Your Battery's Perfect Couple

The Sirius Fast Charger and Battery Tester.

By Frank Granelli

Most new RC pilots use the batteries that came with their radio set. These batteries are, for the most part, rechargeable Nickel-Cadmium batteries (Ni-Cd for short). The first rechargeable RC batteries, Ni-Cds remain the mainstay of the RC world.

Ni-Cds are usually reliable, vibration resistant, widely available and very cost effective. Model pilots have relied on them for nearly 40 years. True, they have a few performance negatives, but on the whole Ni-Cds are a very user friendly power system for our transmitters and on-board systems.

The first performance problem Ni-Cd batteries have involves their sudden voltage loss when the cells reach near-discharged levels. The nominal Ni-Cd voltage, regardless of the cells rated capacity such as 700 mille-Amp hours (700 mAh), is 1.2 volts. Therefore a 4-cell receiver battery pack using 700 mAh capacity cells would have a nominal voltage of 4.8 volts. A transmitter battery pack usually contains 8 cells for a nominal voltage of 9.6 volts.

What is all this "nominal voltage" stuff? Since Ni-Cd batteries are rechargeable, their actual voltage fluctuates over a range. Freshly charged, a single Ni-Cd cell has a "surface" voltage of around 1.4 volts. The term "surface voltage" means that this voltage is not really useable as it disappears as soon as an electrical load is applied to the battery or a few hours have elapsed since the last full charge.

After a few hours, a charged battery's voltage drops to about 1.35 volts. This is a useable voltage which decreases quickly when current is drawn from the battery. Under load, a good Ni-Cd's voltage drops from 1.35 to between 1.2 and 1.3. Therefore we say that its nominal voltage is 1.2 volts. A Ni-Cd battery remains at this 1.2-volt level for most of its time under load.

As current continues to be drawn during operation, the voltage very gradually drops to around 1.1 to 1.05 volts. After reaching about 1.05 volts however, the

bottom drops out of a Ni-Cd and voltage drops to almost nothing in just a few minutes. What this means to an RC pilot is that there is little warning, and even less time to do something, once a Ni-Cd reaches the end of its capacity.

Everything works well then there is a sudden slowing of control response, in the case of a receiver pack, or a big range loss for a transmitter, when the battery reaches the end of its charge. In either case, the end result is a re-kitted, or re-ARF'd, aircraft to retrieve. The moral here is to make sure never to push a Ni-Cd battery anywhere near its limits.

The other Ni-Cd problem is the loss of capacity over time. Unlike the "dry cells", like a Duracell® battery, a Ni-Cd battery is not made of just one chemical-containing package. Instead, it is made from many small plates, packed closely together with a chemical media in between and then enclosed by the metal container. Over time, small chemical deposits build up between the many plates. The deposits reduce the battery's ability to absorb and store a charge. Therefore, the battery's mAh capacity is reduced.

After two years of regular slow charging with the charger that is packed with the usually RC system, most Ni-Cd batteries have only about 80% of their rated capacity. The result is less safe flight time.

The Sirius Charge Pro Series, made by Peak electronics, is designed to overcome both these Ni-Cd problems. I first encountered the Sirius Charge about six years ago at a trade show, the Westchester Radio Aero Modelers (WRAM) show held every February. This nice gentleman spent 20 minutes telling me about this "Vunder Machine" and I didn't believe a word he said as the claims were just short of magic.

But he was insistent and I finally agreed to try one. The Sirius Charge didn't live up to the claims. Instead it exceeded them. Rushing home from the show, I put this charger on an 18-year old Kraft receiver battery. While the 500 mAh battery pack only had about 100 mAh capacity, I had kept it around so I could use the plastic case (battery packs had hard plastic cases in those days) sometime in the future.

I charged the battery overnight on a slow charger and then discharged it using an Ace R/C Abacus discharger (no longer available). The battery had just 75 mAh in it after 16 hours on the slow charger. I then charged it with the Sirius Charge charger.

The Sirius charger is a fully automatic charger. It senses the battery's voltage and then sets itself for either five cell (4.8 volts) or six cell (6.0 volts) receiver packs. The transmitter side is always set for 9.8 volts. It also senses the amount of charge current that can be safely used, usually 550 mA and when the battery is fully charged.

