Getting the Most from Your Hand-Held Transceiver

Ed Harris, KE4SKY, Virginia RACES State Training Officer

If repeaters are unavailable after a disaster and you are limited to simplex operation, a portable transceiver with its original flexible antenna is inadequate for emergency communications.

I started with a "handy-talkie" or "HT" when I first got my ham license. Today, as Virginia RACES training officer I recommend that new operators buy 2-meter mobile transceivers. They cost no more than a portable. Today's equipment is compact, rugged and reliable. For portable operation, carry the mobile transceiver in a briefcase with a 17ah-gel cell battery and telescoping 1/2 wave or magnetic-mount mobile antenna. Include 25 feet or more of coax to get the antenna up high, away from people. This arrangement may not work for everyone. Therefore, if all you have is a portable transceiver, the following will help you to Amake the most of it!≅

An "HT" makes perfectly good sense for*:*

- Anyone who doesn't drive;
- Commuters who use public transportation;
- Controlling a mobile radio as a cross-band repeater
- As a Aspare,≅ backup or loaner.

The National Institute of Science and Technology tested Public Safety "high-band" VHF and amateur 2-meter antennas. Flexible antennas commonly used on portable transceivers have -5db, Anegative gain@compared to a quarter wave whip held at face level. This means that 5-watt portable VHF with stock antenna has an effective radiated power of only 1-watt. Placing the portable on your belt produces -20db of attenuation, reducing EIRP to 50 milliwatts! UHF results are no better...

"Rubber ducky" antennas are rubber covered helical springs, which are intended to withstand some rough handling, but they are not indestructible. Flexible antennas used on California fire lines for several weeks showed a 60% failure rate. Flexible antennas should be replaced annually or as soon as they show ANY apparent kinks, cracks, abrasion or other wear to visual inspection.

An effective expedient to improve a flexible antenna is to attach a counterpoise (19.5" long for the 2-meter band, or 6.5" for the 70 cm band) of stranded wire, crimped and soldered to a battery clip or ring terminal which will fit over the antenna connector. Reinforce the soldered connection with heat shrink to resist flex. When attached to the outer collar of the BNC connector or the antenna shield, the counterpoise prevents transmitted RF from coupling with your body. This enables it to perform like a center-fed dipole, instead of an "end-fed dummy load!" The main lobe of the radiation pattern can be "aimed" by, grasping and pointing the end of the counterpoise in the direction where you need a stronger signal.

Some after-market and home-made antennas perform much better than the standard helical "rubber duck." A J-pole antenna constructed of 300-ohm twin-lead rolls up and fits into your pocket. When thrown up in a tree, it increases both height and gain. Full-sized, flexible 1/4 wave and telescoping 2-wave antennas work very well. A quarter wave provides unity gain when used with a counterpoise and held at face level. This represents a 5 dB improvement over a stock flexible antenna, because most of the effective signal is radiated. If operating from a vehicle, connect your portable to a magnetic mount mobile antenna to provide a clear RF path outside the vehicle. This overcomes the substantial attenuation, which results from operating a portable unit from inside a metal vehicle. Always carry suitable adapters so that you can connect your portable transceiver to an outside base or mobile antenna, when one is readily available.

In marginal operating locations a telescoping, half-wave is much better, because it provides the same unity gain without a ground plane that a 1/4 wave antenna does when used with a ground plane. A 2-wave antenna can be pulled up into a tree, dangled out a window, attached to a window pane with suction cups, or be used bicycle or motorcycle mobile, or in city driving on a window clip mount. A telescoping half-wave increases useable simplex range of a typical 5 watt, 2-meter portable from about a mile with the stock flexible antenna to 3 miles or more, depending upon terrain. Adding a counterpoise to a unity gain antenna enables a portable unit to keep in reliable contact within 5 miles of an EOC or base station also equipped with an elevated, gain antenna on a tower.

Telescoping antennas are more fragile and work best when stationary or in the open, avoiding side impacts or rough handling. Avoid prolonged mobile use of telescoping antennas on window clip mounts at highway speed, because excessive flexing loosens their internal electrical connections. Never collapse a telescoping antenna by whacking it down with the palm of your hand. Gently pull it down with your fingers. If you note any wobbling or looseness, replace the antenna.

Flexible antennas are safer when working in close quarters around people and are more durable when walking through dense vegetation for wildfire suppression or search and rescue operations. They better for dual-band transceivers because telescoping antennas are usually mono-band. Dual-band flexible antennas approximate a 1/4 wave on 2 meters and a 5/8 wave on 70 cm, are optimized for one band and may resonate poorly on the other. How efficient a particular antenna is can be determined only by testing. **A telescoping half-wave, or half-wave, dual-band-mobile antenna with magnetic mount, will work well either with or without a ground plane, and offer the best A bang for the buck.@**

Any emergency antenna for your portable transceiver much be rated to handle up to 25 watts of RF output. This enables it to be used as an expedient antenna for a mobile radio in portable operation, or to permit use of an external "brick" amplifier with your portable transceiver.

