Battery Documentation

We are using the 3 cell, 11.1V, 3000mAh Zeee High Performance Lithium Polymer (LiPo) Battery. These things are fragile, and, if mistreated, dangerous. So read all the documentation and treat them carefully. The manual is copied below. The important (and confusing points) are reviewed here.

First of all, as far as I can tell, 11.1V means basically nothing. The important values are:

* **Maximum charge: 12.6V.** DO NOT CHARGE BEYOND THIS LIMIT, OR THE BATTERY CAN CATCH FIRE AND EXPLODE.
* **Minimum charge: 9.6V.** Do not discharge beyond this this limit, or the battery will cease to function properly, you will not be able to recharge it, and it may become unstable and dangerous if you try to charge it again.
* **Storage charge: 11.4V** (50% capacity) always store at this value if you aren’t using it for any prolonged length of time. (Try to keep it there unless you’re using it that day).

The 3 cell means that the battery is actually composed of 3 separate batteries strung together. When the battery is healthy, each cell should have roughly 1/3 of the charge. However, these need to be rebalanced each time you charge the battery. Therefore, you should always charge the battery in “balance mode” using the C150 (black) or LiPro (blue) chargers. The battery has the large anode and cathode wires, as well as a bundle of four other, smaller wires. These smaller wires tell the charger what charge each cell has independently, and allows the cells to be re-balanced. Always plug these smaller wires in when charging.

During operation, the smaller wires can also be attached to a LiPo battery voltage alarm. This will show you the charge of the battery and each cell on an LED screen, and it will trigger an alarm if the voltage falls below a set threshold. The battery discharges surprisingly quickly during flight, so always use the voltage alarm to ensure you don’t over-discharge the battery.

It is possible to adjust the rate of charging on these chargers. However, IT IS UNSAFE TO CHARGE ABOVE 1C. What does that mean? The C stands for capacity of the battery in amp-hours. Our battery is 3000mAh, or 3Ah. So 1C means charging at a rate of 3Ah. This implies that the battery will be fully charged at this rate in 1 hour. Charging at, for example, 2C or 6Ah is tempting, because it would charge in half the time, but dangerous, because it can cause the battery to overheat, catch fire, and explode. Charging at, for example, 0.5C or 1.5Ah is safe, but I’m not sure why you would do it, because it’s slower.

When charging the battery, DO NOT LEAVE IT ALONE. Set an alarm to remind yourself to check on it and manually stop when it reaches the desired charge. For example, if you start at the storage charge (11.4V) and want to fully charge it to 12.6V at 1C, you should plan on about half an hour, and check periodically. Discharging unfortunately is usually slower.

If the battery swells or becomes disfigured in any way, retire it immediately.

DO NOT DISPOSE OF A LIPO BATTERY IN THE TRASH. Instead, first mark the battery so you don’t accidentally use it again. Then use the charger on the discharge setting to reduce the voltage of each cell below 3V. If the charger won’t do it all the way, you can connect the battery to a large resistive load (we have some 100W 10Ohm resistors). Then, wrap the anode and cathode in electric tape to avoid accidental short circuit, and take it to a battery recycling or e-waste facility.

Using the battery

Once you have a charged battery, the battery is placed between the upper and lower baseplates, slotted through the Velcro loop. The battery wire has a female Deans T connector, and the drone has a male Deans T connector. To power up the drone, connect the Deans T connectors together. You should see several LEDs on the RPI and sensors light up.

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