net/HFNVIS.html</a>
Background information and LOTS of links	<a href="http://www.qsl.net/k5eph/nvis.htm">www.qsl.net/k5eph/nvis.htm</a>
Antenna Guidelines	<a href="http://www.sedata.net/nvis.html">www.sedata.net/nvis.html</a>
Antenna Information & Links	<a href="http://home.earthlink.net/~w0ipl/nvis.htm">http://home.earthlink.net/~w0ipl/nvis.htm</a>
Great NVIS Overview & Links	<a href="http://www.qsl.net/wb5ude/nvis/">www.qsl.net/wb5ude/nvis/</a>
RACES Applications of NVIS (Some info from other links)	<a href="http://www.ci.san-jose.ca.us/oes/races/hfradio.htm">www.ci.san-jose.ca.us/oes/races/hfradio.htm</a>
Information, Links and Testing	<a href="http://www.tactical-link.com/">www.tactical-link.com/</a>
NVIS Antenna Article	<a href="http://www1.vcars.org:8040/CARL/NVIS.html">www1.vcars.org:8040/CARL/NVIS.html</a>
NVIS Book Review	<a href="http://www.antennex.com/shack/Jan02/nvis.html">www.antennex.com/shack/Jan02/nvis.html</a>
Yahoo Group on NVIS	<a href="http://groups.yahoo.com/group/NVIS">groups.yahoo.com/group/NVIS</a>
Canadian Made Commercial HF Radio	<a href="http://www.hfradio.ca">www.hfradio.ca</a>
<b>Information on 5 MHz (60m) In Other Countries</b>	<a href="http://www.innotts.co.uk/asperges/5megs.html">www.innotts.co.uk/asperges/5megs.html</a>
	<a href="http://www.btinternet.com/~dsergeant/index.htm">www.btinternet.com/~dsergeant/index.htm</a>
	<a href="http://www.ucs.mun.ca/~jcraig/5megex.html">www.ucs.mun.ca/~jcraig/5megex.html</a>
ARRL 60m (5MHz) FAQ	<a href="http://www.arrl.org/FandES/field/regulations/faq.html">www.arrl.org/FandES/field/regulations/faq.html</a>

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