NVIS

Near Vertical Incident Skywave

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Introduction

- What Is NVIS?
- What are the advantages of NVIS?
- How to deploy NVIS.

What Is NVIS?

- NVIS, or Near Vertical Incidence Skywave, refers to a radio propagation mode which involves the use of antennas with a very high radiation angle, approaching or reaching 90 degrees (straight up), along with selection of an appropriate frequency below the critical frequency or MUF (maximum usable frequency), to establish reliable communications over a radius of 0-200 miles or so, give or take 100 miles.

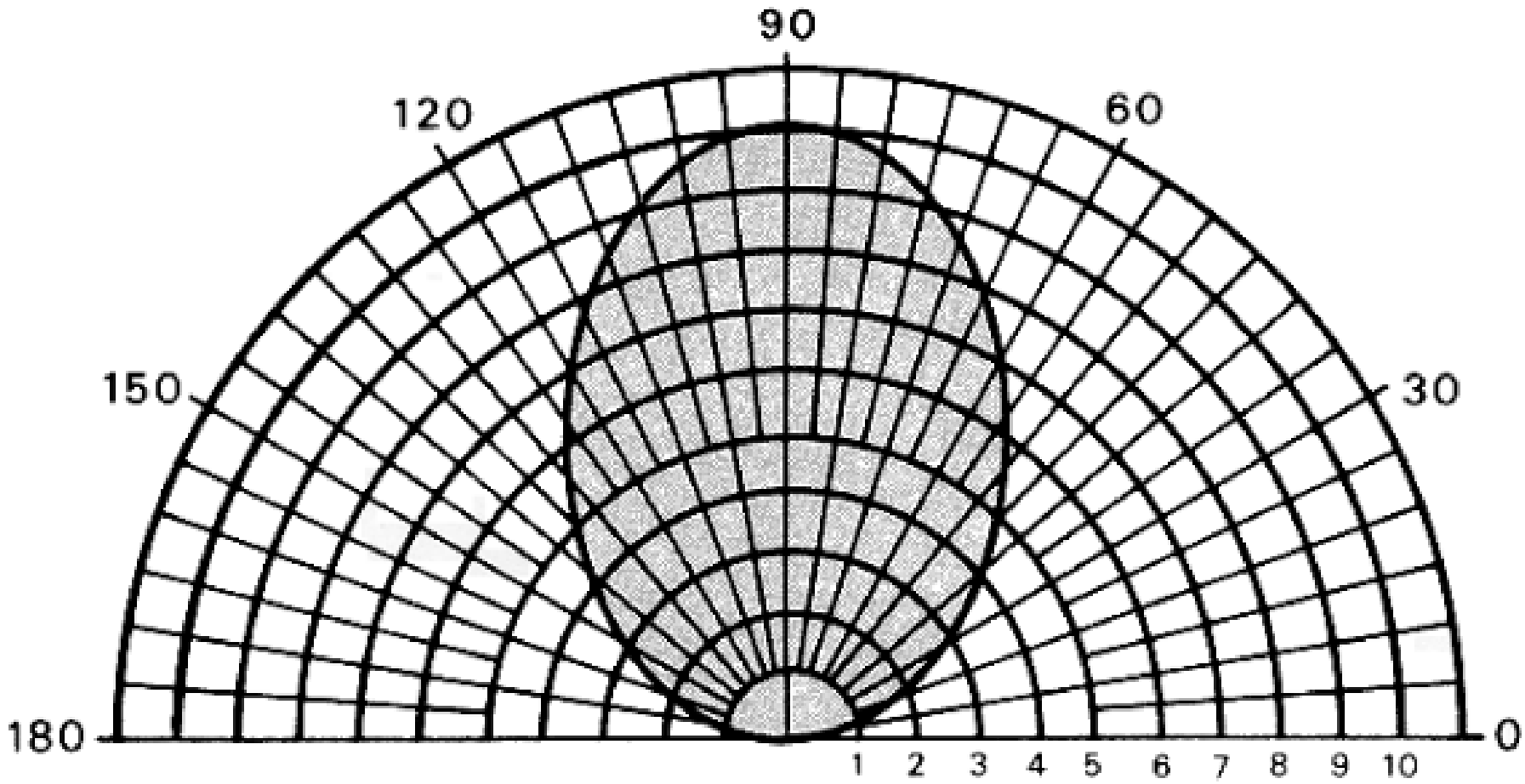
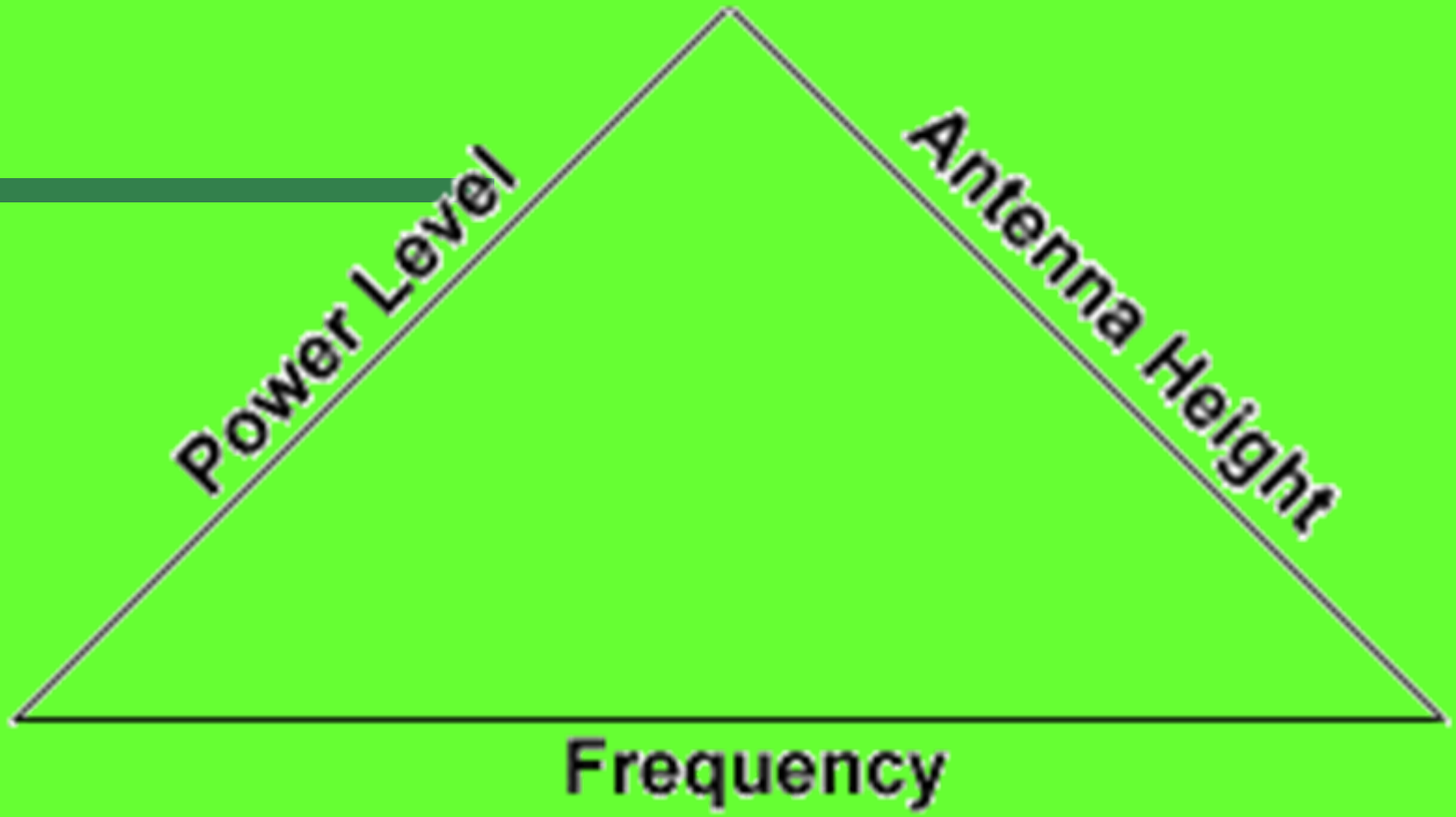


