Lithium Polymer (lipo) Battery Safety and Guidelines

By Jon Zimmerman 1-17-2021

Capacity: The capacity shown on the label is listed in milliamp hours (mah). A 2500mah pack is equal to 2.5 amp hours. To convert to amp hours, divide mah (2500) by 1000.

Fully Charged Voltage: The fully charged voltage of a typical lipo battery is 4.2 volts per cell. Charging past this limit will shorten the life of your battery and can be dangerous. Some charge to a value just below 4.2v to increase the lifespan of their batteries. I charge to 4.2 volts per cell.

Charging Amps: Most, not all, batteries show the charge rate on the label. A 3c charge rate means you can charge at a rate 3 times the battery's capacity in amps. For a 2500mah pack with a 3c charge rate you can charge at a rate up to 7.5 amps. Multiply the charge rate (3) by the battery capacity in amps (2.5) to get the maximum amp rate you can charge at. I never charge above 2c no matter what the label says, some never charge above 1c. Charging at high rates can shorten the life of your battery. Use your best judgement and form your own bad habits.

Storage Voltage: I think the industry standard for the storage voltage is 3.8v per cell. I don't get too picky about that number. I store my batteries in the 3.78 to 3.85v range. Storing batteries fully charged (4.2 volts per cell) over an extended period of time will cause them to puff, shortening the life of the battery.

Internal Resistance (IR): Most chargers can report the internal resistance of the individual cells. This can be a good tool to monitor or diagnose the health of your pack. I typically note the IR on a new battery and casually keep track of it. Larger capacity batteries typically have a lower IR.

Low Voltage Cutoff (LVC): I don't recommend flying to LCV. I try to land with a resting voltage of no less than 3.78 volts per cell. Set a timer, fly, land, unplug the battery and let it rest for 5 minutes. Check the voltage and adjust your timer on the next pack so you land at your target resting voltage. Do not let your battery drop below 3.0 volts per cell. Flying the battery at low voltage will cause it to overheat and puff, shortening the life of the battery. Remember, the voltage sags under load while flying. The resting voltage is higher than the voltage the battery sees in flight. It is best to give yourself plenty of margin.

C (discharge) Rating: The C rating on the label of your lipo is most likely a lie. In my opinion, most manufactures overate their batteries for marketing purposes. A 2500mah, 40c battery can theoretically handle a 100 amp sustained load. In other words, it can discharge at 100 amps without damaging the

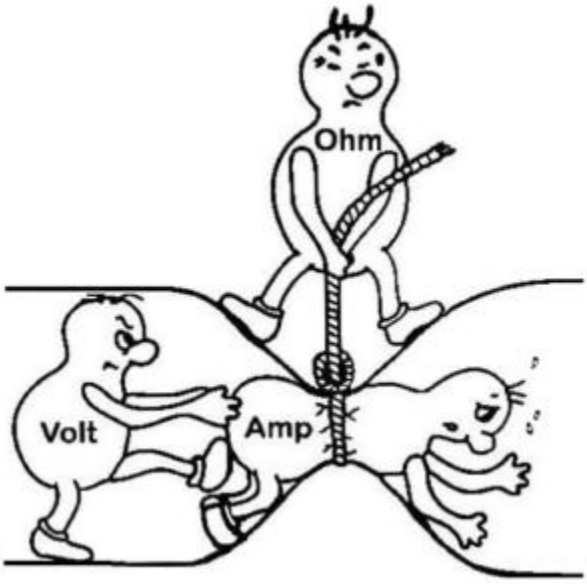
battery. Multiply the C rating (40) by the capacity in amps (2.5) to get the sustained load your battery can handle. Obviously use common sense with these numbers. Overloading the battery will cause it to get hot and puff, shortening its life.

Cell Count (S): The S count is the number of cells in the battery. Each cell has a nominal voltage of 3.7v. A fully charged cell contains 4.2v. A 3S battery has a nominal voltage of 11.1v and a fully charged voltage of 12.6v.

Fire: lipo batteries hold a great deal of energy and can catch on fire. Please use precautions while charging to contain a possible fire. Some independent research will show many solutions.

Disposal: When a lipo is dangerously puffed, or just at the end of its lifecycle, I Discharge the battery to zero volts. I use a brushed motor for a load. Lightbulbs or resistors work also. Once it is fully discharged, solder or twist the positive and negative wires together to prevent a residual charge from building. Dispose of following local laws. Use caution when discharging. The battery can puff and overheat while discharging below 3 volts per cell.

In summary, if your lipo batteries are getting hot or puffing you could be overcharging, over discharging, overloading (pulling an amp load above the actual C rating), or storing them at too high of a voltage. There is plenty of information available on the internet if you would like to dig deeper into lipo batteries. This is just a guideline that hits some of the highlights.



Amps x Volts = Watts

Watts / Volts = Amps

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