Hey, buddy, about your radio gear!

Here are some interesting facts about radio systems gleaned from Pete Waters of KMI.

Transmitters and receivers are factory tuned within a range, not many of them are dead center out of the box. They work OK. Tuning them to dead center increases their range and assures adjacent frequency rejection.

1. Tuning involves meters and scopes and is done by adjusting the pots within each unit. Cutting the antenna does nothing.

2. Antenna length is immaterial for most practical purposes. The shorter the length the less the range. Cutting an antenna is not recommended. To shorten one, punch holes in both long edges of a business card and thread the antenna wire through it like a shoelace. Place this near the receiver and then run the wire out of or down the fuselage.

3. Folding the antenna back on itself only affects range and for sport flying has little effect.

4. There are 12 kinds of crystals; not all crystal are equal.

5. Battery charging and cycling is essential. Trickle charging is to be avoided. Rig up a timer and using the factory supplied charger turn it on for 2 hours each day.

6. Receiver installation is critical. Be sure it is installed in a foam case so it is isolated from engine vibration.

7. After a crash send the receiver in for a check. Shake it and if it rattles it definitely must go in.

8. Do not mount a receiver with velcro; it allows too much vibration.

9. Servos have electronics in them. Be sure to cycle them vigorously to assure they still work right.

Nicad Battery Fun & Games

By Robert Osorio

I started out in this hobby flying electric planes. I haven't flown any electrics in a long while, but I learned a lot about Nicad batteries from my experiences, and I'd like to share them with you. I don't claim to be an expert on the subject, far from it - I'm still learning. Like everything in this hobby, take everything you read here with a grain of salt. When you've been in this hobby long enough, you develop your own style and techniques. None of them are necessarily right or wrong, as with many things it's just a matter of personal preference.

Battery maintenance, like everything in this hobby, is a matter of personal choice. Some people carefully maintain their batteries, cycling them regularly with electronic cyclers, and checking their capacities to see how much life remains in them. Most modelers, though, don't concern themselves too much with their batteries, and pretty much ignore them until they start getting weak, or fail altogether. You might think, being a former electric plane flyer, gizmo freak, that I'd be in the first camp, but to be truthful, I'm very lax about battery maintenance and care myself. While I don't particularly subscribe to the intensive battery maintenance school of thought, I don't think there's anything wrong with it, either There's nothing wrong with doting over your batteries like they're your grand children. They'll last longer, and they won't surprise you at a bad time when they eventually do go flat. Overall, I, like most sport flyers in general, take a pretty laid back attitude towards my batteries. That's not entirely a bad thing. Our equipment is a whole lot more reliable today than it used to be, and if you develop some good habits you may never have a problem.

BATTERY LIFE: First of all, let's get one thing straight. Nicad batteries do not last forever. Nicads have a definite life span due to the breakdown and crystallization of chemicals within the cells. This life span includes shelf life when not in use, so if a battery has been sitting on a shelf in the hobby store for a year, 15 - 25% of it's useful life may already be gone! You can extend the life of a battery by putting it in a refrigerator while not in use. This will slow down the chemical processes going on in the battery cells, but will not entirely suspend them.

The most you can expect out of a Nicad pack, even if you take excellent care of it, is four years. Now this is an outside figure for a well-maintained, good quality pack. Unfortunately, all batteries are not created equal. You may not realize it, but batteries come in different grades, just like most electronic components. It should come as no surprise then, that in order to keep prices down manufacturers tend to put low-grade batteries in their economy radios. Let's face it, a radio manufacturer figures the average person buying an economy radio may not even be in the hobby two years later, and if he is, there's a thriving battery after-market parts venue for the company. The lower grade batteries just don't last as long as the premium grade - I've rarely gotten more than a year and a half out of the cheaper batteries without a cell failure. Also, the low-grade batteries tend to come in lower capacities, so when they do weaken you have less of a reserve.