Figure M-6 *Typical elevation plane patterns for half-wavelength antennas one-eighth wavelength or less above ground.*

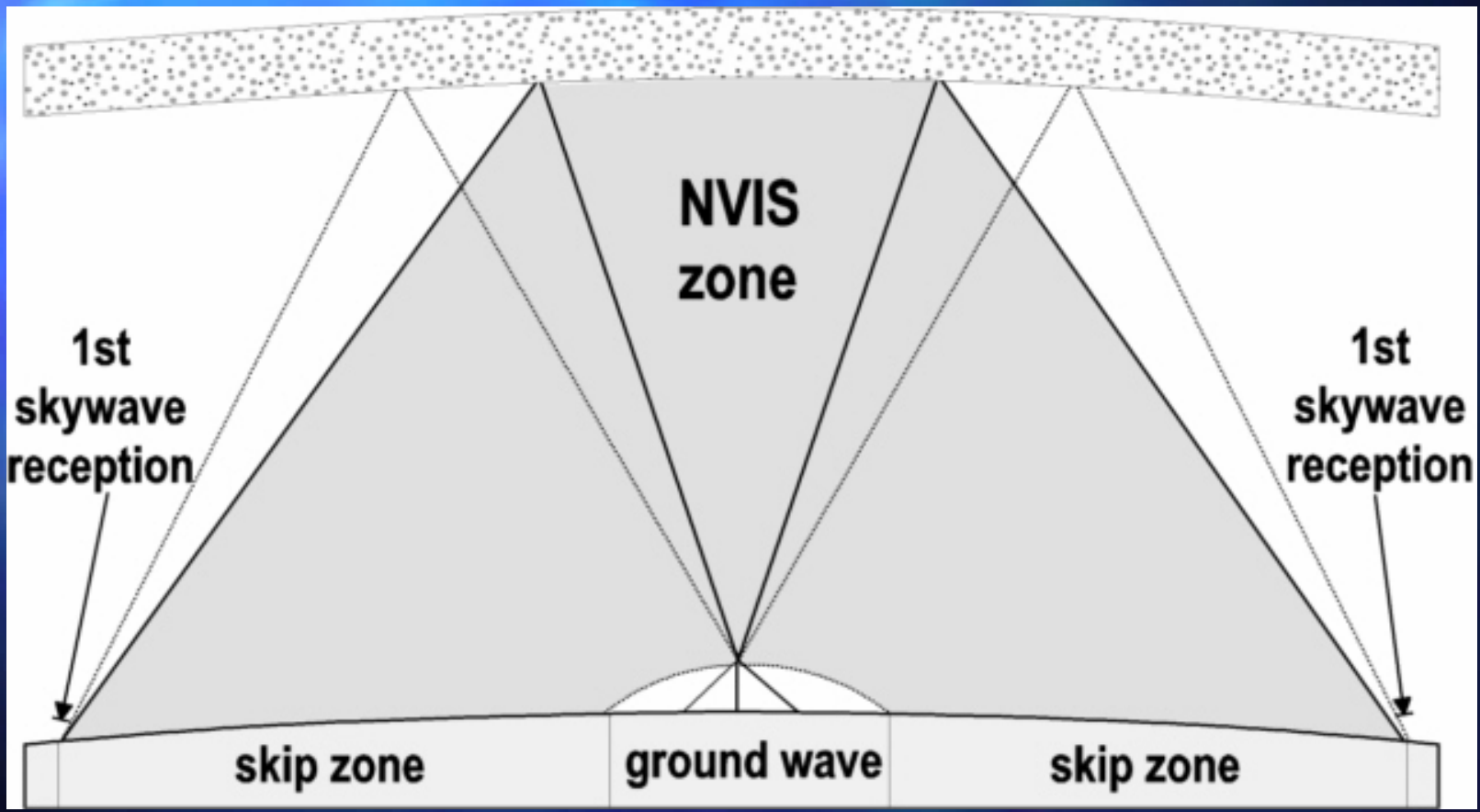


NVIS is not an antenna, but a technique. Reliable communications between stations are based on three major factors.

Advantages of NVIS

- NVIS covers the area which is normally in the skip zone, that is, which is normally too far away to receive ground wave signals, but not yet far enough away to receive sky waves reflected from the ionosphere.

Advantages of NVIS



- There is no skip zone unless you, the communicator, create it.

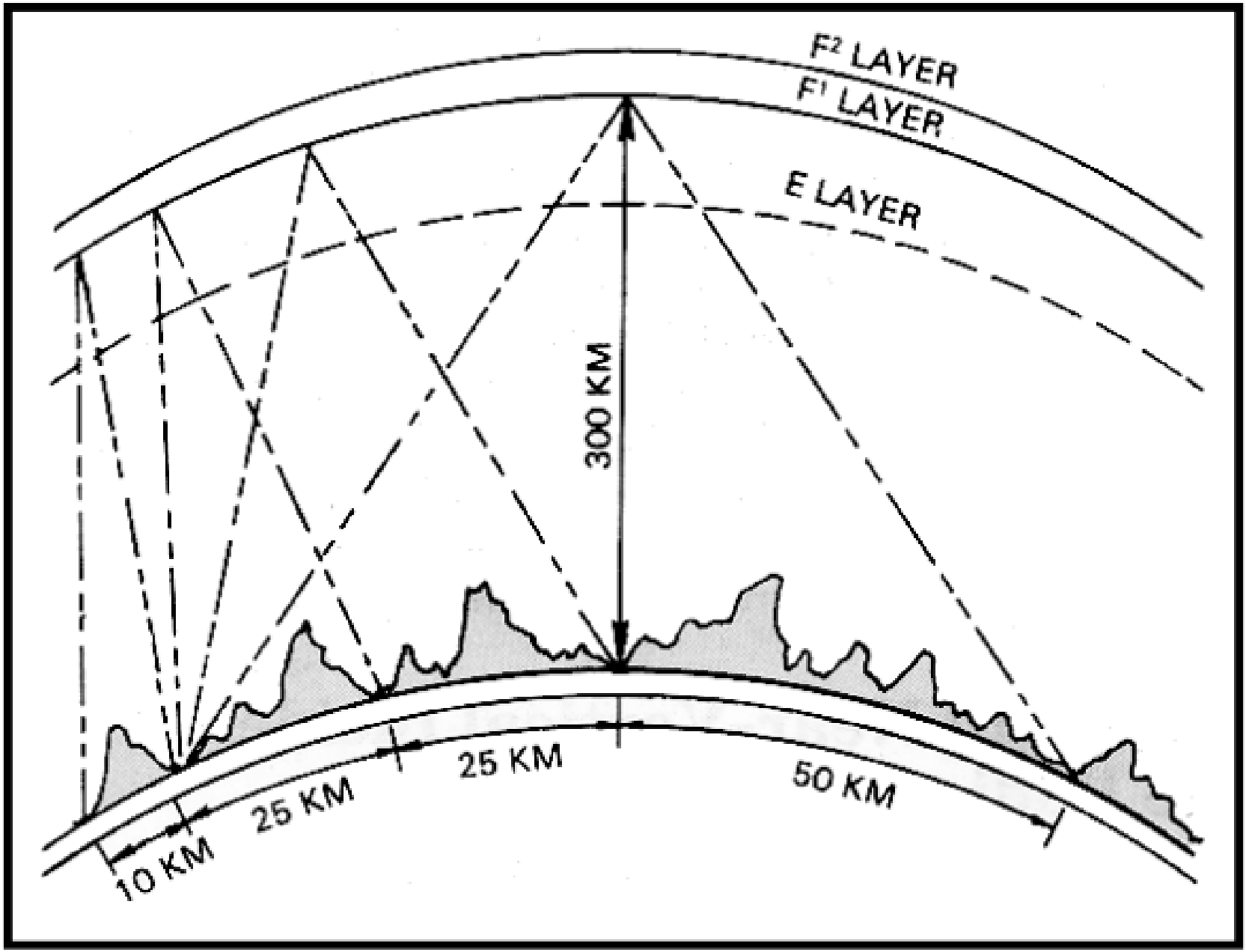
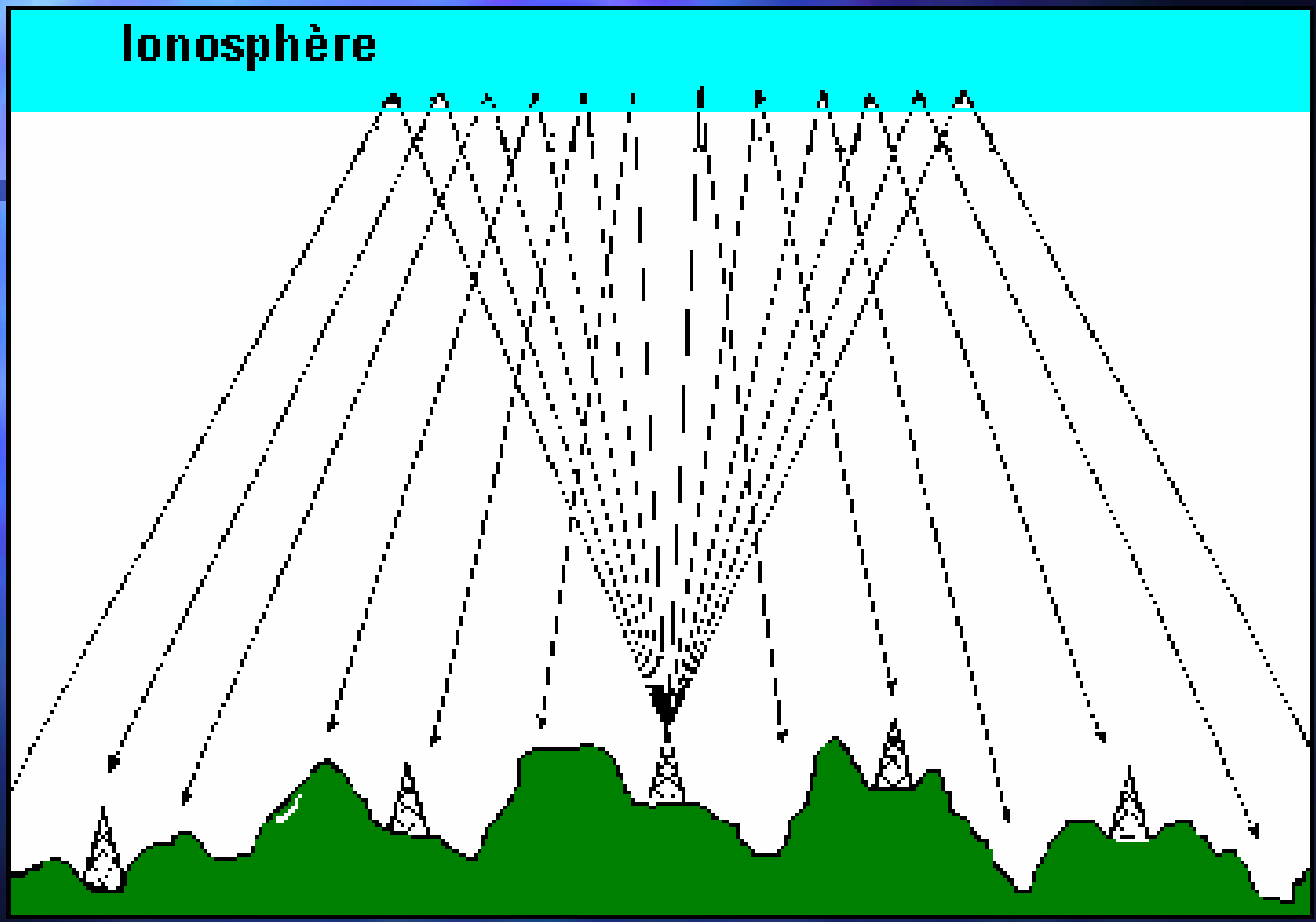


