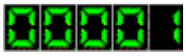
HT Tiger Tails and other good information



Brought back 08-18-04

Santa Clara County, California
ARES/RACES

EMERGENCY OPERATIONS & YOUR HT

Before I begin, I would like to give credit to C. Edward Harris, KE4SKY, AEC for Fairfax County ARES in Virginia for his article on "Getting the most from your Hand Held Transceiver." Much of this script has been taken from that article. Some minor editorial changes have been made to make it more readable over the air.

HT Antennas

It shouldn't come as a surprise to anyone that when limited to "barefoot" operation with a "rubber duck" on simplex, HTs are not adequate as a primary rig for emergency communications. The National Institute of Standards and Technology (NIST) ran some tests (back when they were still the NBS) on Public Safety high band and amateur 2-meter antennas. They found that a "rubber duck" has -5db gain compared to a quarter wave antenna held at shoulder height. In terms of effective radiated power (ERP), a 5w HT with rubber duck antenna, held at shoulder height would actually radiate 1.5 watts. Placing the HT on your belt attenuates the signal another 20db, reducing ERP to only 15 milliwatts! UHF results weren't found to be much better.

A simple and inexpensive improvement that can be made to the "rubber duck" is the addition of what is called a "tiger tail". You can make one of these using a quarter-wavelength (19-1/4" for 2 meters) piece of #14 through #20 stranded wire, crimped and soldered to a battery clip. Reinforce the soldered connection with heat shrink tubing or tape to resist flex. Clamped to the outer collar of the BNC connector on your HT antenna, it acts as a counterpoise so that RF from the HT doesn't couple with your body. A "tiger tail" is directional and can be used to change both radiation angle and direction. It gives best simplex performance when pointed in the general direction of the station you are trying to "hit".

Almost any antenna works better than the "rubber duck" that comes with an HT. A flexible ¼ wave or telescoping half-wave antenna are both improvements. A ¼-wave used at shoulder height with a counterpoise has "unity" gain, which is a 5 db improvement over a rubber duck, because most of

the signal is radiated. Using an HT at 5 watts with a ¼ wave mag mount on an improvised ground plane, or telescoping half wave with a "tiger tail" improves simplex readability even further.

In marginal locations, a telescoping half-wave is a good performer. A half wave used without a ground plane has the same unity gain as a ¼ wave when used with a ground plane. Adding an effective ground plane or counterpoise to a half- wave produces roughly 2 db of gain. A telescoping half wave can also be attached to a coax jumper and pulled into a tree, dangled out a window, attached to a window pane with suction cups or used with a window clip door mount.

Telescoping antennas work best when operating stationary or in the open, avoiding side impacts or rough handling. Extend and retract the radiating elements very carefully. If you note any wobbling or looseness, replace the telescoping radiator, if possible, or replace the entire antenna. Keep a close watch on your HT's connector also. It can become loose after extended use of a telescoping antenna.

Flexible antennas are safer when working in close quarters around people and are more durable when walking through dense vegetation during search and rescue operations. They are a good choice for dual-band transceivers, but are usually optimized for one band and merely "acceptable" on the other. Most approximate a ¼ wave on 2 meters and a 5/8 wave on 70 cm. How efficient a particular antenna is can be determined only by controlled testing.

If you want to buy one emergency HT antenna, without risk or experimentation, the telescoping half-wave, flexible 5/8 wave or quarter wave mag mount all offer the best "bang for the buck" in my opinion. A telescoping half-wave boosts practical simplex range of a 5 watt, 2-meter HT from several miles with a rubber duck to many miles over suburban terrain. Adding a tiger tail further extends readable simplex range under the same conditions.

Whatever antenna you choose, try to find one that is rated for at least 25W so that it can also serve as an emergency antenna for the HT with a power amplifier at medium power. A ¼ wave mag mount connected to a power amplifier works best on a car, but a suitable improvised ground plane can usually be found around the home or office. A metal filing cabinet, rain gutter, refrigerator, balcony railing or other large metal object may work just as well. If all else fails, place aluminum foil over a large piece of cardboard .

