# Mountaineer R/C Flying Club

June 2003

AMA Charter #659

John Clark's Decathalon on its maiden voyage

## Club News

In a nutshell, rain and wind!! The weather has been nearly unbearable. Good news is that the sun has finally come out and we've had a couple of real nice days.

I missed the last meeting and haven't received any notes from anyone, so there won't be any meeting notes in this letter. Denny got the Porta-Jon we bought to the field. Stan got the Mountaineer R/C prop that hangs from the shelter refinished and back up. Looks good.

***Barry***

## All About Batteries

I've been wanting to do some articles regarding the batteries we use. Since I've just about run out of things to talk about, now seems like a good time. Since there is so much information available on batteries, this will be a multi part series.

First, lets look at the different technologies. There are basically three different technologies available to us in the hobby. The old faithful NiCd (Nickel Cadmium), NiMH (Nickel Metal Hydride) and Lithium Ion/Poly. There always seems to be talk about batteries while sitting around the field and everyone seems to have their own opinions, so here is mine.

The only reasonable choice in my opinion for receiver battery packs is NiCd at this time. They have proven to be very reliable and durable even under the worst conditions. NiMH and Lithium do have some weight and capacity advantages over NiCd as well as some disadvantages. Lets look at them.

NiMH cells are lighter and generally have about 30% to 50% higher capacity than NiCd cells. I suppose in a weight critical application this could be desirable, but lets look at the drawbacks. First NiMH cells don't like vibration and don't tolerate high and low temperatures very well. These attributes could lead to in flight failures.

As compared to NiCd cells, NiMH have a much higher self discharge rate. Typical NiCds will loose about 1% to 2% of their charge per day. NiMHs loose at nearly 3 times this rate. NiMH cells typically only last about a third of the number of cycles that NiCds do. This means NiMH cells don't hold there charge as well and have a much shorter life span.

NiMH also have a much higher internal impedance than NiCd. What does this mean? It means they have to be charged more slowly than NiCds which isn't that big of a deal. The kicker to this internal impedance is that if you place them under load, their voltage drops much lower than a NiCd. In practical terms, if your aircraft

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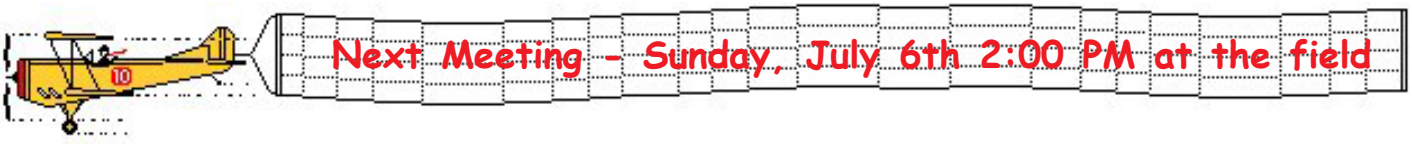

experiences very high loads in flight, the voltage may drop below the minimum to support your receiver and you crash. One scenario that comes to mind would be a retract servo getting jammed causing a high current draw. You could counter this effect by going with a 5 cell pack, but then you lose the advantage of a lighter pack.

The newest of the technologies is Lithium cells. This is an emerging technology with a lot of potential, but I don't feel they are quite there yet. There has been a lot of press about Lithium batteries exploding since there introduction. To date there are very few manufacturers of Lithium cells that sell their products for nonspecific applications. A specific application would be a digital camera, cell phone or laptop battery. If you examine any one of these types of batteries, you will notice they are sealed in a hard plastic case for your protection.

To keep these cells from exploding from over charging or discharging at high rates, they have built circuitry into the packs that causes the packs to turn off under certain conditions. Not a desirable condition for a flight pack. Imagine having your battery decided turn off in flight because you placed it under a high load. Companies targeting the R/C market are using many techniques to get around these problems. For example, Duralite batteries are setup with two connectors. One is a charging connector that utilizes a safety circuit and the other is direct to the battery, bypassing this circuit so you don't have to worry about an accidental shutdown of the battery. Others just leave the circuitry out altogether and instead build it into their chargers and state you must use their chargers with their batteries.

Lithium cells have a much higher voltage then NiCd or NiMH, so typically a flight pack would be made up of only two cells instead of four yielding about 7.4 volts. You've guessed what is coming next. Voltage regulators. If you push a receiver much over 6 volts, strange things start to happen. If you have ever used a 5 cell 6 volt battery pack you may have noticed your plane acting strangely after the battery has been freshly charged. After a minute or two things magically return to normal after the battery bleeds off some of the excess voltage. The regulator is the reason the folks selling these batteries can claim a constant 6 volts to the servos.

Another neat feature of Lithium cells is the way the fail. They fail open, meaning that no voltage flows. In practical terms, a Lithium pack has 2 cells so if either of the 2 fail you get zero voltage and crash. A typical NiCd pack consists of 4 cells and NiCd cells fail closed. So if your 4.8 volt pack loses a cell it will drop to 3.6 volts which in most cases is still enough for the receiver to continue to function assuming the pack had a good charge to start with.

I know what you are saying, all the "big boys" use Lithium so they must be good. It is true, a lot of the guys doing giant scale to use Lithium, but if you were to examine their setup you would see that they generally are using at least two Lithium packs. In many cases two redundant Lithium packs. Redundant packs consist of 4 cells. They are basically two 7.4 volt packs wired in parallel. In this case, the loss of a single cell would have no effect on the aircraft. For the big boys, weight is their concern. Even with the extra packs, regulators, etc., it is still lighter than a NiCd or NiMH solution. I just don't take the hobby that seriously that I'm going to worry about a few extra ounces of battery weight..