Figure M-1. Near-vertical incidence sky-wave propagation concept.

- If you squirt a garden hose straight up at the ceiling you can blanket a large area with water very effectively.
- This is similar to what happens to your signal when it is directed at the ionosphere.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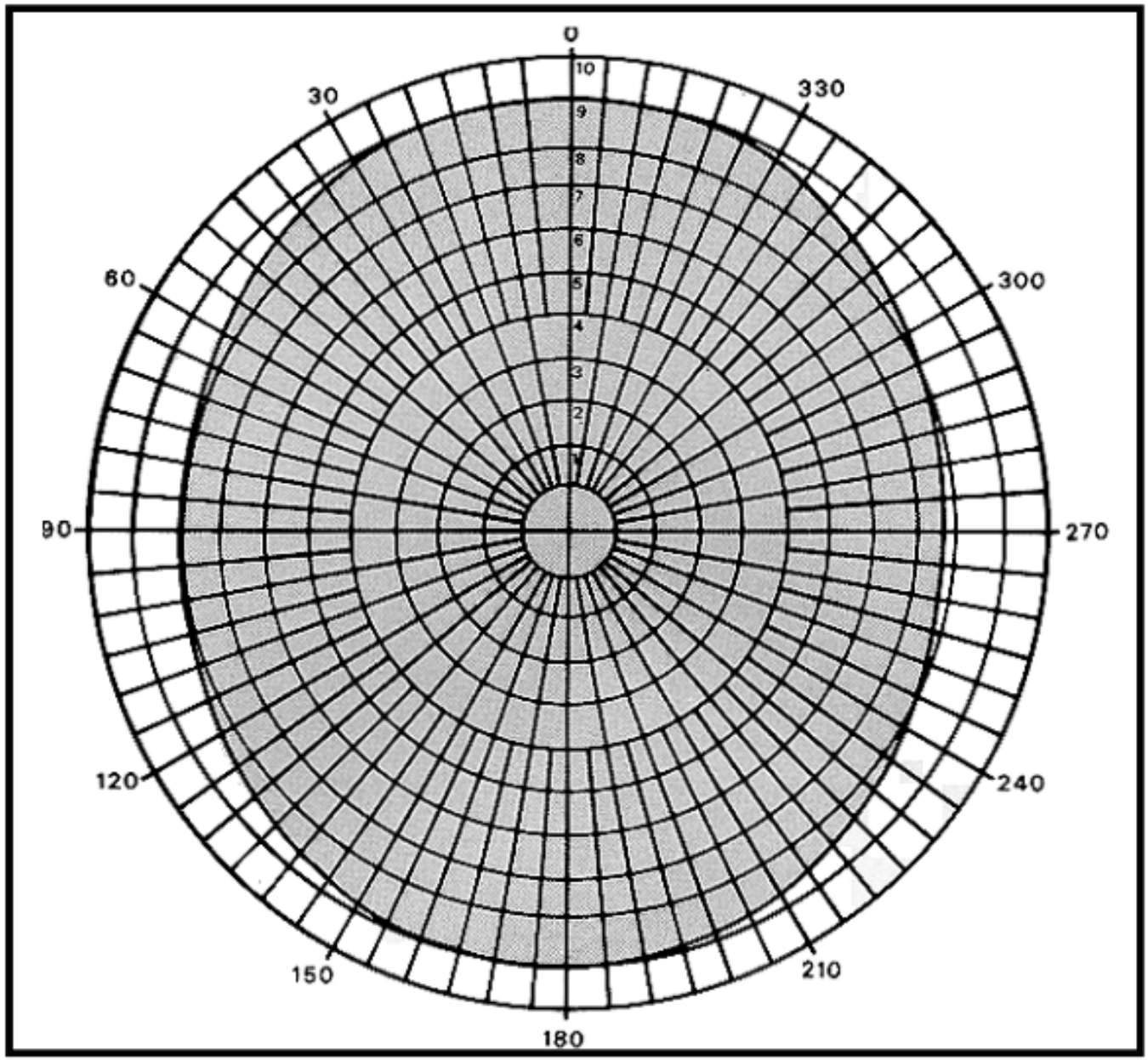


Figure M-2. Near-vertical incidence sky-wave antenna typical azimuth plane pattern.

Advantages of NVIS

- NVIS requires no infrastructure such as repeaters or satellites. Two stations employing NVIS techniques can establish reliable communications without the support of any third party.
- NVIS techniques can dramatically reduce noise and interference, resulting in an improved signal/noise ratio.
- With its improved signal/noise ratio and low path loss, NVIS works well with low power. (20-100 Watts) Conserves battery power.