A good possibility for Fixed position Emergency Operations is the so-called Roll Up J-pole . It's made from 300 Ohm TV Twin-lead and should give you several dB of gain over a rubber duck. I've used mine for the past year and one-half as a base antenna and have been quite happy with it. It is well worth the money spent (~ $20). Let me reset and I'll give the dimensions.

Would anyone like any of the dimensions repeated?

Another antenna that is a good performer for fixed operations is the " American Legion J-Pole ". They are generally available at both the Foothill and Livermore Flea Markets for a reasonable price. Attach it to the top of a 10 foot section of PVC pipe and mount this to a camera tripod. Attach weights to the legs for stability. This makes a very nice fixed station antenna with good gain.

BATTERY BASICS

For Emergency Operations, it is highly recommended that you carry two fully charged nicad packs and an extra AA battery case and batteries. The nicads will power your HT for at least the first full day of operations and the AA's will allow you to continue to operate if you can't recharge your nicads. It's also important in cold weather to keep nicads warm, and not exposed on your belt.

As an alternate or primary power source, use 12-volt, 2 Ahr or higher Sealed Lead-Acid or Gel Cell batteries. They fit in a coat pocket, run an HT all day or power a 2 meter mini-amp for 3 hours at a typical duty cycle. Sealed Lead-Acid or Gel Cell batteries have many advantages. They will allow you to:

- **Operate when other forms of power are not available**
- **Operate longer than with NiCad or Alkaline batteries; 1–3 Ahr batteries are still small enough to be hand carried.**
- **Operate mobile, portable or fixed at a higher output power**
- **Operate at a lower cost; Gel Cells and SLA's are less expensive than NiCads or alkalines.**
- **Operate with fully charged batteries at all times; It's possible to keep these batteries on a "smart" charger continuously.**

Sealed Lead-Acid batteries are used to power medical diagnostic instruments, alarm systems and Un-interruptible Power Supplies (UPA) just to name a few. Depending on the criticality of the application, some organizations replace their batteries on a regularly scheduled basis well before they are worn out and require disposal as hazardous waste. EC's should write or call local hospitals, explaining how batteries they discard are useful for emergency communications activity. It may be possible to obtain a quantity free for the asking, with no more trouble than signing a hand receipt to satisfy the environmental officer and writing a thank you letter to the hospital administrator. Remember, a hospital's "donation" to your ARES group eliminates their disposal cost.

Besides hospitals, and alarm companies, batteries are also available locally at reasonable prices. For example, Halted Specialties usually carries new 12V, 7Ahr batteries for around $20. For those wanting to buy a complete commercial package, HRO sells the "Hot Pocket" which is a 12V, 2Ahr SLA for $78. It comes with its own pouch for attaching to your belt and a wall charger.

If you decide to use Sealed Lead-Acid or Gel Cell batteries, you'll need a battery charger. 12 V Battery Chargers are available from various sources:

- **Jade Products offers a "Smart Charger" for charging Gel Cells and SLA's. It's $126.95 in kit form.**
- **A & A Engineering also offers a "Smart Charger" for Gel Cells and Lead-Acid batteries. Their charger is $59.95 in kit form or $79.95 finished .**

You can also use so-called "Wall Warts", but the general consensus is that your batteries won't last as long on these inexpensive chargers.

Of course, you can always build you own. Two very good articles are the:

June '87 issue of QST entitled "A New Chip for Charging Gelled-Electrolyte Batteries"

This article uses the Unitrode UC3906 "Smart Chip".

