

Hot Air



Message from the President

January, 2012

I hope everyone has had a wonderful holiday with family and friends.

The AMA convention is being held January 6th - 8th. I have heard that a number our members are going to attend on Friday in order to avoid the Saturday and Sunday crowds. I always enjoy attending. Seeing friends and picking up great deals is fun and worth the trip. Hope to see you there.

We will have our first meeting of the year **Wednesday the 4th**. Jerry has some great raffle items and we will be discussing a possible swap meet at the February meeting. Bring any of your winter projects or anything RC-related that Santa dropped by and share them with the membership. Show and tell is always one of the best parts of the club.

Speaking of Jerry Lake, he will continue as club Vice-President. I will be President (yet again). John Spielman will repeat again as Secretary but Patrick Shuss is stepping down as Treasurer. He has supported the club for many years and deserves all our thanks. Stay tuned for news of a possible replacement for Patrick. Chris Newton will continue to produce the

newsletter. When you see any of our club officers, show your appreciation and give them a big thanks for their efforts to support your club.

For those of you that are not going to the AMA Convention on Saturday the 7th, we will have the Fun-Fly at Del Cerro. With the mild weather and the heavy fog, lift has been spotty. We will see what we get.

Next Meeting

**Wednesday,
January 4th
7:30 pm**

**La Romeria Park
19501 Inglewood Ave**

The Entradero Electric Fun-Fly will be held **Sunday the 15th**. The heavy fog this past week has made the field really wet until the fog lifts and the sun has a couple of hours to dry it off. I don't know about the rest of you guys, but water and high capacity LiPo's sure make me nervous.

Please take an opportunity to renew your membership for the upcoming year. Yes, it is that time of year. You can mail in the paperwork or do it at the meeting.

Upcoming Fun-Flys

**Del Cerro January 7th
Entradero January 15th**

Happy New Year everyone! Hope to see you at one of the fields or the meeting.

- Jeff



Notes from the Vice President - ESCs and BECs

I've had a few guys ask me questions recently about speed controls and in particular, how do you make a choice between using the built-in BEC (receiver/servo Battery Eliminator Circuit) or adding an external source (separate BEC or battery), so I thought I'd provide a brief summary of the basics. As usual, be aware that 'your mileage may differ' and this is by no means meant to be an exhaustive dissertation on the subject. I will however, try to make it worth at least what you're paying for it.

When I was flying RC about 35 years ago, we didn't have electric motors or ESC's, so everybody powered their receiver and servos with ~5V Ni-Cad batteries and rolled the dice. The careful flyers would check the battery voltage between flights and the rest would just keep track of the number of flights, thinking they always had at least N (pick a number) flights before the batteries would start to fade. Most guys never thought about the tendency for Ni-Cads to lose charge capacity (so called memory effect) in the absence of careful maintenance and you'd often hear "I ain't got it" and planes would fly out of sight (or crash spectacularly!).

Back then, no one had heard of 3-D flying either. That's where you have very large control surfaces with individual servos that are simultaneously driven to extreme deflections and rapidly reversed. That sort of activity can consume in excess of four or five amps on some larger planes, especially those with the latest power hungry digital servos.

Some of the digital variety can consume ~ 0.5 amps just idling and double that amount under load. Anyway, things are different today, at least for us electric flyers. We now have the following options (not a complete list):

- 1) Power the on-board electronics with a separate Ni-Cad battery or preferably a Li-Fe or Li-Po battery with a voltage regulator (another name for BEC - more on BEC's later).
- 2) Use the output from a linear or switching BEC internal to the ESC to power the electronics through the receiver three-wire ESC control plug.
- 3) Pull the red, or power wire from the ESC receiver plug, thereby disconnecting the built-in BEC/voltage regulator and replacing it with a separate battery or external BEC. (Some ESC's labeled 'Opto-Coupled' don't have a BEC because the input and output sides of the ESC are only connected via optical sensors (no power transmission). I think the opto-coupled ESC's are intended for electrical noise isolation as some ESC's can generate electrical noise that degrades receiver and/or servo operations.

So how do you decide which option to use?

The first benefit of Option 1 is a power source completely independent of the ESC. If you've ever seen a smoked ESC cause loss of power and control, then you can appreciate this option. If your ESC smokes and you have a separate receiver battery, you



at least have a chance of guiding the smoking assembly back to an exciting landing!

Another important benefit of Option 1, particularly to those of us flying large planes and/or using several digital servos, is the ability to provide a high amperage, highly-reliable power source such as a Li-Po battery. Such applications can approach or exceed the common five-amp limit of most ESC BEC circuits. Just keep in mind that most common servo plugs are rated for 5 amps and the plug bringing all that power from your battery into the receiver must carry the sum total of the amps drawn by all the servos. Running a consistent 5 amps through a typically servo wire will make it noticeably warm. Some larger planes use parallel batteries and plugs for this reason.