Advantages of NVIS

- Pure NVIS propagation is relatively free from fading.
- Low areas and valleys are no problem for NVIS propagation.
- Antennas optimized for NVIS are usually low. (10-15ft.) Simple dipoles work very well. A good NVIS antenna can be erected easily, in a short amount of time, by a small team (or just one person).

NVIS Military Applications

Statewide Communications

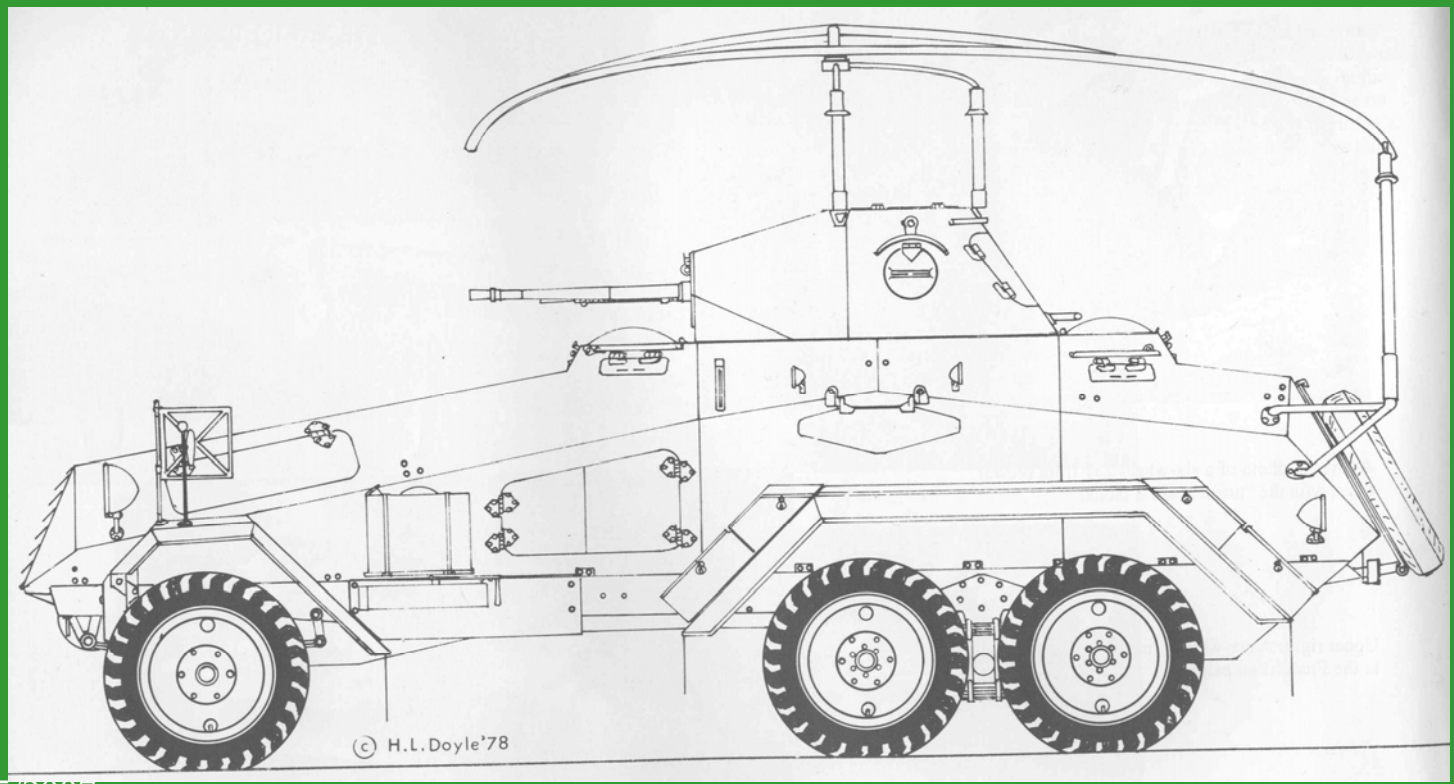
- The VaARNG uses NVIS and other techniques to provide effective HF signals for short, medium and long haul communications. During hurricane Isabel VaDF commo teams used NVIS techniques to tie operations centers together around the state.

VaDF troops and US Army Corp of Engineers collocated in Suffolk, VA.

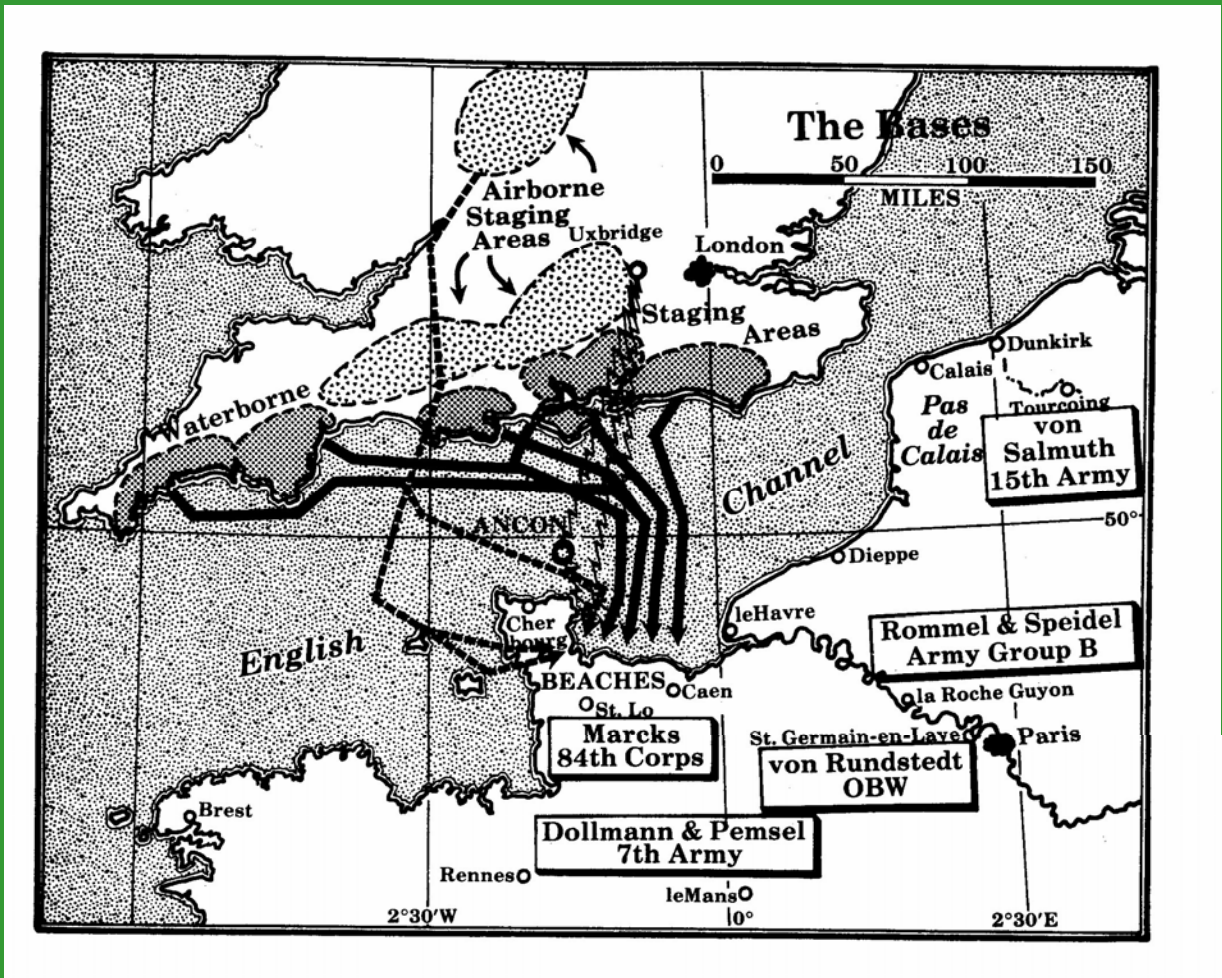
VaDF personnel receiving valuable information on ice and water shipments into the Virginia Beach area via HF Using NVIS techniques.


