

## **LIPO (Lithium Poly) batteries**

### **February 2011 SES Meeting**

- Safety Issues: volatile when abused. By abused, I mean: A drop from 3 Feet onto a hard surface or being in a crash in which the battery is crushed, pierced or shorted out. A charging mistake such as wrong cell count or charge current too high. And discharging at a current exceeding the batteries max current rating. **Any of the above mentioned abuse could cause the battery to swell and or erupt in flames.**
- The “C” rating: is a technical term that determines the maximum discharge current. Most existing LIPO batteries have the C rating clearly marked on them. To determine the maximum discharge rate multiply the C rating by the cell capacity rating. For example: a 1050MA 20C rated LIPO battery would have a maximum current rating of  $1050 \times 20 = 21000$  MA or 21 Amps. Note: the cell count doesn't affect the max current rating since all cells are in series.
- The KV rating of a brushless motor, the cell count of the LIPO battery and the prop size all drastically affect the actual current being drawn out of a battery. As mention earlier, exceeding the max current rating of a LIPO battery can damage the battery, but it may also damage the motor and ESC. Over loading anyone of these components will cause them to overheat and too much heat may cause a fire.
- OK, how do you select the correct battery? Experience will help a lot, but if you remember a few rules of thumb, you can get close to the desired motor and LIPO ratings. Brushless motor KV rule: the higher the KV, the smaller the prop size. LIPO rule: try to keep current draw at full throttle to less than 75% of max current rating of LIPO. Potential fixes for excessive motor current is: Go to a smaller prop or move up to a higher cell count and drop to a much smaller prop. Heat shortens the life of LIPO batteries. If it feels hot to the touch after a flight, you may want to consider reducing current draw.
- Once you get close to a setup that should work, then use the following testing procedure to hone in on the best prop. Remember with a fully charged battery, electric motors produce maximum torque instantly at full throttle and that is great for take offs. But, that maximum torque puts maximum stress on the battery and ESC. So, even when testing make sure you gradually increase the throttle and only leave it at WOT for a few seconds. Once you have the current and power readings, shut it down and compare the measurements with the max ratings for the motor, ESC and LIPO.
- Connect a specially designed volt/current/power meter in between the LIPO and ESC. If the current measured exceeds the ratings of and component, then reduce the prop size. If the plane is a go fast type, you want to keep the pitch as high as possible, so reduce the prop diameter. If the plane is a slower flying type, then reduce the pitch. Changing the cell count makes a much more drastic change than adjusting prop diameter by an inch.
- Charging a LIPO: LIPO batteries must be charged with battery charger designed for LIPOs. Using any other charger is very dangerous. As mentioned earlier a charging error can damage a LIPO and possible cause a fire. So, it is very important to always place a LIPO in a fireproof container while it is being charged. Use a LPO Sack or a ceramic baking dish. And store your LIPO batteries in a metal can.
- Adjust the charge current to at or below the LIPO capacity. That is a 1 C rate. For example this 1050MA LIPO should be charged at 1 amp or less. Some newer generation LIPO batteries can be charged at 4 C

- LIPO balancer: keeping the cells of a LIPO pack at the same voltage will insure the pack is not over charged or even worse over discharged. Some chargers are the balance type and others require the use of a separate cell balancer.
- Battery sag: Usually caused by excessive current being drawn or the cells have weakened and will no longer produce the rated current. In both cases, the voltage sags and the cells heat up. Use these LIPOs in another plane with less current demand or reduce the current draw by changing to a smaller prop.
- LIPO disposal: When a LIPO will no longer put out sufficient current to make it useful, then dispose of it in the following way. Completely discharge the battery and salvage the connectors if you desire. Then slice open the poly bag for each cell and drop the LIPO in a container of water. After a few days, the lithium will dissipate from the cells. It can then be disposed of in the trash.