I haven't mentioned it yet, but in transforming the main battery voltage, which is generally higher than what a receiver system can handle, down to an acceptable value (~6V), the BEC generates heat in the ESC/BEC assembly. In many cases, this is the main source of heat in an ESC. Whenever the voltage has to be dropped down, you'll be doing it with a voltage regulator removed from the ESC. And thus the ESC stays cooler. That's the last benefit of Option 1 I'll discuss here.

The obvious downside to Option 1 is the extra battery (and possibly separate voltage regulator) weight, but for larger planes the few ounces may not be that much of an issue, especially in comparison to the loss of a large and expensive plane due to a failed ESC or over extended BEC. Just remember to charge and bring the separate battery to the flying field!

With Option 2, the main concern is what sort of BEC is employed and/or are you pushing it too hard. There are two common types of BEC's: linear and switching. Early BEC's

(voltage regulators) were almost always of the linear variety and even today, most inexpensive ESC's contain the linear variety. Linear BEC's are basically variable resistors used to drop the battery voltage and generate much more heat than the switching variety. This heating is proportional to the required voltage drop and is often the limiting factor in how many Li-Po cells an ESC can handle. Many of the linear BEC equipped ESC's are rated at 3 amps maximum, and that's probably generous.

Switching BEC's are more sophisticated and employ transistors and other magic components to switch power on and off hundreds of times per second. The percentage of 'on' time determines the output voltage. Despite the added complexity, these units generate less heat and waste less energy than the linear variety and are considered very reliable. If you've ever looked at the small blue Castle Creations separate BEC unit in some of my airplanes, what you're seeing is a switching BEC that weighs less than 0.5 ounces and will provide as much as 10 amps output (I like lots of margin!).

Most newer ESC's, such as the ICE variety from Castle, have switching BEC's built-in and are rated at 5 amps for up to 8 Li-Po cells. I don't use separate BEC's when employing this type ESC. Just keep in mind that several digital servos can still overload these units. I think Castle recommends no more than three digital servos when using their ICE ESC's. You may notice the ICE-Lite variety of Castle ESC's – these also contain a switching BEC but there's no heat sink as with the standard configuration. In this case, the units are rated at only 6 Li-Po cells. That's because although switching BEC's are more efficient than the linear variety, they still generate heat.

The downside with Option 2 is that you're still trusting a small, somewhat mysterious



electronic unit to condition and supply power for controlling your pride and joy. I guess the message here is that the latest switching BEC's, whether on-board the ESC or a separate unit, are highly reliable and can be used without undue worry. Just be aware of their limits.

I won't specifically address Option 3 as it is just a means of implementing your decision on whether to use Option 1 or 2.

- Jerry

Follow-up on Jerry's Notes: Experiences with Option #3

While Jerry did not specifically address Option #3 above, I have some recent experience which may be of interest. About a month ago, I lost control of my large Fox pattern plane shortly after take-off and had to watch helplessly as the bird nose-dived into the Entradero outfield. It looked like a big lawn dart sticking up out of the turf! Luckily the ground was very soft and the plane, being built of spruce, survived virtually unharmed.

After cleaning out the motor and replacing the prop, I was left with the problem of determining why this had happened in the first place. Everything seemed to be in working order and I could find nothing wrong in the power or control systems. The model is a larger one, with a 60-amp ESC and internal linear BEC driving a receiver and 4 analog servos. It shouldn't have been too much for the ESC/BEC to handle and I've flown dozens of flights before this incident without problems. I concluded that the ESC simply "glitched" - perhaps due to a power surge.

To add a margin of safety and because I certainly don't want to see this happen again, I decided to bypass the internal linear BEC in the ESC and add a separate switching BEC in parallel with the ESC to power the receiver and servos. This reduces the load on the ESC while simultaneously ensuring that, even if the ESC fails again, I will still have power to the control system enabling me to land the plane under control. This option has the added advantage of eliminating the space and weight requirements for a separate battery.

I've flown the Fox 4-5 times since without incident and am feeling better about my chances to avoid a similar fate in the future. After all, I might not get so lucky next time with my "lawn dart". If anyone would like help rigging up this solution (Jerry's Option #3), please let me know.

- Chris

As always, there will be a raffle of excellent prizes at this month's meeting. Don't miss out!

Club Officers and Volunteers for 2012

- President: Jeff Chambers
310-370-0771
- Vice President: Jerry Lake
310-370-6697
- Treasurer: TBD
- Secretary: John Spielman
310-378-0951
- Newsletter: Chris Newton
310-347-6806



A December Day at Entradero

On 12/17, I discovered Arnold and Mike having fun at Entradero. Here are a few shots...

- Chris



Arnold's E-flite Rhapsody 25e is beautiful on the ground and a well-behaved performer in the air.

I liked the look of this one so much, I asked for one for Christmas - and Santa obliged! Stay tuned for building notes.

Mike brought a number of planes, including this beautiful new P-47 Thunderbolt.