EMERGENCY OPERATIONS

This drawing is representative of a light-recon vehicle used in forward areas by German forces during WW II.



NVIS HF radio systems played a key role for the Allied Forces during the D-Day invasion of Normandy in 1944.These techniques were incorporated into Signal support planning by Dr. H. H. Beverage.



NJARNG test proves NVIS highly reliable.

20 watts = 100% effectiveness in 200 mile radius

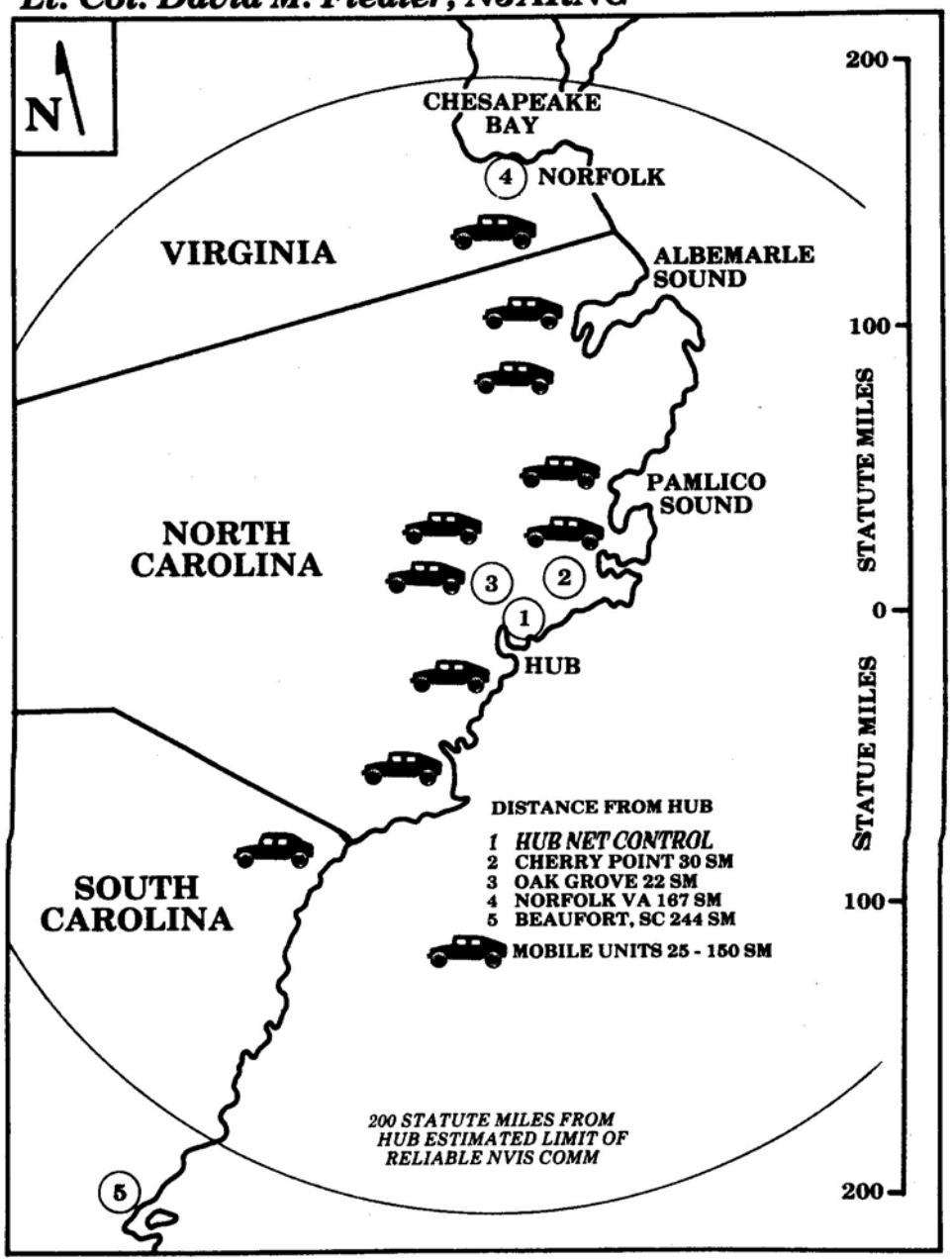
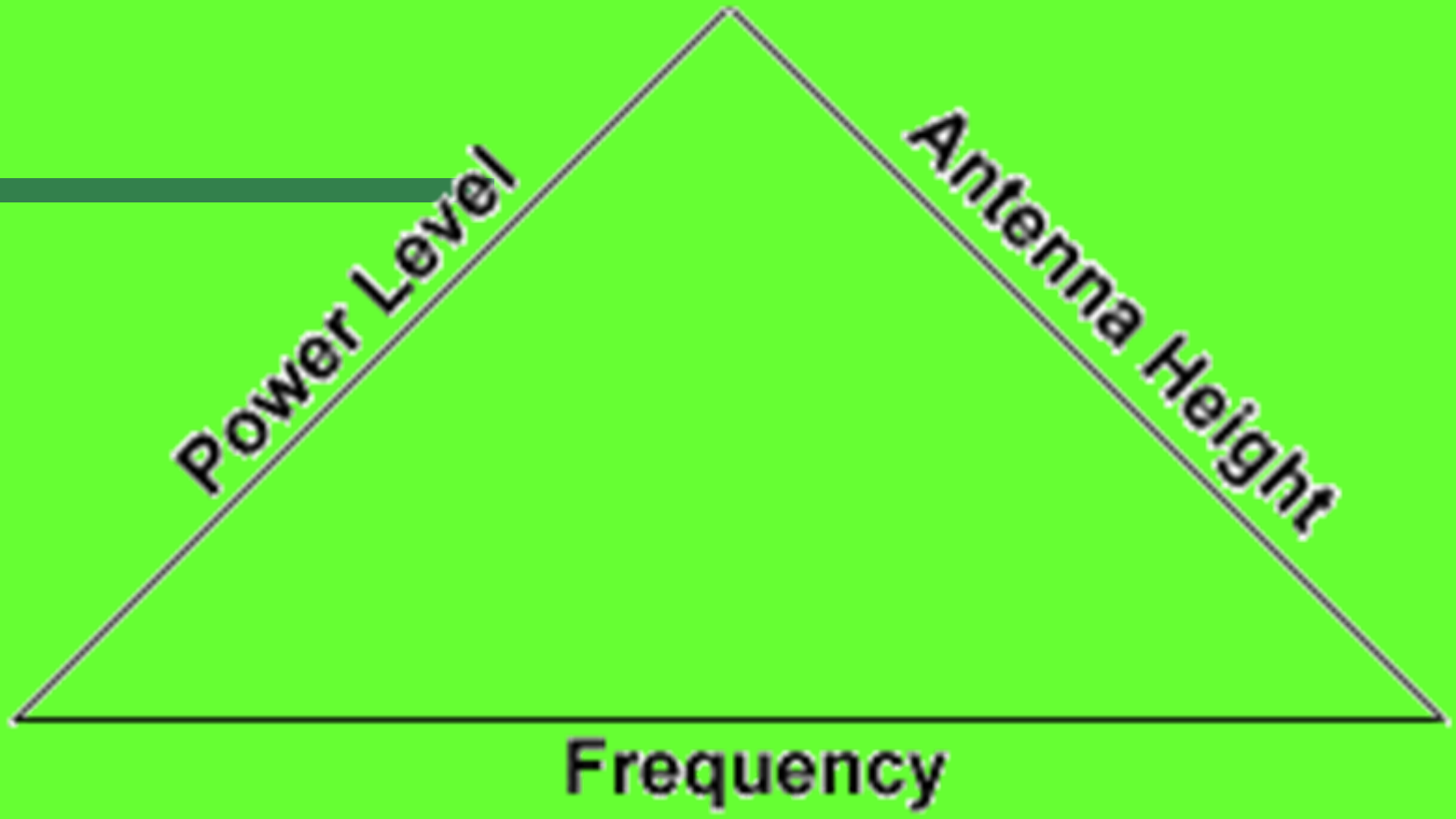


