

The background features a large, faint watermark of the Radio Relay International logo. It consists of a central globe with a grid, surrounded by a circular border containing the text 'RADIO RELAY INTERNATIONAL' and a registered trademark symbol. Above the globe, the letters 'RRI' are prominently displayed within a shield-like shape.

Portable Emergency Communications

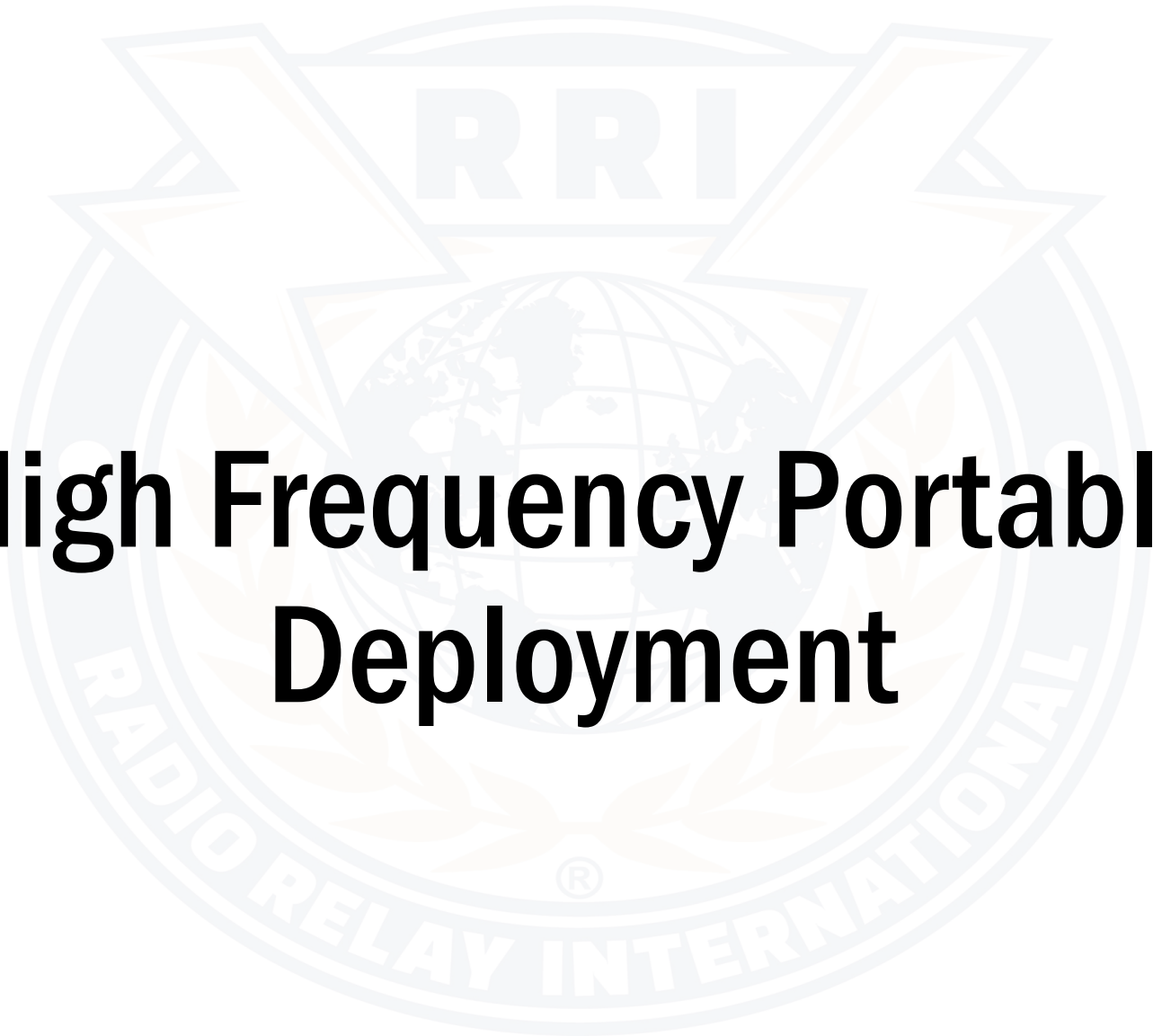
A radio amateur's guide to preparing for "the big one."

Typical Casual Portable Deployment

- One can establish communications with any convenient station.
- One communicates with locations that propagation favors.
- Communications is limited to simple, predictable exchanges (RST, QTH, Serial Number, etc.).
- Battery life is often of minimal concern.
- No need to deploy outside during inclement weather.
- Often no need to operate in the dark.
- No requirements to remain clandestine.

Emergency Communications

- **One MUST communicate with specific net stations.**
- **One MUST communicate over specific distances.**
- **One MUST communicate reliably and with good readability.**
- **Message content is unpredictable and complex.**
- **Operational period may extend over days.**
- **Renewable energy or logistical support needed to refresh power source (fuel for generator, new dry batteries, solar panels, etc.).**
- **Message forms must be kept in duplicate or copied to hard-drive for later reference.**
- **Accurate radio logs with comms summary MUST be maintained.**
- **Lighting, heat, or other ancillary requirements must be considered.**

The logo for the Radio Relay International (RRI) is centered in the background. It features a circular emblem with a globe in the center, surrounded by a laurel wreath. The letters 'RRI' are prominently displayed in a banner at the top of the emblem. The full name 'RADIO RELAY INTERNATIONAL' is written around the bottom edge of the circle, with a registered trademark symbol (®) at the bottom center.

High Frequency Portable Deployment

Is “QRP” enough?