March '94 issue of QST entitled "A Lead-Acid Battery Charger"

There is also some very good information available on the internet. I have several good URL's that I can pass along if anyone is interested. Copy them and paste them into your browser window.

http://www.unitrode.com Unitrode – Home of the UC3906 "Smart Chip"

http://www.benchmarq.com/ Benchmarq chargers

http://www.ibexmfg.com/ Ibex battery chargers

http://www.yuasabatteries.com/ Yuasa "Battery Handbook and Technical Guide"

http://www.electriciti.com/batteri/pwrson1v.html Powersonic batteries

AUXILIARY CONNECTIONS

Power cords for connecting to automobile cigarette lighter plugs or gel cell batteries will be needed for extended operation. Be aware that cigarette lighter plug power may be unreliable due to contaminated cigarette lighter sockets. Also, the sockets themselves vary in size, allowing the plug to vibrate loose. As an alternate source of power, however, everyone should still have the capability since they are readily available.

Be sure to assemble any auxiliary power cords for your HT or small power amps following the standard wiring configuration shown in your respective SPECS or SVECS manual. The configuration that follows is taken from the ARRL ARES Resource Manual. The SVECS manual agrees with this configuration; I'm not certain of the SPECS manual. This configuration uses twin lead 12 to 16 gauge "zipline" with Molex Series 1545, 2-pin polarized connectors and .093 diameter pins. In ARES practice, the female pins are assembled into the male plug which is attached to the power source, and the male pins into the female receptacle which is attached to the rig. This description will make more sense to you when you have the parts in front of you and are assembling the connector.

The plug, receptacle and pin sets are available from Radio Shack, Part No. 274-222 and are rated at 12 amps, which is adequate to power small amplifiers up to 50w output. Wiring is simple. The end of the two-pin Molex plug in cross section resembles a little 2-story house with peaked roof. Remember proper polarity by using the word associations "red roof" and "black basement" for the positive and negative terminals respectively. Crimp the wires in place before soldering to ensure a strong connection. After inserting the pins into the plug and receptacle, check the fit of the assembled fitting and reinforce the wires behind the plug and receptacle with heat shrink tubing or tape.

For re-charging the battery, attach crimp type .187" female tab terminals to fit the male tabs on the battery. The other end of the battery connection will go to a standard cigarette lighter socket. Next, wire a plug onto the leads of a 12-15v, 500 to 900mah charger. A depleted battery can be restored in 4 to 6 hours by plugging it into your car's battery. Gel cells and SLA's larger than 5 Ahr may be left on a 12-14V DC "smart" charger of 1 amp without harm. A word of caution here . . . . . become very familiar with your particular charger and the types of batteries that you intend to charge before leaving a charging battery unattended. A malfunctioning charger can create a very BIG mess very quickly.

HAND HELD DUTY CYCLE LIMITS

If you subject compact HTs to frequent full power 5w transmissions of several minutes duration they will overheat and the final power transistors may fail prematurely. Kenwood and Yaesu state in their service manuals that their HTs are rated for 20% duty cycle at maximum RF output, or 30 seconds of transmit to 2 minutes of standby.

Of the popular 2-meter HT's, Standard does not restrict duty cycle on theirs, rating their amateur hand helds equal in that respect to their aviation, marine, commercial and public safety portables. Unless your HT is a Standard, older Icom or converted commercial gear, it is best to use your HT mostly on medium or low power for long winded rag chews and restrict full power 5w use to short transmissions to save the finals. If you have a need for high power transmissions of several minutes duration and can't replace or supplement your hand held with a mobile rig, I would advise getting a power amplifier to do the heavy work. Just remember to reduce your HT's output power going into the amplifier, otherwise, you will still burn up your finals.

ADVICE ON POWER AMPLIFIERS

An excellent way for HT owners to upgrade their portable ARES/RACES equipment is to purchase a power amp. An ideal amp should weigh less than 1 pound, be capable of 10 to 15w output when driven by an HT at 1w, or 20 to 40w output when driven by the same HT at 2 to 3w output. It should draw no more than 8 amps of current at its maximum rated output, enabling it to operate safely from the .093 diameter pin Molex Series 1545 connector or fused cigarette lighter plug.