Generally manufacturers use 450 milliamp-hour (mAH) batteries in their economy radios. This figure means that if a device is continuously drawing 450 milli-amps (mA), the battery will provide this level of power for one hour before being depleted. There's more to this than I'm making it out to be, but this is a good rule of thumb. An average .40 size sport plane with four standard servos can draw around 200 - 400 milliamps when you're moving the sticks. Ideally, if there's no binding in your control linkages when the servos aren't moving, the receiver should be drawing only about 50 mA by itself. So, an average of 300 mA is probably a good ballpark figure. Your mileage may vary. The more you use the controls, the more power you eat up. That's why it seems a beginner can fly lazy circles all day on one charge, but after four flights of heavy aerobatics your battery is stone dead. Anyway, manufactures figure that on average, a 450 mAH pack will last five to six flights, and that's okay. More expensive radios have better batteries with higher capacities (600 -

800 mAH) because they expect you to use seven or eight servos. Giant scale models should use a 1200 mAH battery, at a minimum, because of the larger control surfaces, and the tendency to use giant scale servos on at least the rudder.

I make my own battery packs and I always use 600 mAH Sanyo batteries. Look for the ones stamped "Made in Japan". I've never verified this, but I've been told the ones made in Mexico and Malaysia aren't as good a quality. Making your own pack isn't hard, just a little time consuming. Take apart an old battery pack sometime and you can see how it's put together. Manufactured packs generally have metal straps arc-welded to the cells, but you can solder them together with 20-gauge wire or solder-wick braid (a flat braided wire used for removing excess solder). If you prefer to buy a pre-made pack, you don't necessarily have to buy a replacement from the radio's manufacturer. You can buy pre-made packs made with Sanyo 600's that will fit in your radio, or come with bare leads that you can solder your old battery's connector to.

CHECK YOUR VOLTAGE: If you don't own one, put this newsletter down right now and go out and buy an Expanded Scale Voltmeter (ESV). This is absolutely the best flight insurance you can buy, and it's cheap (around $20). Get into the habit of checking your receiver battery's voltage before every flight. IF IT'S IN THE RED, DON'T FLY! It's that simple. I don't consider the transmitter quite so critical. All things being equal, your transmitter batteries will usually last longer that your receiver batteries. There's already good insurance built into the transmitter anyway, just get into the habit of checking the meter on your transmitter before each flight.

Always check your batteries before each flight, even if you know they're okay. When your batteries start going bad, they'll give you plenty of warning, but you have to be paying attention in the first place. Just because the ESV says they were fully charged before the last flight, doesn't mean they've got enough power this flight. When packs fail, they usually fail due to a cell shorting (a cell opening can happen too, and is un-survivable, but it's pretty rare). When a cell shorts out, the pack will still take a charge. A freshly charged pack with a bad cell will always read fully charged on an ESV at the beginning of the day. As the day goes on though, that pack is going to weaken very, very quickly and you may be lucky to get two flights out of it. ALWAYS CHECK YOUR BATTERIES BEFORE EACH FLIGHT. There is no better insurance you can buy. If you do this, and nothing else, you'll probably never lose a plane due to a dead battery.

CHARGING TECHNIQUES: First off, forget what you've heard about Nicad "memory". There is no such animal - and if you don't believe me, check out any Nicad battery reference guide. Yes, early Nicads were far more chemically unstable several years back than today, although most manufacturers claim it was never a problem. You decide. Fact is, the one factor that most affects a battery's peak voltage is temperature. A warm pack will not take as much of a charge as the same pack cooled down. This is why the electric car and plane folks usually swap batteries between flights, or resort to arcane methods of cooling their packs. I used to swap between three packs and keep the hot ones in zip-lock Baggies placed in my cooler.

Most modelers have a very simple charging method: if you know you're going to fly tomorrow, you plug your radios into the charger overnight. If you read your manual, you'll notice that it's not recommended that you charge your batteries for more than 12 hours. That's because the charger provided with your radio is not a trickle charger.