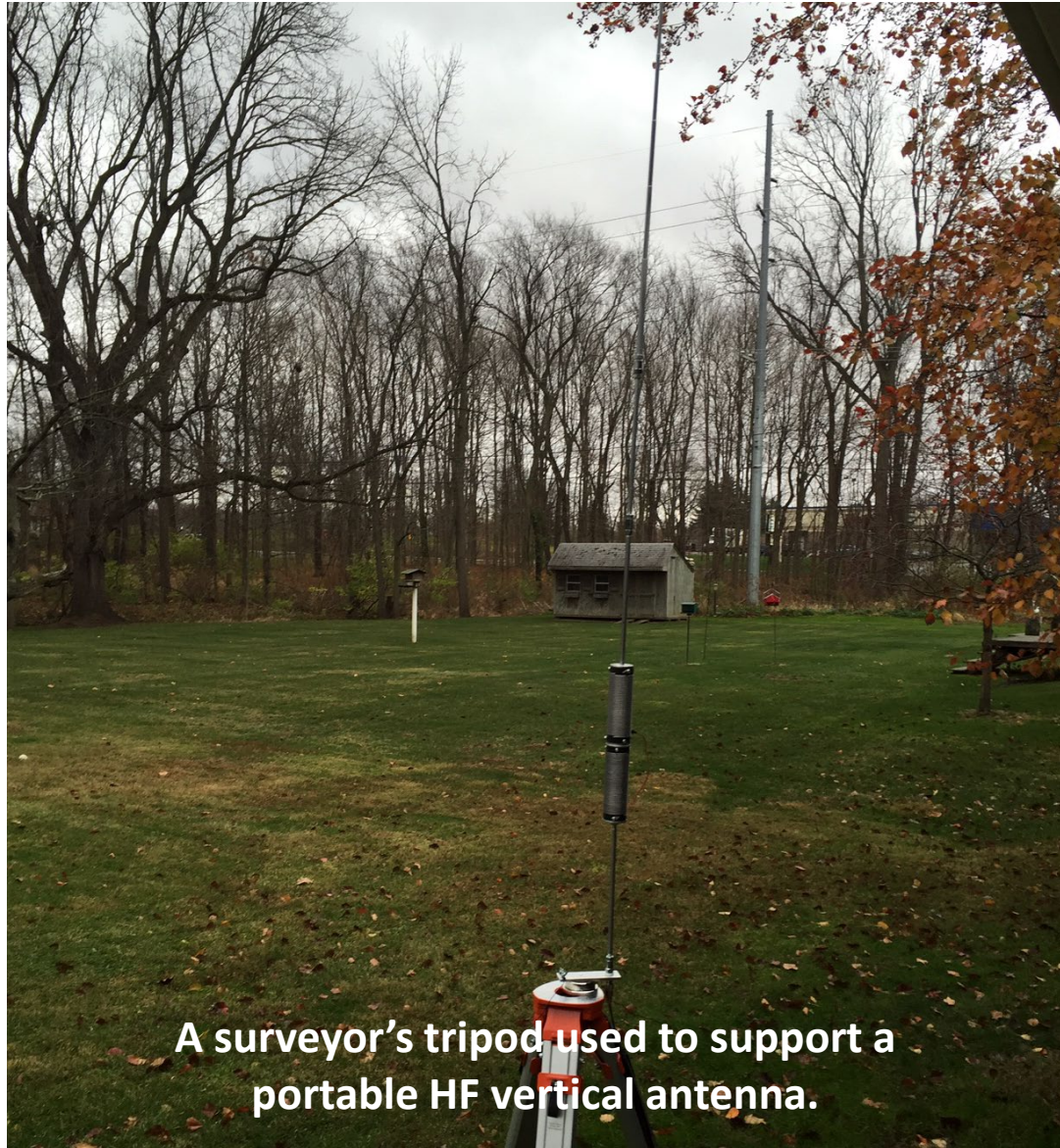
- The general answer is “sometimes.”
- Military experience shows a 20 to 30 watt *option* is necessary in some cases.
- Radio Relay International disaster exercises confirm military experience.
- Five watts can work under many conditions provided control station or other point-of-contact has an *effective* antenna system.
- Narrow-band modes offer better performance (signal/noise ratio).



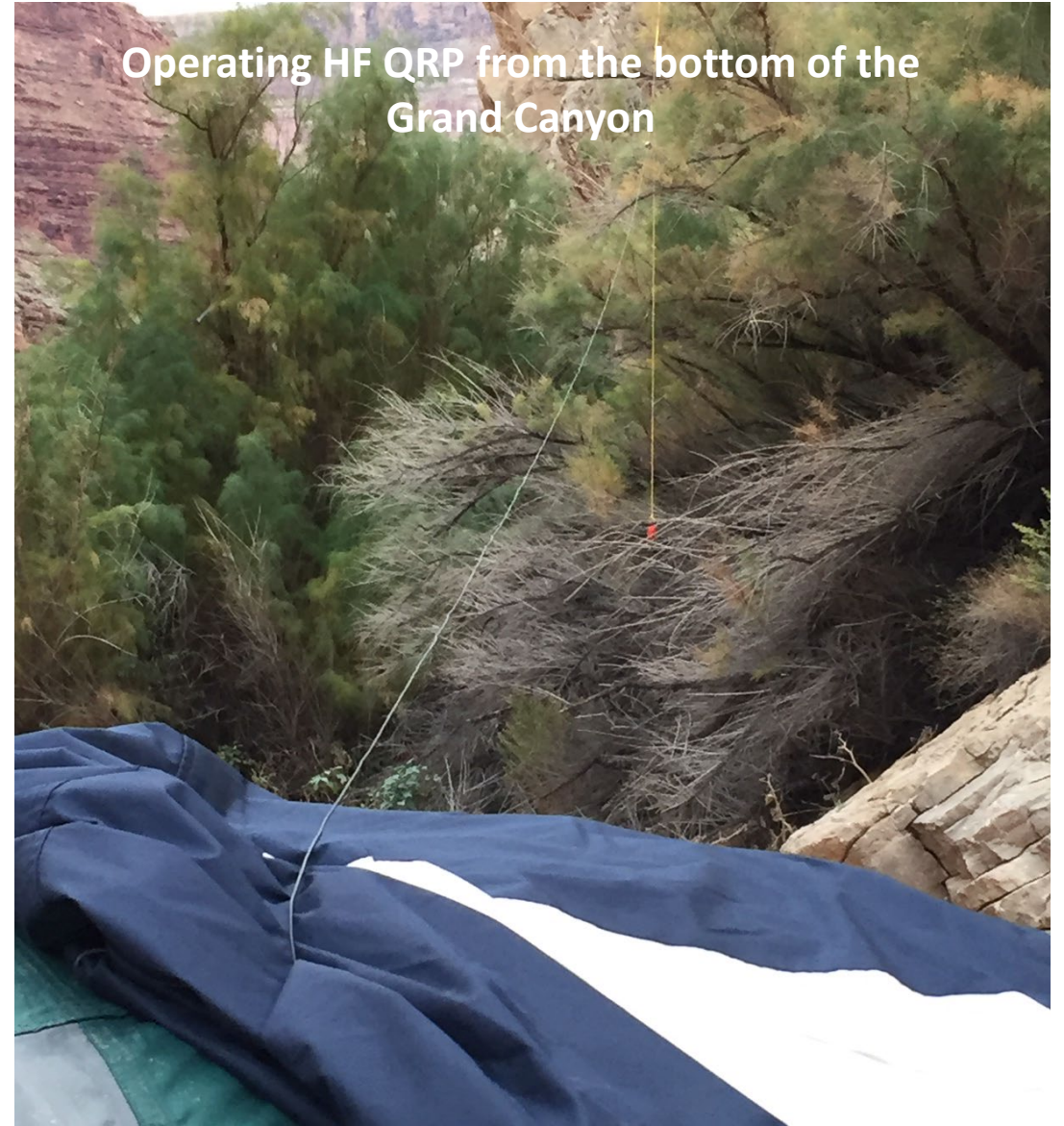
Antenna Efficiency

Random Wire

- A Random wire must work against an effective counterpoise or ground system.
- Elevate a counterpoise when practical – isolates system from I-squared-R losses in soils.
- Push-in ground-rod(s) may prove helpful.
- Lengths less than a quarter wavelength tend to exhibit lower radiation resistance (lower efficiency).
- Efficiency of a tuner or balun may influence efficiency. Greater impact at low power levels.



A surveyor's tripod used to support a portable HF vertical antenna.