An FM-only amplifier without a preamp will be adequate in most cases. A preamp tends to accentuate intermod due to paging transmitters. Unless you equip your portable station with a notch filter and/or cavity bandpass to suppress this intermod, the preamp will serve no useful purpose. Be wary of bargain "no-name" amps you see at hamfests or in discount catalogs. Some are not aligned for the entire U.S. 2-meter band, many lack thermal protection circuitry for over voltage, overdrive or high VWSR or simply have an inadequate heat sink and will overheat and quit.

OK, this concludes "Emergency Operations and your HT." Are there any questions?

From: Ed Harris

To: va.ares@ares.org

"Getting the Most from Your Hand-Held Transceiver"

When limited to "barefoot" operation, with a "rubber duck" on simplex, HTs are not adequate as a primary rig for emergency communications. I started with an HT when I first got my license. I now recommend 50w mobiles as a first rig, but admit they don't work for everyone. If all you have is an HT, the following will help you to "make the most of it." An HT does make perfectly good sense for:

1. **Anyone who doesn't drive;**

2. **Commuters who use public transportation;**

3. **Controlling a dual-band mobile in cross-band repeat or;**

4. **As a "spare," backup or loaner.**

FACTS ABOUT HT ANTENNAS

National Bureau of Standards tests of Public Safety high band and amateur 2-meter antennas indicate that a "rubber duck" has -5db, "negative gain" compared to a quarter wave held at face level. In terms of effective radiated power (ERP), this means that a 5w HT with rubber duck, radiates only 1 watt. Placing an HT on your belt results in another -20db attenuation, reducing ERP to 50 milliwatts! UHF results are no better...

This simple helical spring is intended to withstand rough handling, but is not indestructible. Flexible antennas used on fire lines for several weeks showed a 60% failure rate. The California ACS recommends that flexible antennas be replaced annually or more often if they show any apparent kinks, abrasion or other wear to visual inspection.

A simple, inexpensive and effective expedient to improve a "rubber duck" is a counterpoise or "tiger tail. Make this from a quarter-wave piece (19.5" on 2m, 11.5" for 220 and 6.5" for 440) of stranded wire, crimped and soldered to a battery clip. Always reinforce the soldered connection with heat shrink tubing or tape to resist flex. When clamped to the outer collar of the BNC connector on your HT antenna, the counterpose prevents RF from coupling with your body, so your antenna acts like a center-fed dipole instead of an end-fed dummy load! In marginal conditions extending the counterpoise horizontally, pointing your hand to steer the radiation pattern where you need it, produces a dramatically stronger signal than letting it "droop."

Several HT antennas are commonly available which perform much better than the standard helical "rubber duck." Flexible 1/4 wave and telescoping 1/2 wave antennas work very well. A quarter wave provides unity gain when used with a "tiger tail" or counterpoise and held at face level. This simple device represents a 5 db improvement over a typical rubber duck, because most of its effective signal is radiated. If using the HT in a vehicle, use a mobile mag-mount antenna to provide an RF path outside the vehicle. This overcomes the -20db attenuation which otherwise results from operating your HT with a rubber duck antenna inside a metal vehicle. Always carry a male BNC to female UHF adapter so that you can attach your HT to a base or mobile antenna, when one is readily available.

In marginal operating locations a telescoping half-wave is a better performer, because it provides the same unity gain without a ground plane that a 1/4 wave does when used with a ground plane. A 1/2 wave

antenna can be pulled up into a tree, dangled out of 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. Adding a ground plane or counterpoise to a 1/2 wave produces about 2 db of gain. A telescoping half-wave boosts the readable simplex range of a typical 5 watt, 2-meter HT from about a mile with a rubber duck to 3 miles or more, depending upon terrain. Adding a tiger tail improves receive and extends simplex range up to about 5 miles.

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 mobile window clips at highway speed, because excessive flexing loosens the 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 a better choice for dual-banders because most telescoping antennas are single-band. Most common dual-band flexibles 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. Some antennas do perform better than others, but how efficient a particular antenna is can be determined only by testing.

