August 2014 Volume 25 Issue 8

TURBULATOR

Newsletter
of the Rio Rancho Radio Control Flying Club

AMA Club #2770

WATERMAN FIELD ELEVATION 5840 FEET 35° 17.2'N 106° 44.8'W

Cochiti Lake

PRESIDENTS CORNER

"Da Prez Sez"

August already, and summer is starting to fade away with some shorter days. The wind has died down quite a bit after a windy spring, and the weekends have shown a increase in members flying. The last few trips to Cochiti were calm and a lot of fun. Float flying off the water is a blast, and the lunches are good also. So, come on up next time and have a little different kind of fun.

See U inside on the 28th, and Saturday at the field for the August meeting.

Coming Events

1. July 28th 9am-Noon Indoor Flying at the Star Center
2. August 18th 9am-Noon Indoor Flying at the Star Center
3. Santa Fe club has their annual float fly coming up on Sat/Sun, August 23/24th

A Guide to Understanding LiPo Batteries

Lithium Polymer batteries (henceforth referred to as “LiPo” batteries), are a newer type of battery now used in many consumer electronics devices. They have been gaining in popularity in the radio control industry over the last few years, and are now the most popular choice for anyone looking for long run times and high power.

LiPo batteries offer a wide array of benefits. But each user must decide if the benefits outweigh the drawbacks. For more and more people, they do. In my personal opinion, there is nothing to fear from LiPo batteries, so long as you follow the rules and treat the batteries with the respect they deserve.

This guide was written after many hours of research. It is as accurate as I can make it without actually being a chemical engineer (though, in researching this article, I did talk to a few of them). That said, this guide isn't intended to be taken as definitive. It is a living document, and as common knowledge regarding LiPo batteries changes, so to will this guide.

LiPo Packs versus NiMH Batteries

Let's first talk about the differences between LiPo batteries and their Nickel-Cadmium and Nickel-Metal Hydride counterparts.

LiPo Packs versus NiMH Batteries

LiPo batteries offer three main advantages over the common Nickel-Metal Hydride (NiMH) or Nickel Cadmium (NiCd) batteries:

LiPo batteries are much lighter weight, and can be made in almost any size or shape.

LiPo batteries offer much higher capacities, allowing them to hold much more power.

LiPo batteries offer much higher discharge rates, meaning they pack more punch.

But, just as a coin has two sides, there are some drawbacks to LiPo batteries as well.

LiPo batteries have a shorter life span than NiMH/NiCd batteries. LiPos average only 300–400 cycles.

The sensitive chemistry of the batteries can lead to fire if the battery gets punctured and vents into the air.

LiPo batteries need special care in the way they are charged, discharged, and stored. The required equipment can be expensive.

What Do All the Numbers Mean?

They way we define any battery is through a ratings system. This allows us to compare the properties of a battery and help us determine which battery pack is suitable for the need at hand. There are three main ratings that you need to be aware of on a LiPo battery.

So what does it all mean? Let's break it down and explain each one.

Voltage / Cell Count

A LiPo cell has a nominal voltage of 3.7V. For the 7.4V battery above, that means that there are two cells in series (which means the voltage gets added together). This is sometimes why you will hear people talk about a "2S" battery pack - it means that there are 2 cells in Series. So a two-cell (2S) pack is 7.4V, a three-cell (3S) pack is 11.1V, and so on.

In the early days of LiPo batteries, you might have seen a battery pack described as "2S2P". This meant that there were actually four cells in the battery; two cells wired in series, and two more wired into the first two batteries in parallel

(parallel meaning the capacities get added together). This terminology is not used much nowadays; modern technology allows us to have the individual cells hold much more energy than they could only a few years ago. Even so, it can be handy to know the older terms, just in case you run into something with a few years on it.

The voltage of a battery pack is essentially going to determine how fast your vehicle is going to go. Voltage directly influences the RPM of the electric motor (brushless motors are rated by kV, which means 'RPM per Volt'). So if you have a brushless motor with a rating of 3,500kV, that motor will spin 3,500 RPM for every volt you apply to it. On a 2S LiPo battery, that motor will spin around 25,900 RPM. On a 3S, it will spin a whopping 38,850 RPM. So the more voltage you have, the faster you're going to go.

Capacity

The capacity of a battery is basically a measure of how much power the battery can hold. Think of it as the size of your fuel tank. The unit of measure here is milliamp hours (mAh). This is saying how much drain can be put on the battery to discharge it in one hour. Since we usually discuss the drain of a motor system in amps (A), here is the conversion:

1000mAh = 1 Amp (1A)

I said that the capacity of the battery is like the fuel tank - which means the capacity determines how long you can run before you have to recharge. The higher the number, the longer the run time. Airplanes and helicopters don't really have a standard capacity, because they come in many different sizes, but for R/C cars and trucks, the average is 5000mAh - that is our most popular battery here in the store. But there are companies that make batteries with larger capacities. Traxxas even has one that is over 12000mAh! That's huge, but there is a downside to large capacities as well. The bigger the capacity, the bigger the physical size and weight of the battery. Another consideration is heat build up in the motor and speed control over such a long run. Unless periodically checked, you can easily burn up a motor if it isn't given enough time to cool down, and most people don't stop during a run to check their motor temps. Keep that in mind when picking up a battery with a large capacity.