Figure 1. Area of test operations

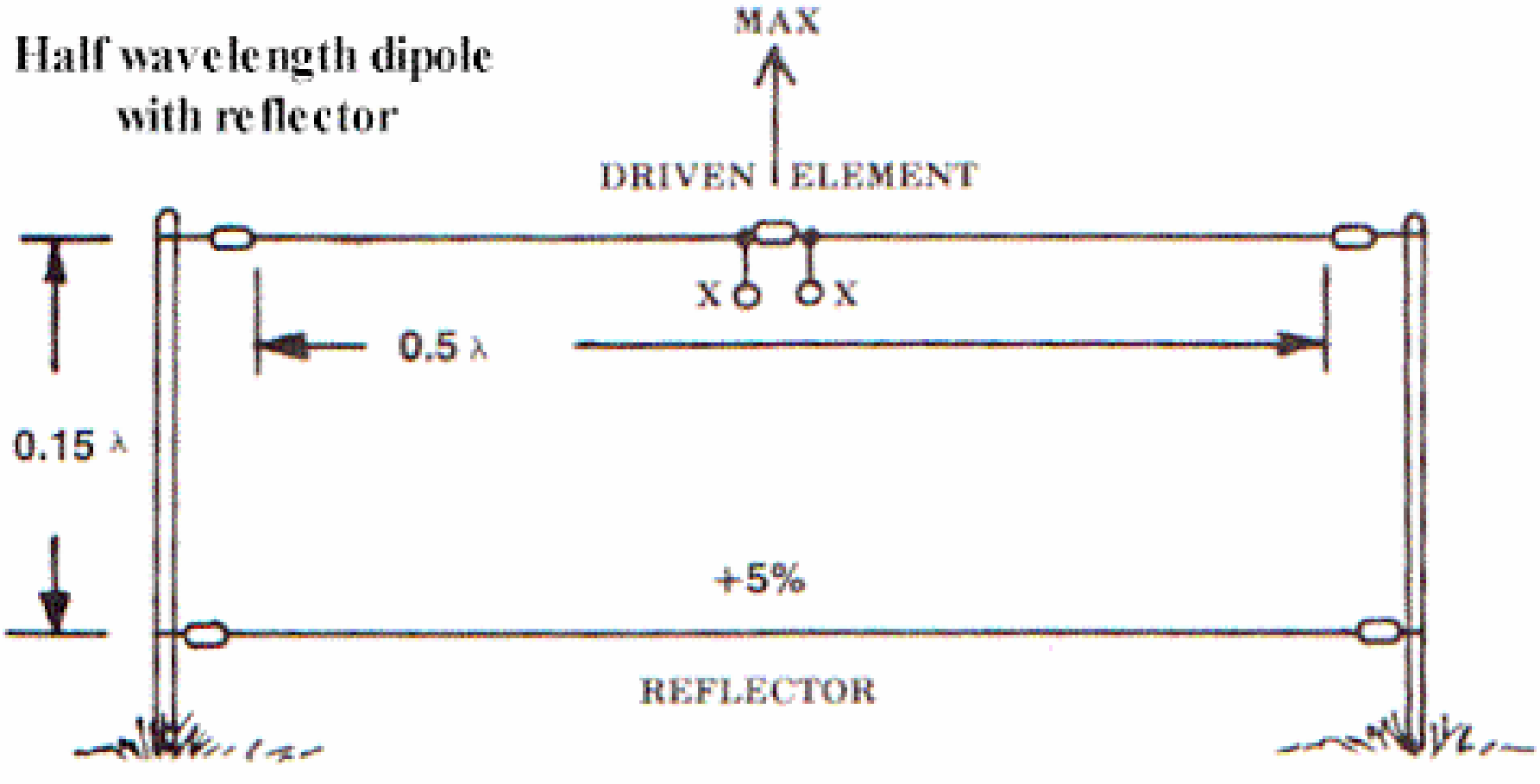


Antenna Height

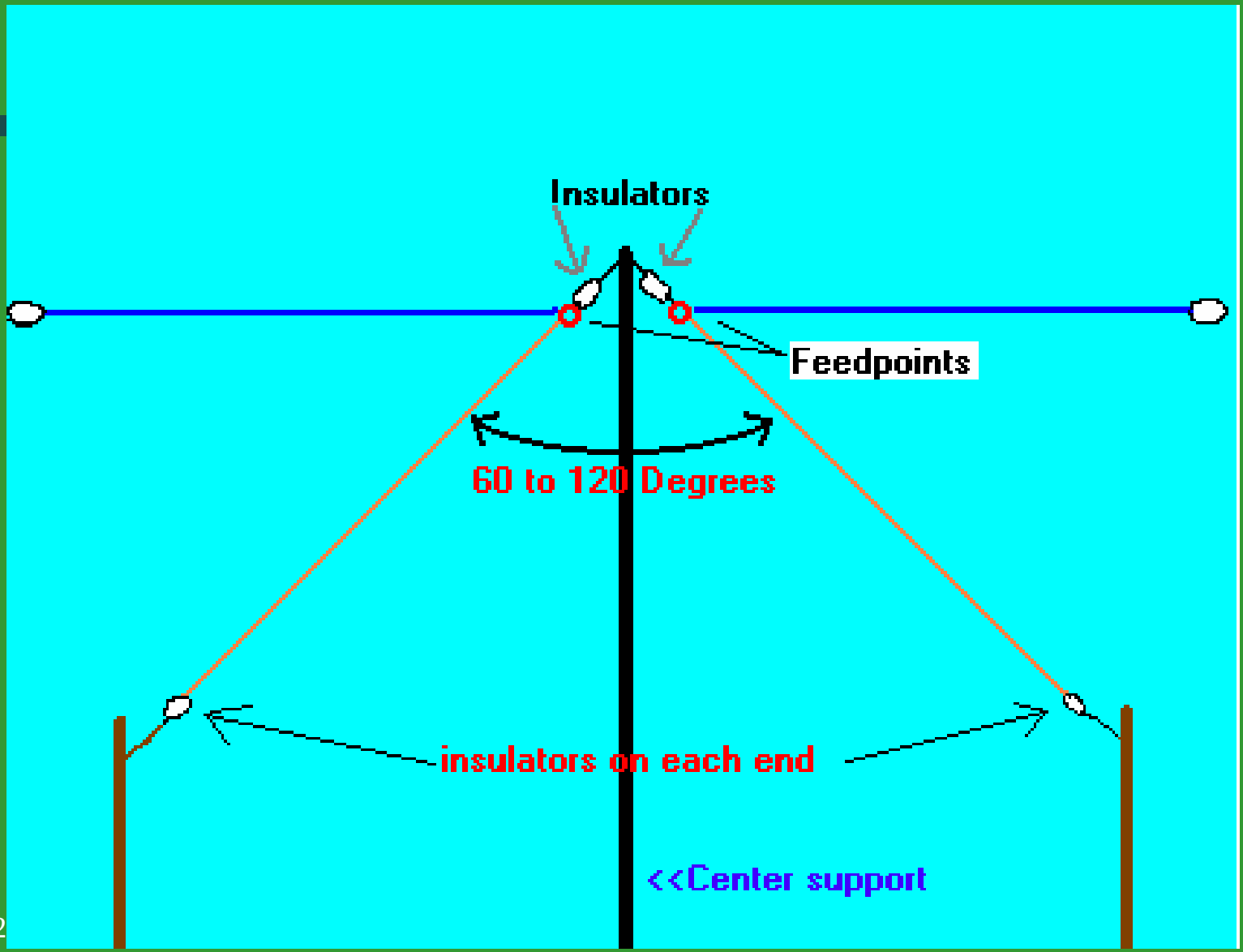
NVIS Deployment

- One of the most effective antennas for NVIS is a dipole positioned from .1 to .25 wavelengths (or lower) above ground.
- Heights of 5 to 10 feet above ground are not unusual for NVIS setups.
- The inverted vee is another good NVIS antenna so long as the apex angle is kept gentle--about 120 degrees or greater.