If you want to buy one emergency HT antenna, without risk or experimentation a telescoping half-wave, flexible dual-band quarter wave; or half-wave, dual-band-mobile magnetic mount, which will work without a ground plane, offer the best "bang for the buck." Whatever HT gain antenna you get should be able to handle 25W so that it can also serve as an emergency mobile antenna or be used with a brick amp. In our group experience the Comet CH-72 and SBB-1 dual-band flexibles, rated for 50w, work well. Adapters enable either to be used on an HT, attached to a mag mount or pulled into a tree with an attached tiger tail and coax leading from a mobile or brick amp.

A mag-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 bikes, motorcycles, Humvees or ambulances with fiberglass caps use a half-wave mobile antenna which doesn't require a ground plane.

BATTERY POWER BASICS

The most common operator error working public service events is failure to carry enough batteries to last all day. Always carry two fully charged

NiCd packs AND an extra AA battery case, so that you can keep operating if you can't recharge your nicads. Cycle and recharge dry nicad packs every two to three weeks. Write the recharge date on a strip of tape on each pack. In cold weather it is important to keep NiCd packs warm by keeping them in an inside coat pocket and not exposed on your belt.

Adapter cords enabling you to take power from an auto cigarette lighter plug or a gel cell battery are needed for extended operation. Cigarette lighter plug cords are often unreliable because the sockets are often contaminated and not the best conductors and they very in size so that the plug may vibrate loose,. As an alternate power source you should still have one, because they are ubiquitous and in a pitch much better than nothing.

Auxiliary power cords to power your HT and small brick amp from an external gel call battery should follow the wiring configuration shown in the ARRL ARES Resource Manual. Use twin lead AWG12 to AWG16 gage "Zipline" with Molex Series 1545, 2-pin polarized connectors and .093 pins. In ARES practice the female pins are assembled into the male plug which is attached to the power source and the male pins into the female receptacle which is attached to the rig. The plug, receptacle and pin set is $0.99 from Radio Shack, Part No. 274-222, rated at 8A, which is adequate to power small brick amps up to 35w output. Tech America carries the genuine Molex parts in bulk, which are rated at 11 amps and suitable for bricks or mobiles up to 50w.

Wiring is simple. The end of the two-conductor Molex plug in cross section resembles a little 2-story house with peaked roof. Remember proper polarity by the word associations "red roof" and "black basement," or "pointy positive" and "flat 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 and reinforce the wires behind the plug and receptacle with heat shrink or tape. On the battery ends attach crimp type .187" female tab terminals to fit the male tabs on the battery. Wire a plug receptacle onto the leads of a 12-14V, 250mah-500mah wall transformer and for normal charging use a time and current to equal 120% of the battery's capacity. You can rig two sets of cords directly to your car battery to power an HT and your brick amplifier without using the cigarette lighter plug. This works well for commuters who use an HT in the car and take it with them after they park. Splice AGC type fuse holders onto both leads, as close to the battery as possible. Use 2 amp fuses for the HT and 10 amps for brick amps up to 40w. Use different wire gages such as AWG16 for the HT and AWG12 for the brick amp, so that the two different cords are readily distinguishable by sight and feel.

HAND HELD DUTY CYCLE LIMITS

If compact HTs are subjected to frequent 5w transmissions of several minutes, they overheat and the final power transistors may fail prematurely. Kenwood and Yaesu state that their HTs are rated for 20% duty cycle at 5w PEP, or 30 seconds transmit to 2 minutes of standby. This is not common for today's Hts. When I first got my license, I burned up three sets of "finals" during the year warranty period, powering an HTX-202 from an auto cigarette lighter plug.

After the warranty ran out, I replaced it with a Kenwood TH-22A and within a few months repeated the same result. Kenwood's Virginia Beach service center politely admonished me that I was "exceeding the recommended duty cycle" for a hand held and should buy a mobile. I followed their recommendation, sought other HTs for ARES /RACES /Skywarn and now pass that advice along.