Operating HF QRP from the bottom of the Grand Canyon

Antenna Efficiency

Verticals

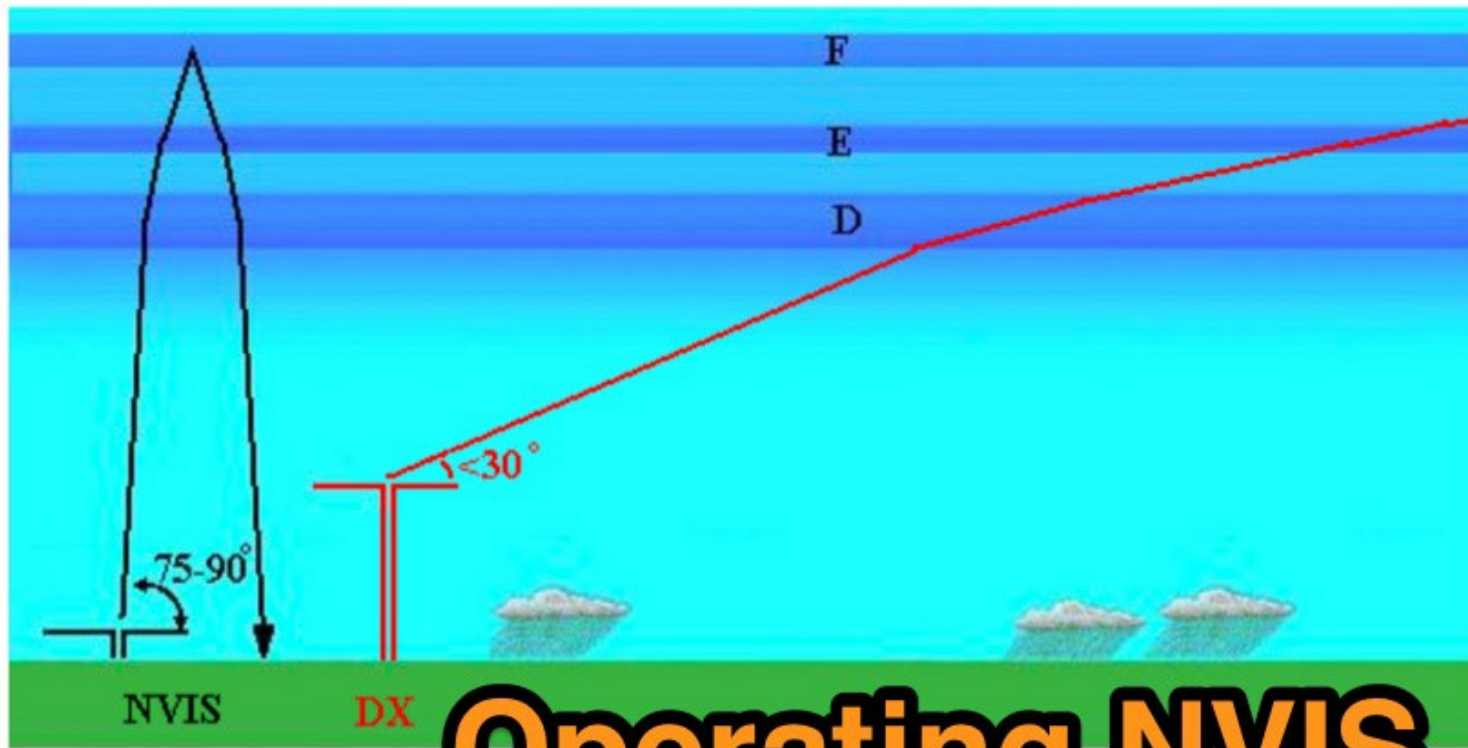
- Same rules apply to ground system or counterpoise.
- Elevate the counterpoise when practical – isolates system from I-squared-R losses in soils.
- Loading coil design and quality influences efficiency.
- Loading coil position influences efficiency; center loading more efficient than base loading.
- Utilize an antenna analyzer to determine tap point on multi-band coil.
- May not offer good NVIS performance.



Antenna Efficiency

Dipole Antennas

- Dipole antennas offer reasonable efficiency but transmission line can add weight and bulk.
- Poor quality coaxial cable can introduce losses.
- Height remains important, but NVIS can offer advantages for moderate distances (state wide coverage).
- Inverted-V arrangement requires only one support. Tent stakes, bricks, or weight plates can secure ends.
- End-fed halfwave antennas with “un-un” matching network can offer a good compromise between random wire and dipole.



Operating NVIS

Lower antenna height
+
Proper frequency
selection
=
Regional coverage

*NVIS may be ideal for
statewide coverage.*

Modes - CW

- For lightweight HF operation, CW is the best all-around mode – assuming qualified operator(s) available.
- Low power consumption.
- More efficient than voice methods for given RF power level.
- NO ancillary devices (computers, sound card interface, modems, etc.).
- Easy to protect from elements (only key need be accessible).
- Human brain transcribes record message traffic – no need for printer.

There is a reason the military used CW well into recent years!

Modes – Voice (SSB)

- Ubiquitous – a common denominator.
- Simple equipment.
- Less efficient than CW for given power level.
- Conveys record message traffic at a slower rate.
- Human brain transcribes message traffic – no printer or ancillaries needed.
- Less accurate than CW or digital when conveying complex or technical information.
- Operator(s) must have solid traffic handling skills (experience using proper phonetic alphabet, proper prowords, etc.).
- Circuit discipline is essential to maintaining efficiency.

Modes - Digital

- **Automated modes (PACTOR) available.**
 - RRI Digital Traffic Network
 - Winlink
- **Narrow bandwidth modes offer better efficiency for a given power level.**
- **Require computer and perhaps peripherals to power.**
- **Printer and paper can be affected by damp, humid weather.**
- **Some narrow-band modes not well suited to record message traffic.**
- **A complete digital station may require generator, fuel, etc.**

Digital modes are often most practical when deployed inside a structure , building or mobile command post.



VHF – UHF Comms

VHF-UHF Antennas

- **Antenna height is always a factor.**
- **Seek a balance between transmission line length, coax quality, size/weight during transport.**
- **Roll-up J-Pole antennas with transmission line can be hoisted high into a tree or other support to gain height.**
- **Directional antennas may prove beneficial for reaching a distant repeater or for establishing a point-to-point circuit.**
- **A small UHF Yagi antenna can be supported easily by small tripod – commonly done with broadcast RPU antennas.**

Communications Security

- **Primary concern: media intercept.**
- **Goal of emergency management and NIMS process is to have unified, single-point source of public information.**
- **Information overheard on scanners may be taken out-of-context and start rumors or otherwise prove problematic.**
- **Use something other than FM for sensitive information. Understand message prioritization.**
- **FLDIGI and similar digital methods are usually sufficient to deter media intercept.**
- **VHF or UHF SSB and CW also offer excellent confidentiality when required.**

