



Safety Message

October 2020—Lipo Ramblings

Lithium chemistry batteries have become a big part of our hobby. Batteries and chargers today are MUCH safer and more reliable than those ten years ago. Still, using a Lipo battery incorrectly can cause the battery to catch fire causing serious injury or property damage. Consistent battery hygiene will not only increase the safety factor, but also greatly increase the continual performance and life of the battery.

C rating is a rating of how quickly energy can be discharged from a battery. The rating is combined with a battery's capacity to find determine the maximum discharge. It's well documented that a higher C rating from a manufacturer means next to nothing when comparing batteries from other manufacturers. The simple fact is manufacturers lie and make up C ratings in order to sell batteries. Furthermore – they give away batteries to Internet influencers in order to get them to lie and endorse their batteries.

The **actual** C rating is a function of resistance of the cells. The cell with the highest resistance is the “weak link” for the pack and in effect establishes the “RealC” of the pack. Myself and some others in the club have ESR meters which do a great job telling the truth of a battery. I recently bought two 2750mah “35C” batteries from Roaring Top. When these batteries were measured at 72 degrees (the standard) the ESR meter revealed the batteries were actually capable of 18C. I also bought two 2200mah batteries from a new inexpensive dealer (Liperior) and their 35C batteries had a RealC value of 24C. I then bought a “premium” battery **at a premium price** from Dinogy. This 2600mah battery is advertised as a 70C battery and is expensive. I put it on my ESR meter and it's RealC is 17C!!! Thus – of these batteries – the inexpensive Liperior batteries from RCbattery.com not only had the best RealC, but are much cheaper and the cells are better matched.

If your charger will measure resistance – you may be inter-

How To Safely Handle Lipo Batteries

ested in this online tool <http://jj604.com/LiPoTool/> for evaluating your battery. A chargers resistance measurement is not as accurate as an ESR meter – but it's infinitely better than manufacturers claim.

- ➔ Prevent puncturing of Lipo batteries. Avoid sharp objects projecting into the aircraft battery bay (screws or motor shaft). A hole in the pack and can lead to battery failure or even a fire.
- ➔ Never immerse the battery in water. Dry a battery immediately if it gets wet.
- ➔ Avoid dropping batteries, dropping Lipos can cause the battery cell to crush causing an internal short which may lead to fire.
- ➔ Never store batteries inside a vehicle – especially in the summer.
- ➔ Never allow the terminals to contact metal objects. This may short-circuit batteries, resulting in fire or explosion.
- ➔ Never store loose batteries together unless the terminals are covered with non-conductive material such as **plastic or silicon battery connector caps**.
- ➔ Never expose batteries to extreme temperatures or store in direct sunlight. The temperature range must be between 40-120° F (4-49° C).
- ➔ Heat kills Lipos, the hotter a battery gets (over 120° F), the shorter the lifespan will be. Never charge a battery that is still warm after usage, and don't use a battery that is still warm from charging.
- ➔ Warm batteries before use if the temperature is below 40° F. Cold temperature increases resistance which lowers current power from the battery. More energy is lost to heating due to the increased resistance which also reduces the flight time.
- ➔ Always verify cell voltage of batteries before use, this is especially important for packs that have been out of service for greater than six months. Assure all cells are within 0.1v or re-balance the battery.
- ➔ Always charge/store batteries in a non-conductive,

fireproof container or bag. Ammo cans should be vented or unsealed to prevent explosion in the event a battery catches fire in the can.

- **Always store standard Lipo batteries at 3.75 – 3.80 volts (+/- .05 V/cell).** Nonstandard chemistries (Lifepo4, LiHV) should be stored at manufacture recommendations.
- Use your charger's discharge or storage functions to return batteries to storage voltage after each flying session. Batteries above storage voltage are much more volatile.
- Ensure that all cells in a battery maintain the same voltage across all cells at all times (+/- 0.2v)

Charging

- Always use a compatible balanced mode charger which is specifically designed for the chemistry of battery you are using. **Example:** If you are charging a Lipo battery and the charger can support different battery types, ensure you select the correct type. Failure to do so may cause a catastrophic explosion and/or fire. **Note:** Although all use lithium chemistry, LiPo, LiFe, Lilo and LiHV are all different and charge to different final voltages.
- Always charge batteries at a rate less than or equal 1C (one times the capacity unless specified by the manufacturer.) Even if specified, charging at higher C rates will degrade the lifespan of the battery. For example, a battery of 2200mA can be charged at a rate of 2.2 amps or less.
- When charging with a parallel charging board, all batteries capacity and cell count must match. The C rate for parallel charging is the sum of the capacity of all batteries on the circuit. For example, three 2200 mah batteries on a parallel board can be charged at a collective rate of 6.6 amps or less.
- Always charge batteries in an open area away from flammable materials.
- Charge batteries on a noncombustible surface. Be aware that batteries may project themselves (like a rocket) several feet if they puncture and/or catch fire.
- Never charge batteries that are hot to the touch (above 100° F).
- Never charge a battery that shows signs of puffing.

- Never charge a battery pack that has been punctured or damaged.
- If you start seeing any physical changes to the battery while charging, example puffing, STOP charging immediately and dispose of the battery.
- Never let the positive and negative battery leads touch each other. It can lead to cell ballooning, cell damage, fire or an explosion.
- Always set the charger to proper cell count and/or voltage listed on batteries' labels.
- Never overcharge batteries beyond the capacity listed on batteries labels. Overcharging a Lipo battery will degrade its life – and can lead to explosion and or fire.
- It's advantageous to have a smoke detector directly above charging station and battery storage area.

Discharging

- Never discharge batteries at amperage rates higher than specified on batteries' labels (C rating).
- Don't allow the temperature of batteries to exceed 120°F / 49°C during discharge. Adequate cooling for batteries is required.
- Never discharge Lipo battery to a level below 3V per cell under load. Doing so will significantly degrade the performance and life of the battery.
- If you start seeing any physical changes to the battery while discharging, example puffing, STOP discharging immediately and dispose of the battery.
- **Completely discharge battery before disposing of battery.** This can be done using a resistive circuit such as light bulb, lipo powered soldering iron, or similar.