Of the popular 2-meter HT's, only Standard doesn't restrict duty cycle and warrants their amateur hand helds equal to their commercial, aviation, marine and public safety band portables. Unless your HT is a Standard, old Icom "brick" or "pre-tiny" Yaesu, use low or medium power most of the time to save your finals and limit your full power 5w use to short transmissions.

ADVICE ON BRICK AMPLIFIERS

If you have need for high power transmissions of several minutes duration and can't replace or supplement your hand held with a mobile rig, my advice is to get a brick amp to do the heavy work. This keeps your HT from overheating, and helps ensure a solid copy signal for emergency simplex operation. An ideal amp for HT owners to upgrade portable ARES or RACES equipment at modest cost should weigh under a 1=BD pounds, be capable of 10 to 15w output when driven by an HT at =BD to 1w, or 20 to 40w output when driven by the same HT at its normal 2 or 3w output from a standard NiCd battery pack. It should draw no more than 8 amps current at its maximum rated output, enabling it to operate safely from the .093 pin Molex Series 1545 connector or fused cigarette lighter plug.

An FM-only brick without a preamp is best, because a preamp brings in intermod on FM. Small brick amps we have found satisfactory for ARES are use the Diawa 2035, Mirage B-23, B-34, dual-band BD-45 and Rf Concepts Mini 144. There are larger amps producing 100+ watts output when driven by an HT, but their size, 5+lb. weight and 20+ amp power requirements lend them more to contesting than to "backpack" portable ARES or SAR use. Be wary of, "no-name" amps at hamfests or in discount catalogs. Many are not aligned for the U.S. 2-meter band, lack protection for over voltage, overdrive or high VSWR or have inadequate heat sink so they overheat and simply quit. Seek a quality amp with ample heat sink, of a known brand which stands behind the product, rather than the smallest "box" at the lowest price.

"Getting the Most from Your Hand-Held Transceiver"

When limited to "barefoot" operation, with a "rubber duck" on simplex, HTs are not adequate as a primary rig for emergency communications.

I started with an HT when I first got my license. Today, I would recommend a mobile as a first rig, and if need be, carry it in a briefcase with a suitable gel cell battery for portable use, with the caveat that it doesn't work for everyone. If all you have is an HT, the following is recommended to enable you to "make the most of it."

An HT does make perfectly good sense for:

1. **Anyone who doesn't drive;**
2. **Commuters who use public transportation;**
3. **Controlling dual-band mobile in cross-band repeat or;**
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A simple, inexpensive and effective expedient to improve a "rubber duck" is a counterpoise or "tiger tail. Make this from a quarter-wave piece (19.5" on 2m, 11.5" for 220 and 6.5" for 440) of stranded wire, crimped and soldered to a battery clip. Always reinforce the soldered connection with heat shrink tubing or tape to resist flex. When clamped to the outer collar of the BNC connector on your HT antenna, the counterpoise prevents RF from coupling with your body, so your antenna acts like a center-fed dipole instead of an end- fed dummy load! In marginal conditions extend it horizontally, pointing your hand to direct the main lobe of the radiation pattern in the direction where you need a stronger signal.

Several HT antennas are commonly available which 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 antenna height and gain. Flexible 1/4 wave and telescoping ½-wave antennas also work well.

A quarter wave provides unity gain when used with a "tiger tail" or counterpoise and held at face level. This represents a 5 db improvement over a typical rubber duck, because more of the effective signal is radiated. If using an HT in a vehicle, use a mobile mag-mount antenna to provide a clear RF path outside the vehicle. This overcomes the -20db attenuation which otherwise results from operating your HT with a rubber duck antenna inside a metal vehicle. Always carry a male BNC to female UHF adapter so that you can attach your HT to an outside base or mobile antenna, when one is available.