Power supply

- **VHF/UHF operation often requires lower RF power output than HF methods.**
- **Gel-cells or a small deep-cycle marine battery can operate a VHF-FM transceiver at 5-watts for days.**
- **Hand-held transceivers are best equipped with dry-cell battery pack option. A box of alkaline AA-batteries can easily maintain operation for 48 to 72 hours.**
- **Include a 110-VAC power supply if possible in case generator power is available.**
- **As with HF operations, a solar panel may prove suitable as a renewable energy source. Charge one battery while utilizing a second battery.**

Maximizing VHF/UHF preparedness

- **Have an extendable antennas for VHF handhelds – much better performance than a “rubber duck” antenna.**
- **Consider building a small man-pack unit to facilitate use of a higher power VHF transceiver.**
- **Make a laminated chart of frequencies for nets and repeaters in your region.**
- **Be prepared to use alternate frequencies/repeaters.**
- **Be prepared to use alternate bands (e.g. 440-mHz instead of 144-mHz) when in RF dense areas (i.e. incident command post, etc.).**
- **UHF usually offers better building penetration.**



Administrative Details

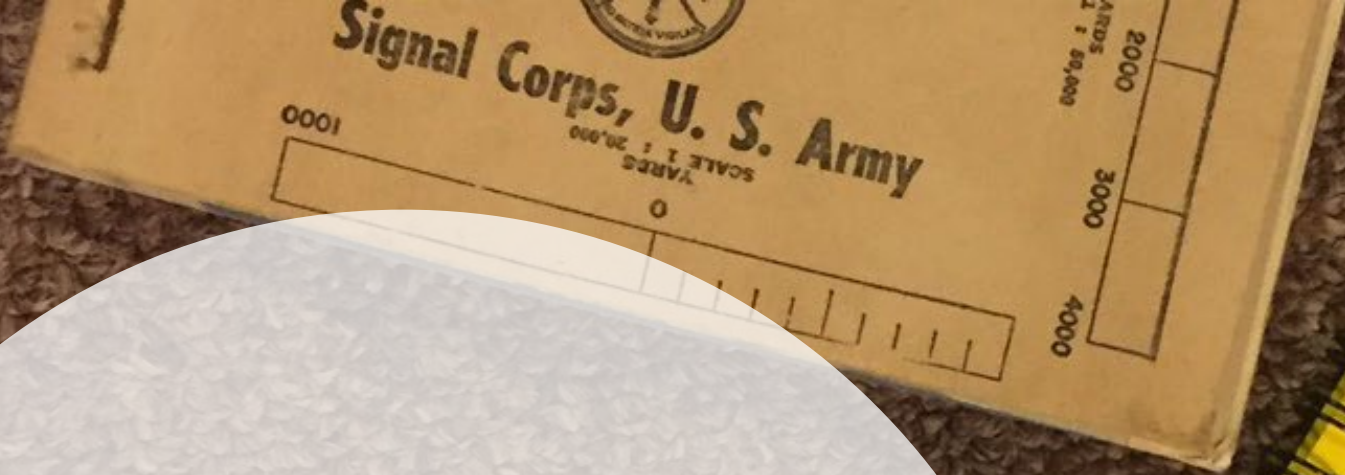
Tactical vs. Record Message Traffic

- **Understand the difference.**
 - Tactical communications is typically first-person instructions or general information.
 - Record message traffic is typically data that must be retained accurately or information that must be transcribed for delivery to a third party (with a copy retained by the radio operator).
- **Most VHF/UHF traffic will be tactical, but be prepared to handle both.**
- **Radio logs summarizing tactical communications can prove very valuable. Expect to be queried about past details during an operation (e.g. “What was the ETA on that water buffalo?”).**

Records/Traffic

"The more things change, the more they stay the same."

- Old fashioned paper and pencil is often the best option.
- Message blanks in duplicate (carbon/self carbon) are readily available from office supply sources.
- "Rite in Rain" notebooks are ideal for field deployments.
- Pencils don't "bleed" in wet weather and remain functional in cold weather. Ideal for use with "Rite in Rain" products.



Example: Adams SC1158

- Readily available from office supply sources.
- Carbonless duplicate on matching yellow form for records.
- Suitable for radiogram or ICS213 message.
- Comes in a book of 50 message blanks.
- Ideal size for placing in go-kit.
- Write or print neatly!

RAPID MEMO

Space for administrative data, message preamble, etc.

TO	DATE
	SUBJECT

Area for message text

Signature, title, agency can be placed at bottom of form.

Adams SC1158

Interoperability

- **Format and transcribe message traffic in all-capitals: This CLEARLY indicates to originator and addressee that message is non-case-sensitive.**
- **Spell-out any scientific abbreviations, which may be subject to misinterpretation (e.g. “millibars” instead of “mb”).**
- **Understand that messages may be transferred to voice networks, delivered by telephone or conveyed by other non-case-sensitive methods to achieve delivery.**

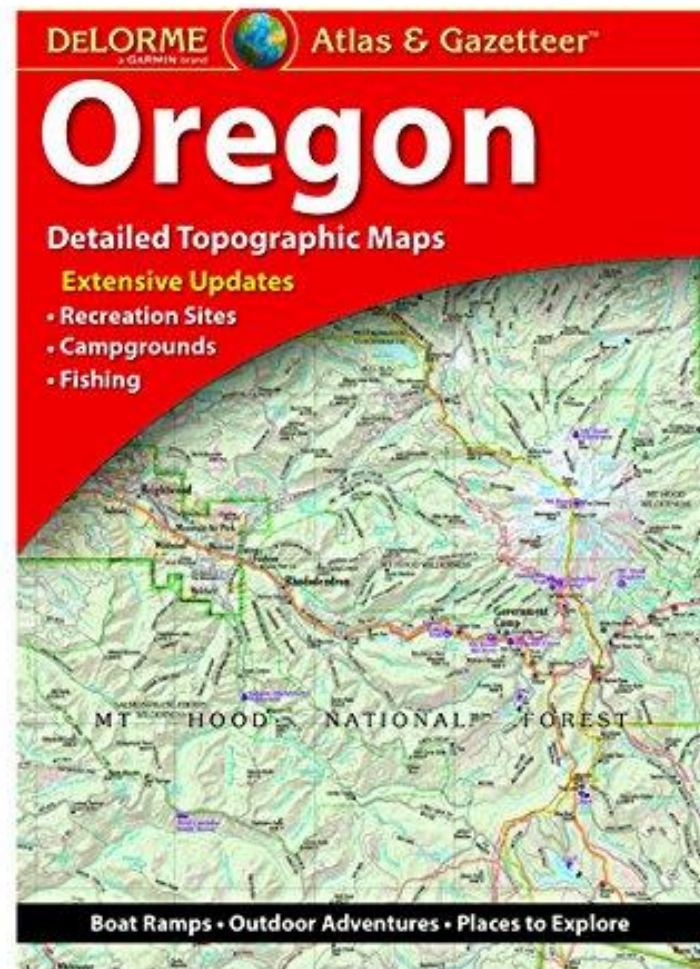
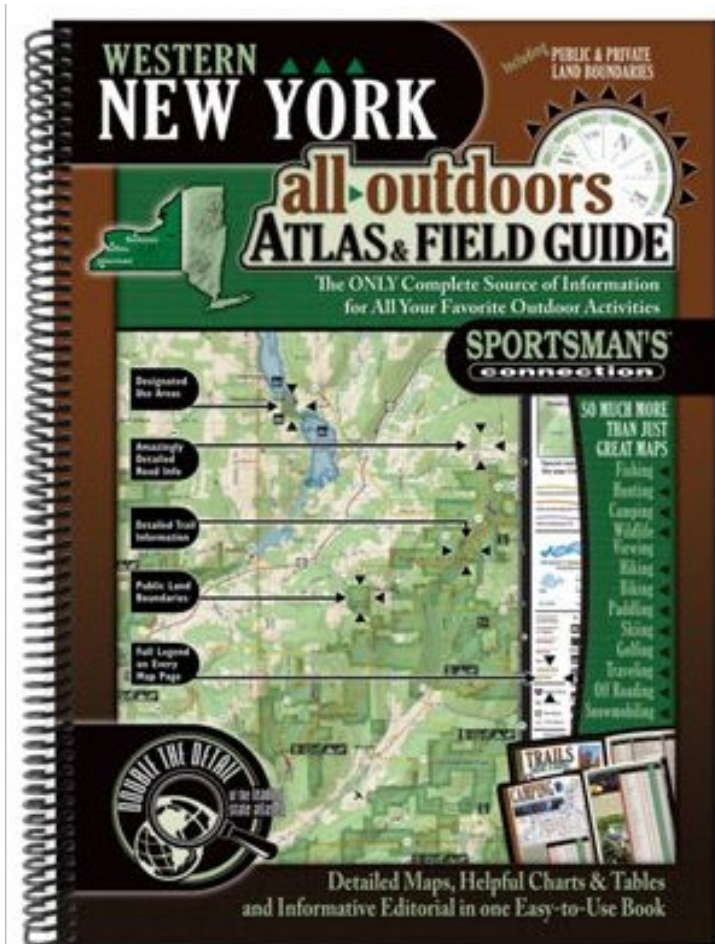
Traffic Exchange Interoperability Examples:

- Amateur digital circuit to Amateur VHF/UHF voice circuit.
- Amateur digital circuit to EOC message router to public safety voice talk-group for delivery to an official in the field.
- Telephone call to EOC message router with message transfer to Amateur Radio digital network to reach a remote incident command post.
- Winlink e-mail addressed to an official, which is then retrieved by an assistant for delivery to addressee in the field via voice two-way radio.
- RRI DTN (Digital Traffic Network) to DTS (digital traffic station) to state/section voice or CW net.

The “last mile” connectivity situation may vary from message to message. Use mixed-case *only* if there is reasonable assurance the message will be conveyed by digital methods and printed for delivery at its destination.

Other Details

- **Extra pens and pencils with small pencil sharpener.**
- **Maps of your state or region – excellent detailed state map books are often available at sporting goods stores for use by hunters and anglers.**
- **“Posse Box” or similar combination binder/clip board can be helpful.**
- **Waterproof container for storing electronics can be helpful – 50 caliber ammo cans are ideal.**
- **Extra DC power cables, DC-adapters, RF-adapters, and spare flashlight batteries should be included.**



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Clandestine Operations

When it's important not to be noticed!



Security Considerations

- Disaster areas present security risks.
- Example: Ham radio equipment stolen in Puerto Rico during Hurricane Maria response.
- Example: A limited “WROL (without rule of law)” such as that after Hurricane Katrina can occur.
- **In some cases, it may be best to not draw attention to a communications deployment.**
- If interfacing with the public, collect welfare messages at a secondary location, then transport them to a temporary communications site. **Avoid being followed.**

Security Considerations

- A noisy generator **will** attract attention.
- Generators and gasoline are a major target of theft.
- Loud speaker operation may attract unwanted attention – use “cans.”
- Food and water supplies may be a target of theft.
- Sanitation and medical supplies are an important consideration.

Ideally, emergency communications services will be integrated into the NIMS process with security provided by law enforcement. However, there may be cases in which radio amateurs must act unilaterally to fulfill an EmComm need in their neighborhood or community during the early hours or days after a disaster strikes.



Intelligence - Understand your environment

Emerging risks:

- **Civil unrest**
 - **Hazardous materials releases**
 - **Pending levee breaches**
 - **Additional infrastructure failures**
 - **After-shocks, severe weather.....etc.**
-
- **Monitor public safety channels.**
 - **Monitor broadcast media.**
 - **Verify overheard information – avoid rumors.**
 - **Collect situational awareness data via *National SOS Radio Network* and *Hamwatch* programs.**
 - **Intel Functions often best performed off-site and transmitted as SITREP summaries to those deployed.**



Lighting and Shelter and Sanitation

Lighting



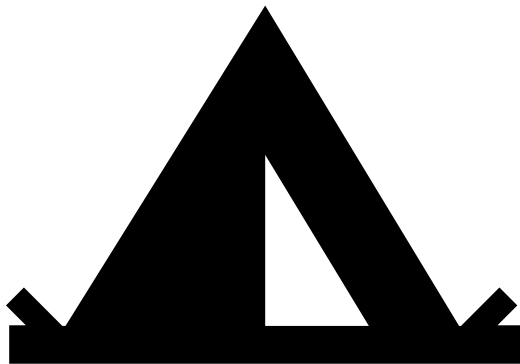
Gasoline Lanterns:

- Additional warmth during cool/cold conditions.
- White gas up to 13 times more efficient than propane.
- Plenty of bright, broad light with minimal shadows.
- Advantageous for area lighting.
- Do not use in confined, poorly ventilated spaces.

LED/Flourescent Lanterns:

- Come in small sizes (ideal for go-kit).
- Operate for reasonably long periods of time (several days).
- No liquid fuels to transport. No need to refill.
- No special instructions or experience needed to operate.
- Note: Some LED and fluorescent lanterns generate RFI

Shelter



- **Essential for deployments during adverse weather.**
- **Tremendous variation in options. Consider:**
 - **Proximity to served agency/community.**
 - **Suitability for antennas, generator, power source.**
 - **Low RF noise floor (survey with small transistor radio).**
 - **Security – avoid high risk locations.**
 - **Avoid power lines and communications cables.**
- **Temporary shelters, such as tents or screened awnings should be easy to set-up and easy to strike.**
- **Folding tables and chairs should be easy to transport and lightweight.**

Sanitation

- Portable toilets.
- Hand sanitizer.
- Paper towels.
- Kitty Litter.
- Slit latrine if absolutely necessary.

- Don't forget the need to control flies and odor – Lime.
- Avoid disease transmission.
- Some level of privacy usually expected.



Food

“Une armée marche à son estomac! (An army marches on it’s stomach).” – Napoleon

- Communications volunteers must eat and drink.
- Water: 2 gallons = 7.5 days drinking water for one person.
- Non-perishable food.
- Coffee is easy to transport and prepare.
- Canned goods, MREs, other simple items.
- Simple camp stove can provide cooking/warming service.