Half wavelength dipole with reflector



Inverted “V” Dipole



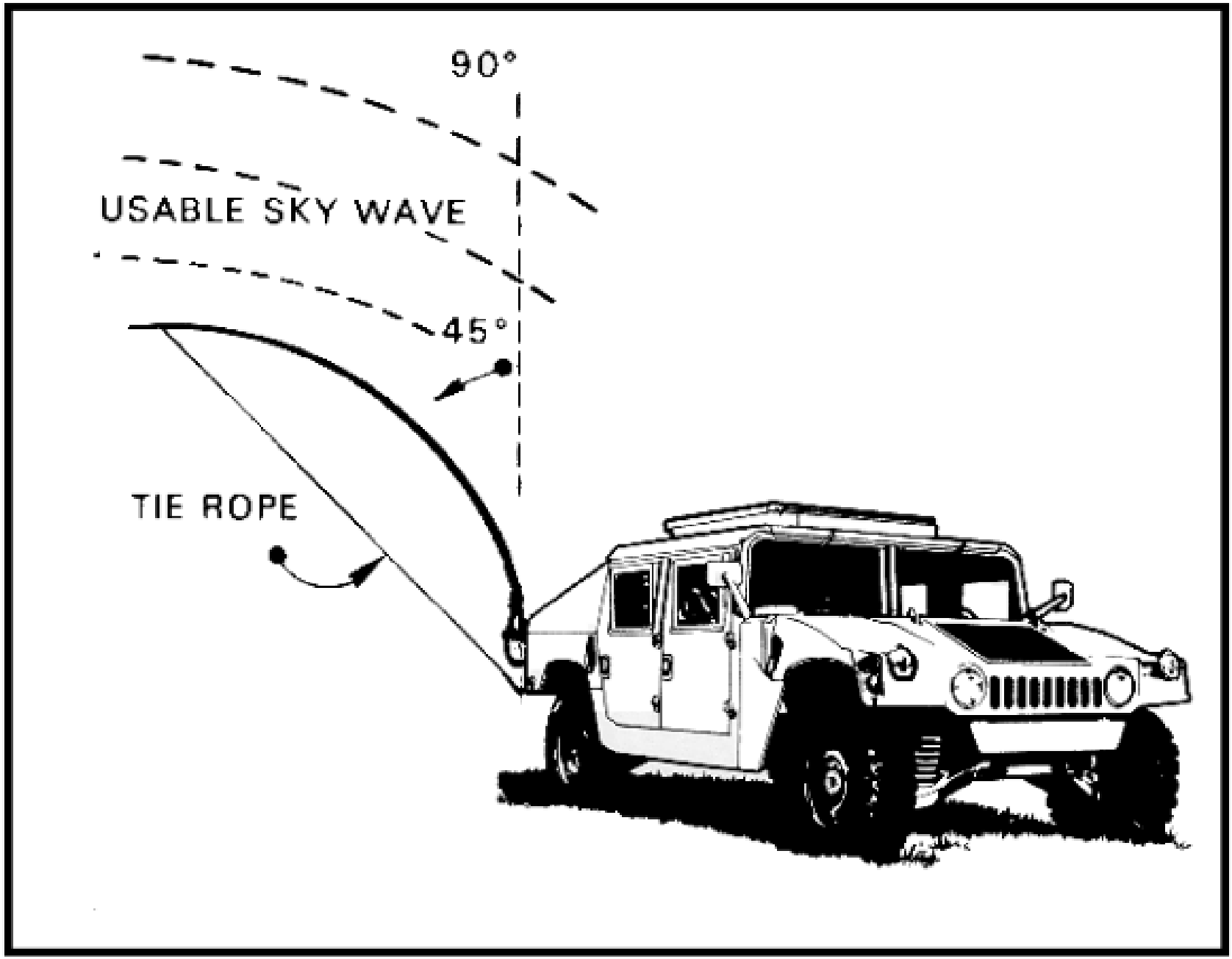
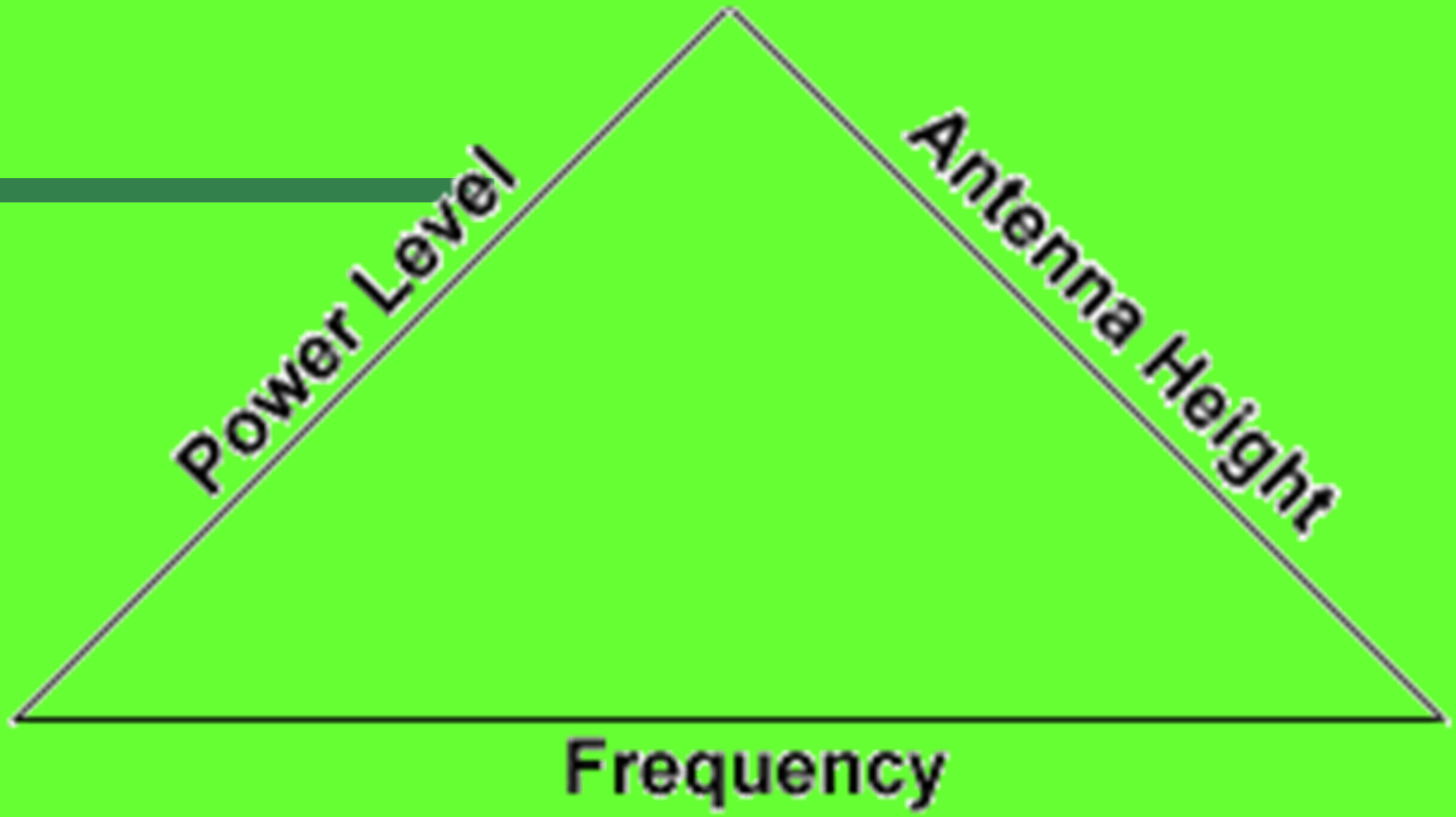


Figure M-9. Tying the whip antenna down.