Now, most of us use NiCd battery packs that cost around $20 and do a great job and are reliable. Price a Lithium system and you start seeing a lot of dollar signs flash by.

NiMH and Lithium are great choices for electric park flyers. Lithium cells can offer some incredible flight times in these planes. But again, if you want real performance from an electric airplane, you still have to go back to NiCd. Other batteries simply are not capable of discharging at the high rates that NiCds can.

For now, I'm content to use NiCd for my flight packs until such time as the EPA or other government agency decides to ban them from production. I doubt we will see this in the near future, but I'm sure it is coming. NiCd cells are very toxic, so dispose of yours correctly. Most Radio Shacks will except them for recycling.

Next time, we'll discuss how NiCd cells work, how to care for them and charging techniques.

# The Mysterious Glowplug

Ever wonder how and why a glowplug works? I accept the fact that they do and I'm thankful for it, but it has remained a mystery to me. In researching the subject, there is very little written about them. Not being an electrical or chemical engineer, I have to rely on the knowledge of others who have taken the time to document our glowplugs.

A glowplug is the little device that screws into the cylinder head of your engine. It allows you to apply electrical energy in the form of heat into the compression area of the engine allowing it to start then maintain engine operation without further electrical input.

The element in the glowplug is made of platinum or a platinum-rhodium alloy designed to survive the electrical heat supplied by your Ni-starter and be able to stay hot after the starter is removed.

The simple explanation of how a glowplug functions in a motor is this. The plug is initially heated by applying a voltage to it. This is to cause it to glow so as to ignite the fuel at compression and start the internal combustion cycle. Once the cycle has started, the power source can be disconnected, as with the heat generated at combustion the catalytic reaction generated between the methanol and platinum in the plug coils become sufficient to keep the process going. The catalytic reaction is a reaction whereby platinum will glow in the presence of methyl alcohol vapor. This will happen without any external power source being applied.

Sounds simple enough right? Well unfortunately, it isn't all that simple. Glowplugs come in a wide variety of heat ranges and the type of fuel, engine and other things greatly determine how well a plug will work.

For the most part, glow plugs are threaded 1/4-32NF and come in short 5/32" long and long which are 7/32". Generally speaking, short plugs are used in engines 0.15 cu. in. or smaller and long plugs for larger engines. This isn't always the case so check your manual to be sure.

Now the really confusing part. The heat ranges of glowplugs. Manufacturers all have their own designation of heat range for their plugs. A cold plug will have a thicker element than a hot plug. Sounds kind of reverse doesn't it? Remember that a glowplug actually glows because of the catalytic reaction between the platinum element and methanol. Glow fuel has three basic components. Methanol, Nitro Methane, and Oil. If you have a fuel that has a high content of methanol and low nitro, you would want a hot plug. The higher methanol content would require less surface area on the element to support catalytic reaction. If running a high nitro content, there would be less methanol to react with, so a colder plug would be needed to support the reaction. In addition, nitro burns hotter than methanol, so a thicker element is needed to withstand the higher temperatures.

So how do you figure out which plug to use? Here is a rough rule of thumb regarding methanol content:

80% methanol or above, use a hot plug
70%-75% use a medium plug
60%-70% use a cold plug
60% or less, a very cold plug

The Wildcat fuel I typically use has 67% methanol content. Based on this rule of thumb, I should be using a cold to medium plug. Which is about right since I almost always use an OS #8 plug or equivalent in my 2-strokes. The #8 is a medium heat plug.

Methanol is not the only factor in choosing a plug. Engine compression, engine size, RPM ranges, outside temperature and about a million other variables play a role in it. For example, a high compression engine will generally favor a colder plug regardless of fuel selected.

Ultimately, there is no set formula for choosing a plug. Trial and error seems to be the proven method. For myself, I've standardized on a particular brand of fuel with a certain nitro/oil content. This more than anything has driven my plug selection.

The OS F plug in 4-stroke engines still remains a mystery. It is the only plug that I and many of you have found to work. I can theorize that it's element is a pure platinum coil that is relatively thick and probably has more windings. This might explain the $10 price tag on them.

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## Around the Field

Even though there hasn't been a lot of folks flying, there has certainly been some interesting moments. The Bag-A-Plane contest is heating up. Dave finally managed to destroy his Sensation and Don Weaver destroyed his Big Stick. Seems like I'm forgetting somebody but it doesn't matter, I'm still far in the lead.

Anyway, John Clark's maiden flight of his Decathlon held some interesting moments but made it back in one piece. Initial flights of Jerry Workman's QHOR coroplast plane had us moving toward the fence.

Dave Gaines brought out his new Enforcer done up like the Space Shuttle and is flying very well. His A-10 is finished, but he hasn't flown it yet. Bob Yates is making noise about building a DC-3. Can't wait to see this one. John Goad brought out his new Telemaster with a foam core wing he cut. It flew well, but the yellow and purple color scheme was a little different.

Lastly, I foolishly ordered the Great Planes Lancair ARF. I'm sure it will spawn a host of Great Planes bashing articles in the future. Love the design, but I know I'm going to hate the kit. For those of you who read my reviews of the Slow Poke, it is now resting comfortably in the Dunbar landfill. Just got tired of looking at ti.

We've added some new and old members. Bryan Doyle recently signed back up. David Stollings of Chapmanville (Tim's brother) and Edward Gadd of St. Albans. Edward has been out of the hobby for a while. I believe he said he used to fly at the Hillbillies with Bob Yates years ago.

***Barry***

***Don Weaver proudly standing over the remains of the stick***

***Dave Gaines' new Enforcer in Space Shuttle attire. Powered by a Super Tiger .60***