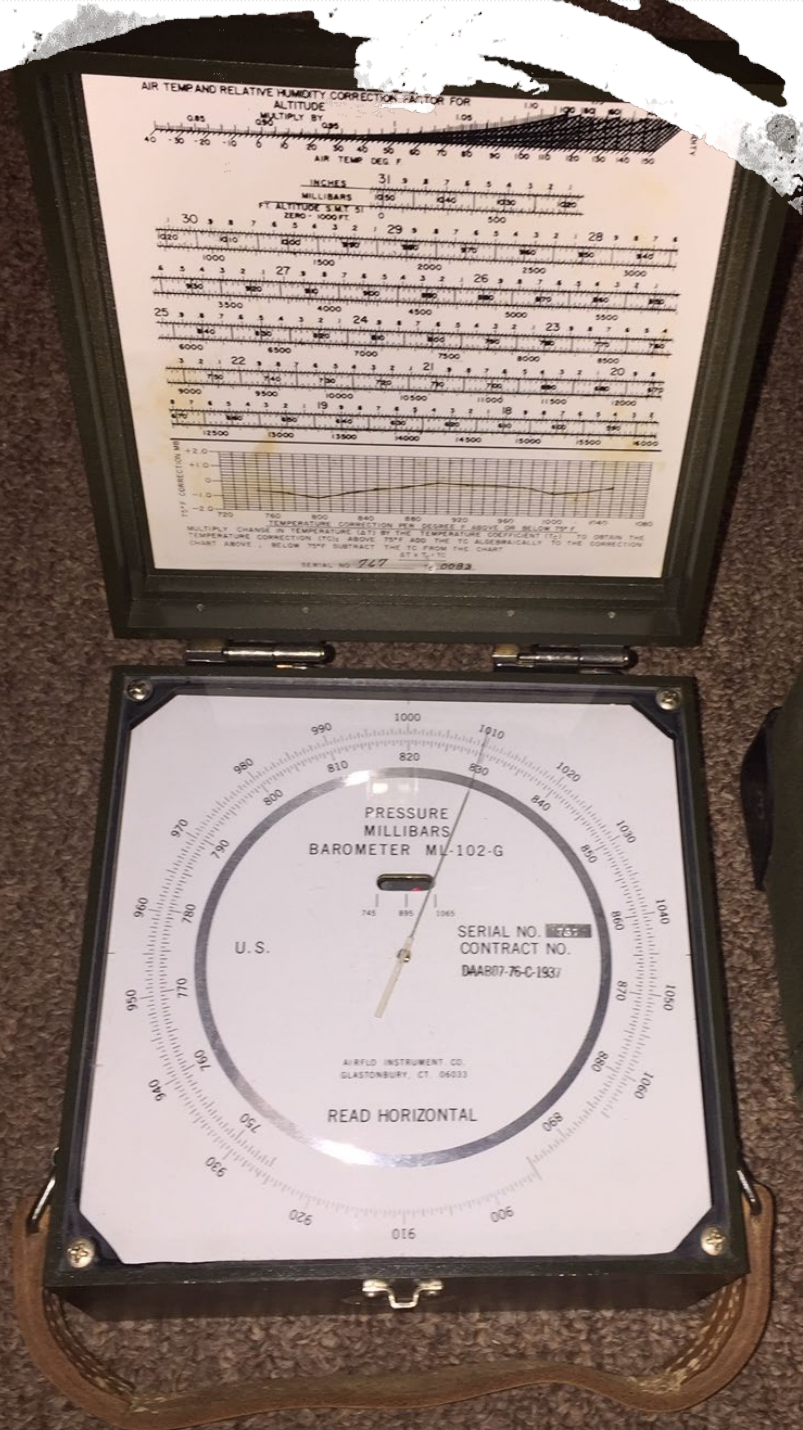


“Everybody complains about the weather, but no one does anything about it”

– Charles Dudley Warner

- Weather data is important during many disasters.
- The Internet and cellular data networks will be unavailable.
- Have alternate sources for weather data, alerts, warnings.
- Be “weather wise.” Have a basic understanding of meteorology to facilitate making your own forecasts and judgments.

Meteorological Considerations





Go-Kits

Go-Kit Philosophy

- **Many options and ideas.**
- **Develop a scalable approach.**
- **Minimal kit for day-to-day – no anticipated emergencies.**
- **Basic kit for higher risk situations – contains the basics.**
- **Advanced groups of accessories staged for major deployments.**
- **Keep emergency equipment in one-place. Dedicated set of shelves in basement, garage or shack.**
- **Test equipment regularly in the field (RRI disaster exercises).**
- **Do NOT pilfer or borrow items (RF adapters, DC power cords, etc.).**

The minimum

A waterproof container with:

- Small multi-band HT
- DC power cable
- AC charger
- Adapter to connect to PL-259
- Small notepad and pencil
- Spare battery pack

Waterproof container: \$ 4.95 at
"Aldi's"

Can be left in car or carried in
overnight bag.



Example: A Basic Go-Kit

- HF and VHF capabilities.
- Basic antennas.
- 12-VDC gel-cell battery.
- 120-VAC charger.
- Morse keys, microphone, etc.
- VHF-FM HT.
- Miscellaneous accessories.

Will show contents next slides.





Inexpensive flashlight (LED)

Compass

FRS Radios

Head Lamp



Gel-Cell Battery

Inexpensive Multimeter

Pens/Pencils

Mini LED Lantern

Various power cables

VHF-HT

Paddles for CW and Microphone



"Rite in Rain" Notebook

HT

AC Charger

VHF Roll-up J-Pole

FT-817ND & Tuner

Slick-line & Throw Bag

Straight Key

"End-Fedz" 1/2 wave antenna and coax

More RF Power?

- 50-watt HF amplifier.
- Automatic tuner and balun.
- AC power supply.
- Interconnect cable for FT-817ND.
- Desiccant pack.
- Inside a sealed Ammo Can.



More Battery Power?

- Two 12-V gel-cell batteries.
- Solar panel regulator.
- Room for AC charger(s).
- Misc. DC cables/adapters.
- One can be used while the other is charging.

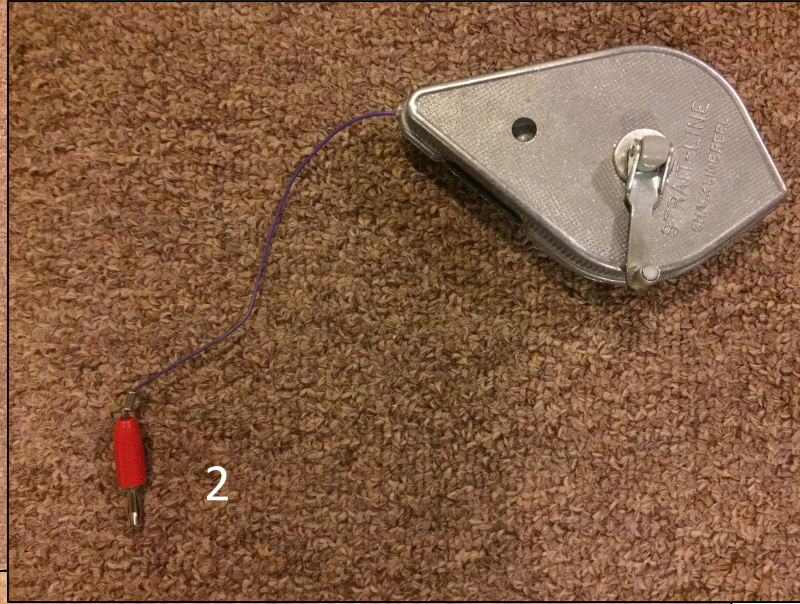


Solar Panels

- Can support low-power operations indefinitely provided the panel is sized properly.
- Use a good-quality solar panel and regulator. Efficiency is critical.
- Foldable solar panels are easy to transport and less likely to be damaged.
- Test under a variety of seasonal and environmental conditions.