Once full charge is reached, the Sirius charger switches to a Pulsed Maintenance Mode. This is not a trickle charge like most other fast chargers. It is a computer controlled full current charge that alternates charging with *discharging*. This

system is designed to recondition the chemicals inside the battery, removing those small chemical deposits on the plates.

I left the old Kraft battery in the Maintenance Mode for 24 hours, it only took one hour to charge it, and then I again tested the old battery on the Abacus. It tested out at 125 mAh. It took five repeated cycles but that 18-year old battery actually reached 375 mAh. I would never fly with it but that is an amazing recovery.

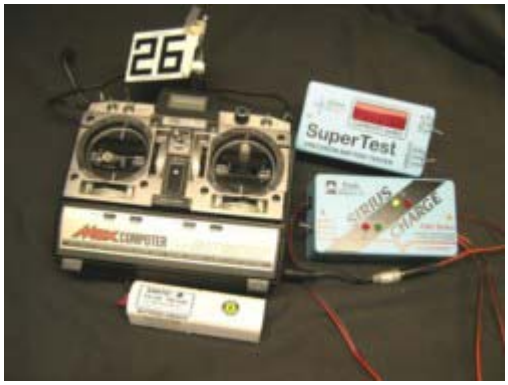

Photo 1 Photo 2

If the Sirius Charge charger could do that with an old battery, what could it do with a newer one? I have an older JR MAX 6 Computer transmitter. This reliable radio system dates from the early 1990's and has had a few battery changes in its eventful lifetime. It was just about time for a new one. Instead, I elected to try the Sirius Charge Charger on its 700 mAh battery.

Photo 3

First I charged the transmitter battery for 18 hours. Then I tested the battery's capacity using the Sirius Super Test precision battery tester (more on that device later) and found it only contained 300.7 mAh (photo 2). I followed the same 24 hour Sirius Charge Charger protocol as with the Kraft battery. The next test (photo 3) revealed a 460.1 mAh capacity. That is quite an increase.

Photo 4

Another cycle and the battery reached a capacity of 620.1 mAh. That represents 88.6% of the battery's original capacity. Anything over 80% is considered OK for flight. So I now have a "new" battery without buying one. That is about a $20.00 savings. More importantly, if the battery continues to be charged using the Sirius Charge charger, it can only improve.

So, one problem is gone, leaving only the possibility of running down the battery at the field. Was the fact that this charger is a 12-volt field charger mentioned? If not, then it should have been. Yup, you can hook the Sirius Charge charger up to your car battery or your flight box battery. Either works well.

This means that a pilot can fly 3 flights, hook up the charger for about 30 minutes to both the transmitter and receiver batteries, "hangar fly" with friends for about 30-45 minutes and then start flying all over again with no worry that your Ni-Cd batteries' voltage is going to "fall off the cliff" leaving your aircraft with little choice but to follow it on down. Not a bad way to spend the day.


Photo 5

The Sirius Charge charger has also changed the way I go to the field. Before getting it, I always had to plan what aircraft to take flying the next day and then slow charge it overnight. If I picked wrong or changed my mind the next day, too bad too late. I was stuck with the one I charged. If the weather prediction for Saturday was for a 110% chance of precipitation I didn't charge the batteries the night before.

Now we all know the weather people are never wrong but sometimes Mother Nature double-dealt them and the sun shone brightly on a clear Saturday morn. But there would be no flying for me because I didn't charge the batteries the night before. Photo 5 shows how the Sirius Charger changed all that. Nestled comfortably in the back of my Suburban, the SIG Four-Star 60 and its transmitter will enjoy a full charge on the way to the field.

These days, I never charge anything the night before. I do all my charging on the way to the field. Peak Electronics has available a car cord, complete with adapter for charger and car lighter socket, to make driving and charging easy. For home use, there is an AC power adaptor available as well. The charger comes with the battery clamps used with a car or flight box battery. It even comes with "banana clips" for use in a power panel. Using these accessories, the Sirius Charge charger works anywhere.