In order to trickle charge your batteries all the time, you need to use a charge current about one-tenth of what the standard charger provides. Some companies sell electronic gizmos that convert your standard charger into a trickle charger. There's a simpler way that I use, and I graciously bow my head to Art Cunningham at RCM Magazine for introducing it to us in his column. I leave all my radios and planes plugged into their chargers, and plug all the chargers into a common power strip. I then plug the power strip into a 24-hour lamp or appliance timer. I set the timer to come on for three hours each day, which results in my batteries staying fully charged, without being overcharged. This, of course, won't work if you are going to fly two days in a row, because

it will take four days for the batteries to be fully charged again. In that case, you need to charge your batteries with a normal overnight charge after flying the first day. It works out fine for me, since I generally only get to fly one day a week. I also carry a fast charger to the field, and can top off my batteries there if I have to.

Again, always check your battery voltage before flying. I've had more than my share of defective chargers. Sometimes a little engine goop gets on the connector terminals and the battery doesn't fully charge. Always check!

FAST CHARGING: Speaking of fast charging, let me burst some bubbles out there. I used to fast charge all my batteries every time I went to the field. Unlike what some people like to believe, I did not destroy my batteries, or reduce their lifetimes appreciably. Sure, fast charging is tough on a battery, no doubt about it, and you can burn up a battery if you're not careful. Overcharging kills batteries, not fast charging. If your charger is working properly, you did everything right, and you burn up a battery anyway, the reason is likely that the pack has a shorted cell, and is no good anyway. Overcharging and shorted cells are the only reasons you will ever burn up a battery. A fast charger should be automatic - a fast charger with a mechanical timer is asking for trouble. If you want to use a fast charger with a timer, then you must measure the voltage of the pack with a digital meter while charging to look for the "peak". The peak is the point at which the battery voltage has climbed to its highest point during charging, and just begins to drop. At this point the pack is fully charged. Any additional charge is going to be converted directly into heat, and will rapidly destroy the battery pack. I used to do it this way, and it's a major pain to watch that meter for twenty minutes. Something always distracts you, and I've wound up burning up a few packs before I learned my lesson.

As I said earlier, I now do a pseudo-trickle charge on all my batteries at the shop, but since I like to fly all day and I fly aerobatics, I usually have to fast charge a pack once or twice at the field anyway. I use what I consider to be just about the finest and most reliable fast charger available, an Astro Model 111 charger. The Astro 111 is automatic peak detection charger. It can charge from four to eight cell packs at 5 amps, which for a 600-mAH receiver pack takes about fifteen minutes. Read the instructions carefully. Like most peak detection chargers, it's easy to fool the Astro into reading a false peak. Why I like the Astro, though, is that when it does goof, it goofs on the safe side. Please note that taking an ESV reading on a pack you just fast charged is worthless. A fast charged pack will always read full on an ESV right after charging. Be suspicious of any pack you know was very weak prior to a fast charge, and doesn't take the full fifteen or twenty minutes to charge up - this could indicate a bad cell.

Peak charging is a must for electric motor batteries, as it can provide up to 30% more run time. There is no way to get a decent flight out of an electric motor without peak charging, and some planes may not be able to fly at all without it. Nicad batteries have a steep discharge curve, and up to 50% of the power in a battery pack can be used up in the first minute of flight. Fortunately, the greatest amount of current is also available during the first minute. By peak charging, you guarantee the maximum amount of power available during this time, which is best used for climbing to altitude. Once there, the ideal strategy is to throttle back to half power, and you should be able to maintain altitude for five to ten minutes (depending on a variety of factors). Peak charging makes a big difference. An electric plane with a peaked pack will rocket to altitude, where a non-peaked pack may not have enough juice to get it off the runway.

DON'T POLLUTE! Since Nicads don't last too long, you're going to wind up throwing a lot of them away in your lifetime. Don't throw them in the trash, though. Nicads contain Cadmium, a highly toxic chemical. Radio Shack stores in my neighborhood accept used Nicads for disposal.

I hope some of this information helps you enjoy our hobby a little better. It's tough enough losing a plane, but it's a shame to lose one because of a battery problem, as it's almost always preventable.