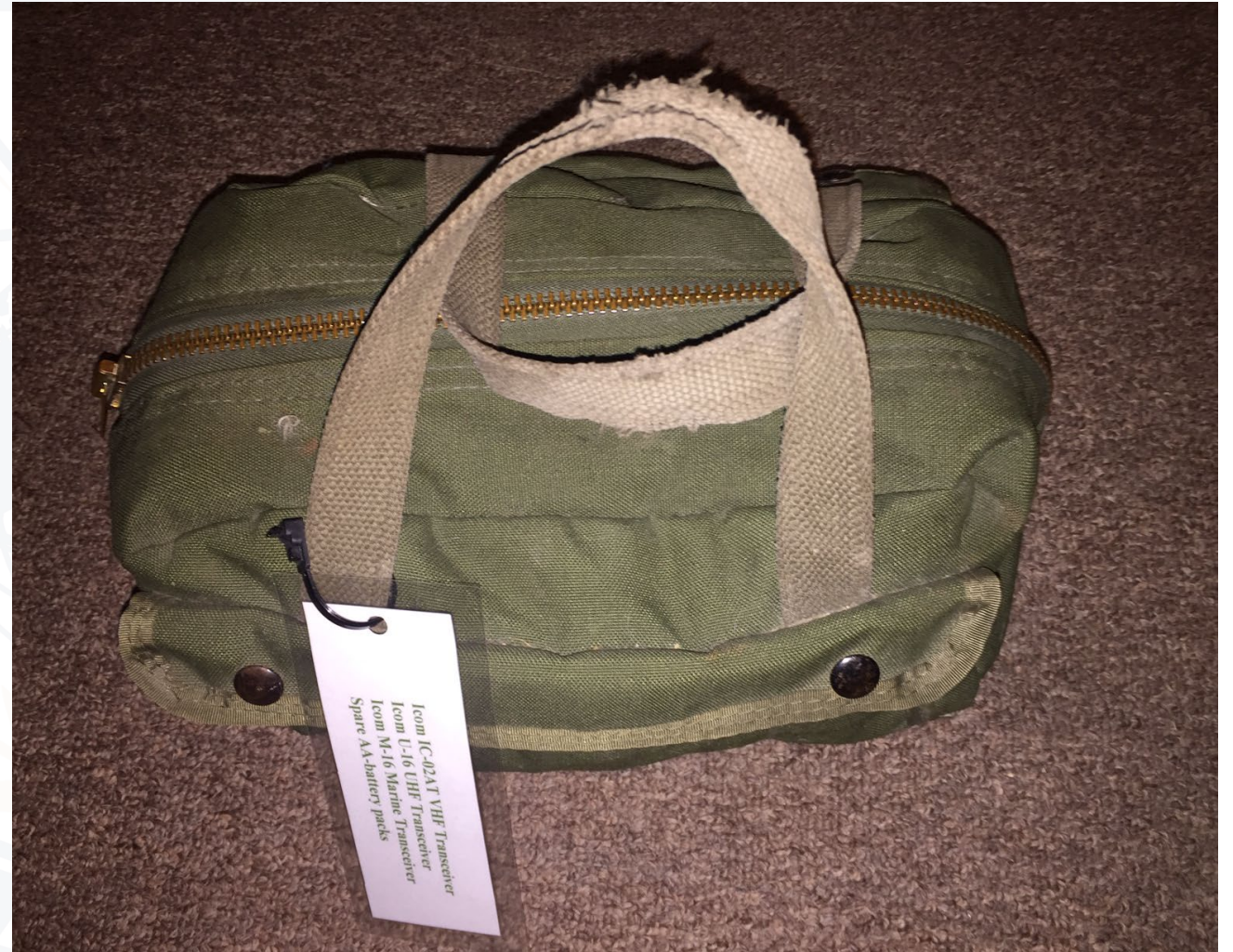
Misc. Antenna Options



1. Military Dipole Kit.
2. Home-made random wire on chalk-line spool.
3. Tape-reel dipole unit.

Additional Hand-held Radios

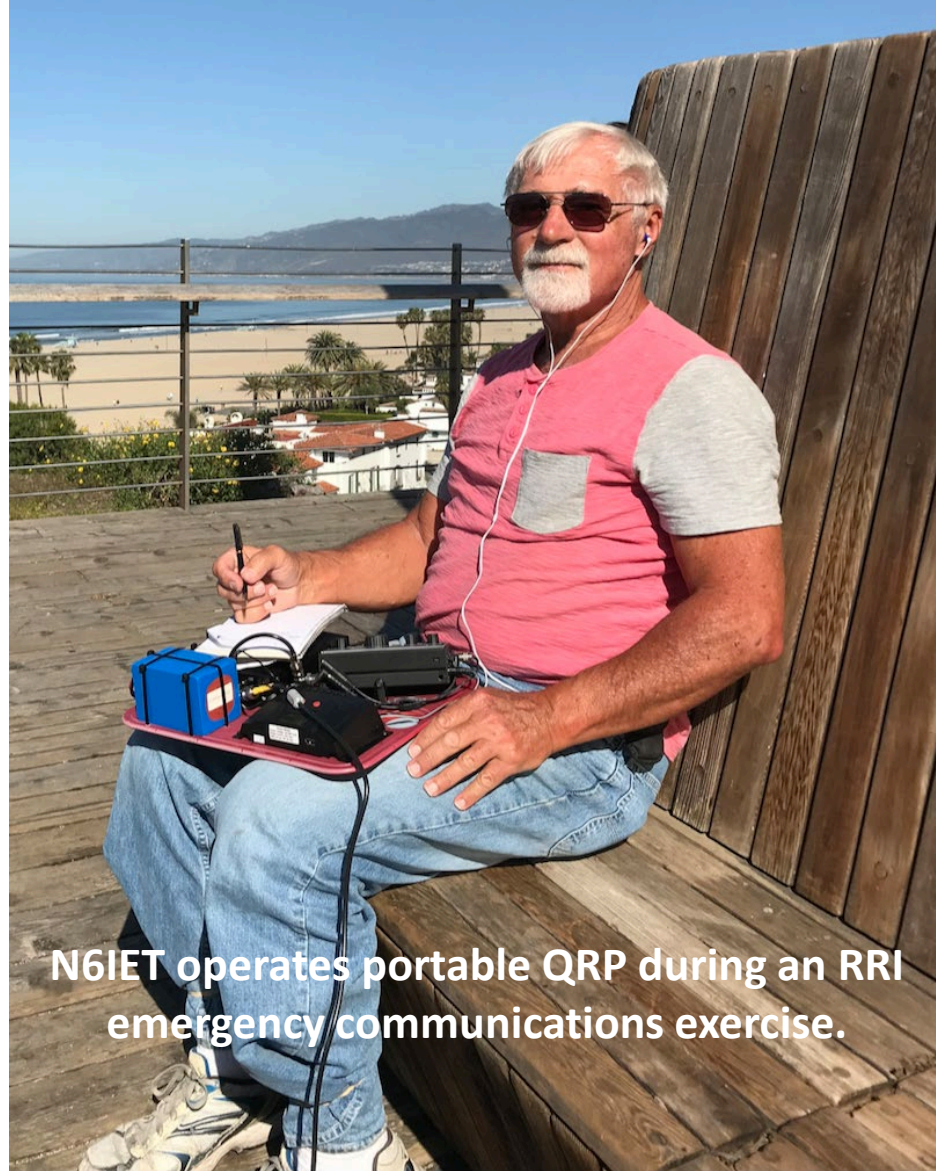
- Have the capability to use Alkaline AA-cells.
- A long-range, extendable antenna can prove helpful.
- Interchangeable battery packs can prove helpful.
- A universal tool, but limited in power and range.