Discharge Rating ("C" Rating)

Voltage and Capacity had a direct impact on certain aspects of the vehicle, whether it's speed or run time. This makes them easy to understand. The Discharge Rating (I'll be referring to it as the C Rating from now on) is a bit harder to understand, and this has lead to it being the most over-hyped and misunderstood aspects of LiPo batteries.

The C Rating is simply a measure of how fast the battery can be discharged safely and without harming the battery. One of the things that makes it complicated is that it's not a stand-alone number; it requires you to also know the capacity of the battery to ultimately figure out the safe amp draw (the "C" in C Rating actually stands for Capacity). Once you know the capacity, it's pretty much a plug-and-play math problem. Using the above battery, here's the way you find out the maximum safe continuous amp draw:

20C = 20 x Capacity (in Amps)

Calculating the C-Rating of our example battery:

20 x 5 = 100A

The resulting number is the maximum sustained load you can safely put on the battery. Going higher than that will result in, at best, the degradation of the battery at a faster than normal pace. At worst, it could burst into flames. So our example battery can handle a maximum continuous load of 100A.

Most batteries today have two C Ratings: a Continuous Rating (which we've been discussing), and a Burst Rating. The Burst rating works the same way, except it is only applicable in 10-second bursts, not continuously. For example, the Burst Rating would come into play when accelerating a vehicle, but not when at a steady speed on a straightaway. The Burst Rating is almost always higher than the Continuous Rating. Batteries are usually compared using the Continuous Rating, not the Burst Rating.

Our example battery has a Burst Rating of 30C. That means it can handle a load of 150A, but only for 10 seconds or less.

There is a lot of vitriolic comments on the Internet about what C Rating is best. Is it best to get the highest you can? Or should you get a C Rating that's just enough to cover your need? There isn't a simple answer. All I can give you is my take on the issue. When I set up a customer with a LiPo battery, I first find out what the maximum current his or her application will draw. Let's look at how that works.

Let's assume that our example customer is purchasing a Slash VXL R/C truck. That motor, according to Traxxas, has a maximum continuous current draw of 65A and a burst draw of 100A. Knowing that, I can safely say that our example battery will be sufficient, and will in fact have more power than we need. Remember, it has a maximum safe continuous discharge rating of 100A, more than enough to handle the 65A the Velineon motor will draw. Similarly, the Burst Rate of 150A easily covers the 100A the motor could draw.

However, the ratings on the motor aren't the whole picture. The way the truck is geared, the terrain the truck is driving on, the size of the tires, the weight of the truck... all of these things have an impact on the final draw on the battery. It's very possible that the final draw on the battery is higher than the maximum motor draw. So having that little bit of overhead is crucial, because you can't easily figure out a hard number that the truck will never go over.

For most applications, a 20C or 25C battery should be fine. But if you're driving a heavy truck, or you're geared up for racing, or you have a large motor for 3D flying applications, you should probably start around a 40C battery pack. But since there is no easy way to figure this out, I encourage you to talk to your local hobby shop to have them help determine which battery pack is right for your application.

For Sale

Reggie cards is selling his Ares Gamma High Wing plane with a battery and radio for $100. A great combo to start flying. Contact Reggie @ reggiecard@q.com

MEETING MINUTES

Minutes from the July 2014 Club Meeting

The meeting was called to order at 10:00am with 14 members present.

The **Minutes** were accepted as published.

The **Treasurers report** was accepted as presented.

Membership Report: The club has 41 paid members. Welcome to new club members Bob Star, Ed Sedal and Steve Schaefer.

Field Report: The field is open for flying! All field maintenance has been completed. We are in the rainy season and may need to do some weed removal.

Safety: An additional safety officer has been appointed and it is Ken Carpenter. There have been no safety issues at the field.

Unfinished Business: The float flys at Cochiti lake have been going well. There are videos available on the web for those who have missed them. We'll continue to fly at Cochiti Lake and will email the club prior to going to the lake.

2. Mike Well was presented with a $100 gift certificate for serving as club Treasurer for the past 8 years. Thanks Mike for all your hard work.

The **meeting adjourned** at 1017.

Raffle Results:

1. George Bliss
2. Ken Carpenter
3. Garry Wallen

Turbulator:

Editor Don McClelland

We are always looking for articles, pictures and your input!

For comments, or suggestions Please Email Don at macmoke1@gmail.com

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Next Club Meeting

Saturday, August 2nd 10:00pm
at Waterman Field.