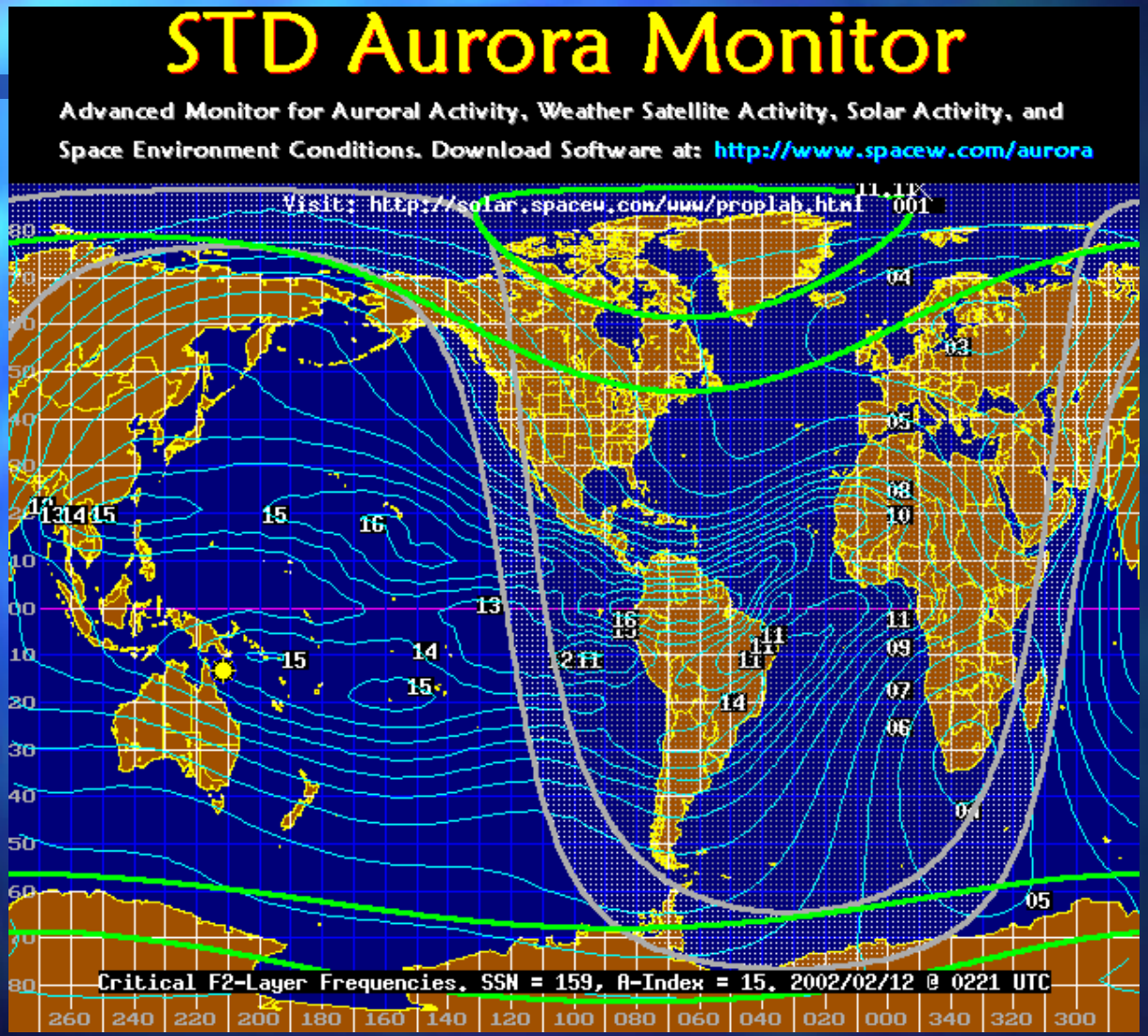
Frequency

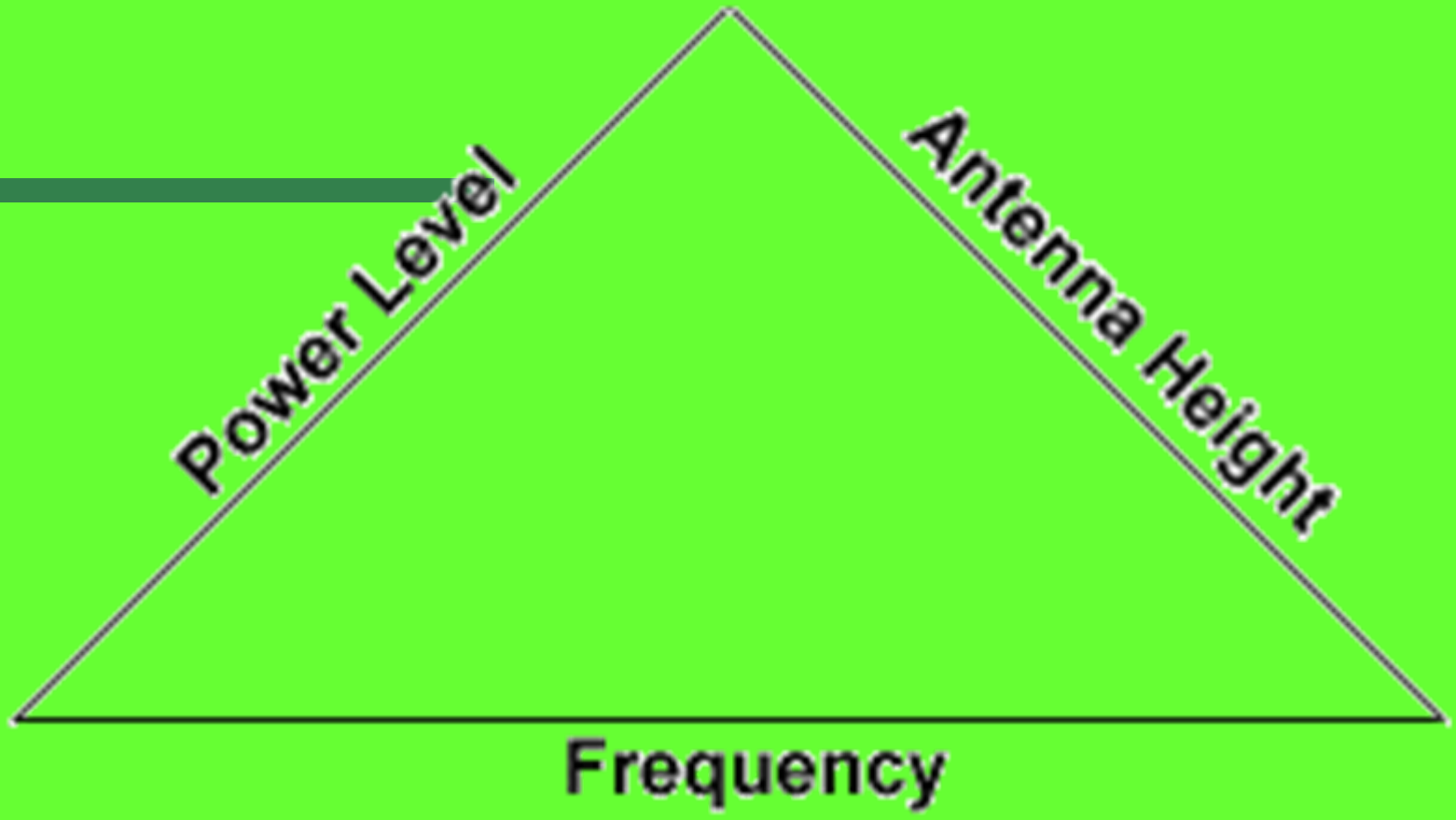
NVIS Deployment

- Typical frequency ranges used for NVIS are usually between 2.0 and 10 MHz.

- 37m band (8.0Mhz.) for daytime and 67m band (4.0Mhz.) for nighttime communications.

One example of propagation predictions available on the internet.





Power Level

NVIS Deployment

- With its improved signal/noise ratio and low path loss, NVIS works well with low power.
- 20 – 30 watts portable stations have a very high reliability factor making them very favorable for emergency operations.
- Low power stations can run ALE at 100% duty cycle.
- NVIS stations can generally be of the 100 watt variety.

PRC1099 HF transceiver, one of the HF types of radios you might use.

NVIS Conclusions

- By steering the take off angle of your signal, HF communications can be extremely reliable for the long haul, medium haul and short haul.
- NVIS and high angle waves are very effective for ranges of 200 to 300 miles and out to 800 miles.
- No need for third party support such as repeaters or satellites.

NVIS Conclusions

- NVIS is effective in any terrain.
- Makes HF a “self supporting” communications circuit.
- NVIS is easy to deploy and very portable.

- Questions???

- *TAKE A 15 MINUTE BREAK*


ETOC 1B