1. VHF Handheld.
2. Marine band handheld.
3. UHF Handheld (commercial version).
4. Three spare alkaline battery packs.
5. Standard antennas.
6. VHF Long-range antenna.

Note: All HTs use same battery packs and charger.





N6IET operates portable QRP during an RRI emergency communications exercise.

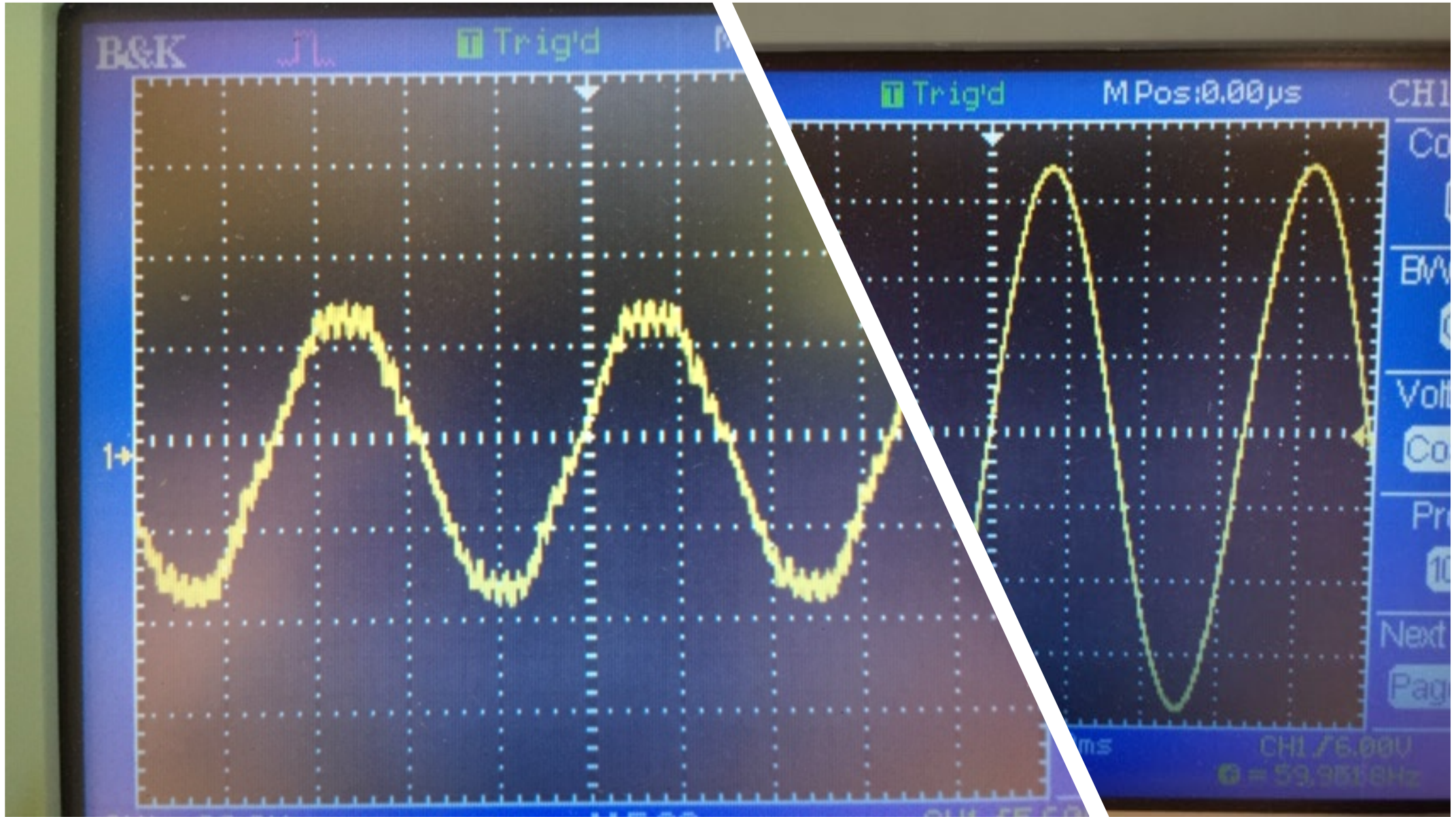
K9ZTV deploys a portable mast designed to support a dipole or light weight VHF/UHF antenna.



Generators

- Require gasoline, which can prove a scarce commodity in a disaster area.
- Older, high-RPM generators can produce noise (ringing) on waveform that is problematic for some modern switching power supplies.
- Inverter generators offer a clean sine wave, better suited to modern electronics.
- Ground the generator.
- Keep it some distance away from building or shelter.
- If not provided, incorporate a fuse or circuit breaker in the output circuit.
- Monitor voltage and current draw if possible.





Left: 60 Hz waveform from an older generator.

Right: 60 Hz waveform from modern, inverter generator.

Gasoline

- Keep at least 10-gallons on hand.
- Use a proper safety can.
- Do NOT fill the generator while its running.
- Gasoline doesn't age well. Periodically cycle stored gasoline through yard equipment or autos.
- "Sta-bil," "Seafoam" and similar additives can improve the longevity of stored gasoline and protect engines.



Final Thought.....

It is not enough to establish communications. One must also communicate effectively.

- Learn proper traffic handling techniques and efficient radio procedures.
- Learn how to keep an accurate radio log with an accurate summary of tactical communications, catalog messages for later reference, and be prepared to handle third-party messages.
- Be brief and accurate in all communications. Encourage served agencies to do the same.
- Always consider interoperability. A message may originate on a digital circuit only to be transferred to a voice circuit to reach its final destination. “Brevity is the soul of wit (and emergency communications).”

Radio Relay International



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www.qni-newsletter.net

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