Care and Feeding of HT Batteries

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Tonight I'm going to be talking about the care and feeding of batteries. That's a pretty big topic, given that almost any of the radio equipment we use in ARES can run off batteries, but for this discussion I'm going to focus on the ones we use in our HTs. That's the one piece of equipment we tend to work with the most, and they're the most vulnerable to issues involving power.

There are four main types of batteries you will find in use in HTs today, and they have names that most of us should be familiar with: Nickel-Cadmium, also called NiCads; Lithium-Ion; Nickel Metal Hydride; and Alkalines. There are some others on the market such as Lithium-Polymers and more exotic designs, but they aren't yet being used as regularly as these four and I don't think anyone wants me to spend all night talking about them.

Let's briefly go through each of these, then we'll talk about how to take care of them:

NiCads have been around since the 1980s, and they're the oldest and generally least expensive of the rechargeable batteries on our list. They do well under most conditions, but they have some characteristics that make them less desirable to use than other rechargeables. First, they are a lot heavier than a Li-Ion or NiMH battery with the same capacity, so carrying spares for your radio can add considerable weight to your go kit. Second, they have a shorter discharge cycle, meaning they won't keep your radio running as long on a single charge. Third, their amperage decreases as they discharge, meaning the amount of useful power they provide decreases as you use them, which can reduce the effective range of your HT especially if you're on simplex. Fourth, they can be affected by cold temperatures, with reduced output and shortened discharge times being the most common issues. Fifth, they will self-discharge, meaning they will lose their charge simply while sitting unused. And finally, they are susceptible to what's called a "memory effect."

For those of you who may not understand what that is, let me give you an example: say you have a bucket that's completely filled with water. You take that bucket into your garden and you use 3/4 of the water in it watering your vegetables. When you take it back to the faucet to refill it, you can only put in 3/4 of what you started with because you still had 1/4 of it left in the bucket. That sounds great since it saves you on water, but when it comes to batteries it's a problem. If you keep recharging a battery that's only partially discharged, over time the battery will "remember" that you used only a portion of its capacity before you put it back on the charger. Eventually it will assume that's all you will ever use, and it locks you out from ever being able to use that last part of its capacity. There are some ways to reduce the chances of memory effect, and I'll cover those a little later.

Now, on to our next battery type. Lithium-Ion batteries are probably the most common ones you will find in today's radios, and can be used as a replacement for NiCads in most older HTs. You'll also find them in many other portable devices including laptop computers, tablets, and cell phones. They seem like the perfect power source - they're lightweight, produce twice the power of NiCads and 30% more than NiMH of the same size, don't fade in output power as they discharge, can be recharged quickly, are not affected by cold weather, have very little self-discharge, and virtually no memory effect. With so much going for them, what's not to like? Well,

they have some negatives too. First is their cost - Li-Ion batteries are 2-3 times more expensive than the same capacity NiCads or NiMH. Second, under certain conditions during use and recharging they can get very hot, and there are some reported instances where Li-Ion batteries that were damaged or not properly recharged have burst into flames.

Nickel-Metal Hydride is the next one on the list, and it's kind of like a cross between NiCads and Li-Ions. While there are a lot of good things going for them - lower cost than Li-Ions, lighter and 40% more power than NiCads, for example - they have several negatives that clearly make them less desirable: they have a higher rate of self-discharge than both NiCad or Li-Ion, to the point that they need to be connected to a recharger as much as possible when they aren't in use; they are affected by cold temperatures; damaged batteries have been known to overheat and ignite; and they are susceptible to memory effect. That's not to say they're the horrible stepchildren of the HT battery world; they just have their own limitations to work with.