In marginal operating locations a telescoping half-wave is a better performer, because it provides the same unity gain without a ground plane that a 1/4 wave does when used with a ground plane. A ½-wave antenna can be pulled up into a tree, dangled out of 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.
Adding a ground plane or counterpoise to a ½-wave produces about 2 db gain. A telescoping half-wave boosts the readable simplex range of a typical 5 watt, 2-meter HT from about a mile with a rubber duck to 3 miles or more, depending upon terrain. Adding a tiger tail to a full-sized quarter-wave or telescoping half-wave dramatically improves receive and in favorable terrain extends simplex range of a typical 5-watt handheld to about 5 miles under average HT-to-base suburban conditions.

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 mobile window clips at highway speed, because excessive flexing loosens the 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 single-band. Most dual-band flexibles 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. Some do perform better than others. How efficient a particular antenna is can be determined for sure only by testing.

If you want to buy an emergency HT gain antenna, a telescoping half-wave,

long-flexible, dual-band quarter wave; or a half-wave, dual-band-mobile magnetic mount, which works without a ground plane, offer the best "bang for the buck." Any emergency HT gain antenna you get should be able to handle at least 25W so that it can also serve as a mobile antenna or be used with a brick amp.

In our experience the Comet CH-72 and SBB-1 dual-band flexibles, rated for 50w, and the Larsen telescoping half-wave, rated at 25w work very well. Adapters enable any of these to be used on an HT, attached to a mag mount or pulled up into a tree with its attached tiger tail and coax to a mobile rig or brick amp.

A mag-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 bikes, boats, motorcycles, fiberglass truck caps or wooden balcony railings use a half-wave which doesn't require a ground plane.

BATTERY POWER BASICS
A common error of new operators is failure to carry enough batteries to last through an event. Hand-held transceivers for ARES should have either an external power socket or an extra AA battery case which enables you to keep operating if you can't recharge your NiCads.

That fancy new HT with lithium-ion battery is useless when the power goes off unless it can optionally powered by the Energizer Bunny or from an external battery!
Cycle and recharge dry nicad packs at least 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.
Adapter cords enabling you to take power from an auto cigarette lighter plug or a gel cell battery are usually needed for extended operation.

Cigarette lighter plug cords are often unreliable because the sockets are often contaminated and not the best conductors. They also vary in size so that the plug may vibrate loose. As an alternate power source you should still have one, because they are ubiquitous and in a pitch it is much better than nothing!

STANDARD POWER CORD CONNECTORS
Auxiliary power cords to power your HT and small brick amp should follow the wiring configuration shown in the ARRL ARES Resource Manual. Use twin lead AWG12 to AWG16 gauge "Zipline" with Molex Series 1545, 2-pin polarized connectors and .093 pins.

In ARES practice the female pins are assembled into the male plug which is attached to the power source, and the male pins into the female receptacle which is attached to the rig. The plug receptacle and pin set is $0.99 from

Radio Shack, Part No. 274-222. These are rated at 8 amps, which is adequate to power small brick amps up to 35w output. Tech America carries the genuine Molex parts in bulk, which are rated at 11 amps and suitable for brick amps or mobiles up to 50w.

Wiring is simple. The end of the two-conductor Molex plug in cross section resembles a little 2-story house with peaked roof. Remember proper polarity by the word associations "red roof" and "black basement," or "pointy positive" and "flat 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 and reinforce the wires behind the plug and receptacle with heat shrink or tape.

On the battery ends attach crimp type .187" female tab terminals to fit the male tabs on the battery. Wire a plug receptacle onto the leads of a 12-14V, 250mah-500mah wall transformer and for normal charging use a time and current to equal 120% of the battery's capacity.

It is recommended that you rig two sets of cords directly to your car battery to power an HT and your brick amplifier instead of using the cigarette lighter plug. Splice type fuse holders onto both leads, as close to the battery as possible. Use 2 amp fuses for the HT and 10 amp fuses for brick amps up to 40w. Use different wire gages such as AWG16 for the HT and AWG12 for the brick amp, so that the two different cords are readily distinguishable by sight and feel.
If all you have is an HT, the above will enable you to make the most of it so that nobody will complain about your "worthless and weak, hand held baby monitor!"