A magnetic mount works best on a car, but an improvised ground plane can almost always be found around the home or office, such as a metal filing cabinet, metal trash can, cookie sheet, rain gutter, refrigerator, window air conditioning unit, balcony railing or any other large metal object. On boats, motorcycles, fiberglass truck caps or wooden balcony railings use a half-wave antenna, which does not require a ground plane.

BATTERY POWER BASICS

A common error of new RACES / CERT operators is failure to plan to carry enough battery power. Always carry at least one spare charged NiCd pack and AA battery case, which enables you to keep operating when the power goes off, if you can't recharge your NiCd pack.

Cycle and recharge dry NiCd packs monthly. Write the recharge date on a strip of tape on each pack. In cold weather keep NiCd packs warm by keeping them in an inside coat pocket and not exposed on your belt.

An adapter cord to power your transceiver from an auto cigarette lighter plug or a gel cell battery is needed for extended operation. Cigarette lighter cords are often unreliable because auto sockets aren't the best conductors, due to contamination and size variations, which cause the plug to vibrate loose. As an alternate power source, you should still have one, because they are ubiquitous and in a pitch, much better than nothing!

Portable power packs such as Quantum are excellent, but expensive. We encourage our operators to make their own using 12-volt gel cell batteries obtained from local hospitals. Sealed lead-acid (SLA) batteries are used to power emergency lighting, alarm systems, medical instruments and computer backup power supplies. They are replaced on a fixed schedule, usually before they are worn out. Because SLA batteries require disposal as hazardous waste unless recycled or reused, a hospital Adonation to your RACES or CERT communications unit reduces their disposal cost. Contact your local hospital and explain how SLA batteries they discard can support auxiliary emergency communications in your community.

Donated SLA batteries must be inspected, recharged and load-tested. Any 12V batteries with an open circuit voltage (V_{oc}) of 12.8V or more are tested immediately and distributed for reissue, if OK. Batteries with V_{oc} <12.8V are connected in parallel across a regulated 13.8V power supply. Those which are not accepting charge after 4 hours are discarded. Total charge time and current should not exceed 140% of battery capacity. Gel cells should never be recharged at over 14V due to gassing.

Reject batteries if their internal resistance exceeds an ohm, as determined by voltage drop divided by the current load in amps. AGood≅ batteries suitable for re-issue should not drop below 11.7V under a test load approximating AC,≅ their amp-hour capacity, for 30 secs. or AC/5" for one minute.

A simple test load for small gel cells up to 20ah is a 50w, 12V-marine/RV bulb or automotive droplight. This equals about 3.8A, approximating a mobile radio on low power 5w transmit or a portable 2-meter hand held, plus a laptop PC and packet TNC. Using two bulbs and AY≅ adapter simulates mobile or brick amp at 25w RF output. This is a good test load for batteries to 30amp-hours. In a Agood≅ battery voltage drop stabilizes quickly, does not fall below 11.5V under load and recovers quickly when the test load is removed.

STANDARD POWER CORD CONNECTORS

Auxiliary power cords for low current devices up to 8A should use twin lead, red-black AWG14 or AWG16 g AZipline≅ with Molex Series 1545, 2-pin polarized connectors and .093 pins. Female pins are assembled into the male plug, (*attached to the power source*) and the male pins into the female receptacle, (*connects to the rig*).

The plug, receptacle and pin set is rated for 8A continuous duty and costs $0.99 from Radio Shack, Part No. 274-222. Wiring is simple. The end of the two-conductor Molex plug in cross section resembles a 2-story house with peaked roof. Remember proper polarity by the word associations Ared roof≅ and Ablack basement,≅ or Apointy positive≅ and Aflat black.≅ Crimp wires before soldering to ensure a strong connection. After inserting the pins into the plug and receptacle, check fit of the assembled fitting. Reinforce the wires behind the plug and receptacle with heat shrink or tape. On the battery leads attach crimp female tab terminals to fit the male tabs on the battery. Solder tabs to battery terminals and tape over them to prevent accidental shorting in handling.

It is recommended that you rig two sets of cords directly to your car battery to power your portable or mobile radio, and laptop computer, if you will send data via packet radio to your EOC. Splice type fuse holders onto both leads, as close to the battery as possible.

If all you have is a portable transceiver, the above information will help to ensure that you can provide an adequate signal for reliable emergency communications. Doing so is vitally necessary to enable your volunteer disaster unit to complete its mission efficiently and safely. More training materials for amateur radio operators to learn essential core skills in emergency communications are featured on the Virginia RACES Training page located at:

http://www.racesva.org/Training/training.html