The last type is the good old, dependable alkaline battery. I've included it because many of us - myself included - have a AA battery pack for our HTs that we can use when we aren't around a source of electricity to recharge our other batteries right away. They're simple, cheap, readily available at any convenience store, and easy to use - just pop them into the battery pack and you're ready to go, and throw them away when they're used up. Their biggest drawbacks are that they can leak if left in equipment for long periods of storage, and they can't be recharged - okay, they do have rechargeable alkaline batteries these days, but those can be just as expensive as Lithium Ion and they don't last as long, plus you have to invest in another charger to keep up with them, so why bother?

Now that you've heard a little bit about each of these types of batteries, which one is right for you? A lot of it will depend on what's available on the market to fit your HT. As I mentioned earlier, older radios used NiCads, while newer ones have Li-Ion or NiMH as standard. Some manufacturers have also developed newer batteries that will work with older models. Be sure to check with your HT's manufacturer to find out which ones are approved for use. If your radio can also use a reloadable AA alkaline battery pack, I highly recommend you invest in one.

When it comes to caring for rechargeable batteries, there are some common rules to remember to get the most out of them, and in turn your HT. First, make sure the battery is designed to fit the radio, whether it’s sold by the manufacturer or it’s an aftermarket battery; this causes more problems than you might imagine. Second, be sure you have the correct equipment to charge your batteries, and know how to use it properly; most manufacturers have specific chargers for each type of battery they sell – make sure you read the instructions that come with it to know how it works. Third, be sure to fully charge all new batteries before you use them for the first time; while most batteries will have a charge right out of the box and it looks like you could use them immediately, you don’t really know how much of a charge they do have and they could drop out at any moment, plus there are some instances in which doing so can damage the battery, so play it safe and charge them up first.

I mentioned earlier there are some ways to reduce the memory effect in batteries like NiCads. Here are a couple of techniques you can use. The first one is, be sure you fully charge NiCads before you use them, and then be sure you fully discharge them before putting them back on the charger. Working a battery through full charge/discharge cycles like that will maximize the amount of useful power they provide, as well as extend their usable run time. This also works very well with Li-Ion and NiMH batteries. The second one is, see if a charger for your batteries is available that includes a conditioning circuit. These are great because they will automatically

take your batteries through a full discharge and recharge cycle, taking the guesswork out of whether you've really done it yourself.

Now for a few tips:

- Don't ever rely on a single battery – always carry a spare. If you look at the ARES Go Kit checklist, you'll see that it's recommended you carry enough power to keep your HT working for at least 12 hours or more, and I'm not aware of any single battery pack that can accomplish that feat. You can do this with any combination of rechargeable and AA battery packs. You don't want to find yourself out in the field and you suddenly drop off the air… remember, if Net Control loses contact with you, they may start diverting limited resources from other areas to find out what happened and if you're okay.

- Rotate your batteries – don't leave the same one on the radio and that radio sitting in your charger when you're not using it. I'm as guilty of that as anyone. Set up a schedule and change the batteries around.

- Any time you get a new battery, test it out first before you actually need to rely on it. Some of you may remember over a year ago when I was having problems during a net hitting the repeater using my HT, and it turned out the problem was a defective battery pack that I had bought, charged up, and started using without testing it first. It doesn't take much – get on and make a few contacts, do some casual ragchewing, and see if it works. If you can throw a meter on it and check the voltage and amps, that will help as well.

- Remember that cold weather can affect batteries – keep spares indoors or in a warm vehicle, and consider carrying one in an inside coat pocket if you're going to be working outside in the cold for any length of time.

- And finally, batteries can become damaged by simply dropping them on the floor, so be very careful when handling them; and if you suspect something is wrong, stop using it immediately and set it aside. It's not as expensive to replace a battery than an entire HT, and it's much less than a trip to the hospital if it overheats and bursts into flames while you're using it.

This concludes tonight's training. I hope this helps you better understand the variety of batteries that are used in our radios, and why it's important to understand their differences and how to take care of them. I'm going to have this presentation posted on the TECO website so that you can refer back to it in the future, and I encourage all of you to ask questions so you can be better prepared when the call goes out for ARES to help our community.