Another type battery is gaining in popularity these days and that is the Nickel Metal Hydride (Ni-MH) battery. The Sirius Charger Pro Series charger charges Ni-MH batteries just as it does Ni-Cds. Of course, Ni-MH batteries do not typically build plate deposits but this charger can extend their useful lifespan with regular use. The Maintenance Mode also keeps these type batteries at their peak just as it does with Ni-Cd packs.

This charger has many safety features built in. Sensing circuits protect against any missed or reversed connections. It is not possible to damage your batteries, or the charger, with this unit. Batteries cannot be overcharged and this charger even has a neat battery booster that ensures transmitter batteries receive a full charge even if its input voltage when connected to a field box battery is as low as 10 volts. That's an interesting feature.

The standard Sirius Charge Pro Series charger will charge Ni-Cd receiver battery packs with capacities up to 2000 mAh and transmitter packs as large as 1200 mAh. It also charges Ni-MH receiver packs up to 1200 mAh and Ni-MH transmitter packs up to 1000 mAh capacity. For larger battery packs there is the Sirius Charge Pro Series Plus charger. But the standard Sirius Charge is about all most new pilots will need until they start competition flying or move into aircraft with wingspans over seven feet.

Here is one last word about this amazing unit. Some Futaba FM and Hitec transmitters have a diode in the circuit with the charging plug. Since the Sirius Charger must receive information from the battery during its initial analysis period and then discharge it during the Maintenance Mode, it will not work through a diode. Peak Electronics has complete information available on its web site about how to use this charger with these transmitters. They even offer a free transmitter conversion service to make sure the charger will work with these units.

The Sirius Charge Pro Series charger is not inexpensive at about $130.00. But I have never been unhappy with my dollar outlay for this unit and have often times been glad. I now have three of these things, two converted by Peak Electronics to Pro Series Plus specifications, and use them constantly and for every contest.

Photo 6 Photo 7

We mentioned the Peak Electronics Sirius Super Test Precision Battery Tester in much of the above discussion. Photo 6 shows this testing unit at work identifying a problem battery in MY PATTERN AIRCRAFT'S TRANSMITTER! Yikes that could have hurt a lot. The transmitter was showing 11.0 volts (photo 7) but only had a *3 mAh* capacity. Three! That would have been just enough to take off and then my competition aircraft would have turned to dust along with my hopes for a good season.

The Super Test uses no power and draws its working current from the battery being tested. Various discharge rates are available for most any size battery. This is a simple plug and forget testing device. The Super Test automatically stops the current drain when the battery drops to about 1.05 volts so as not to damage the pack.

It then records the actual number of mAs it took from the battery and keeps it in its electronic memory. Getting current readings out to one-tenth mA capacity is more information than I will ever need. No RC pilot should be without some way of testing battery capacities. There are many such devoices available, but the Super Test is probably the most accurate.

Do you know just how much current your aircraft draws for a given flight? The Super Test can tell you. Fully charge the receiver battery with the Sirius Charge charger and then test the battery's capacity with the Super Test. Recharge and then fly one typical flight.

Use the Super Test again to measure the receiver battery's remaining capacity. Subtract from the original full charge reading and you have your aircraft's current draw per flight. My Prophecy, a Precision Aerobatic competition, aircraft uses five digital servos (higher current draw than standard servos) and has servo powered retractable landing gear. This aircraft has a 2-0 meter wingspan, a 3.5 hp engine and the control surfaces are always in motion. It uses 220 mA per flight. That means that I can safely fly four flights on its 1400 mAh Ni-MH battery. Then it must be recharged.

This is information every RC pilot should know about the aircraft being flown. My very similar Focus II Precision Aerobatic aircraft has the same servos but has

fixed landing gear and flies more slowly. It uses 180 mA per flight. I still recharge after three flights but the extra reserve is good to have and to know about.

Photo 8

My Super Test is an older model and I do not think it is currently in production. Peak Electronics has a newer model available instead. It is called the Super Test Pro and appears to have many more features and works with batteries as large as 10,000 mAh ratings. You can check it out on their web site listed below.

The Sirius Charger Pro Series and the Super Test Pro form a total battery management system that can save your aircraft while also saving you some money. You can find out more about these very capable devices at www.SiriusElectronics.com