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Aim - Study of mAH battery capacity with flight time calculation and battery connection.

Theory -

Battery management System (BMS) -

A BMS is defined as an electronic system that manages a rechargeable battery by monitering its state, calculating secondary data, reporting that data, protecting the battery, controlling its environment, and/or balancing it.
Battery management system are electronic control circuit that monitor & regulate the charging & discharge of battery.
In the case of multi-cell battery, BMS also provides for cell balancing function to mange that different battery cells have the same charging & discharging requirement.
The task of BMS is to ensure the optimal use of the reidual energy present in a battery.

Methodology -

Are LiPo battery safe?

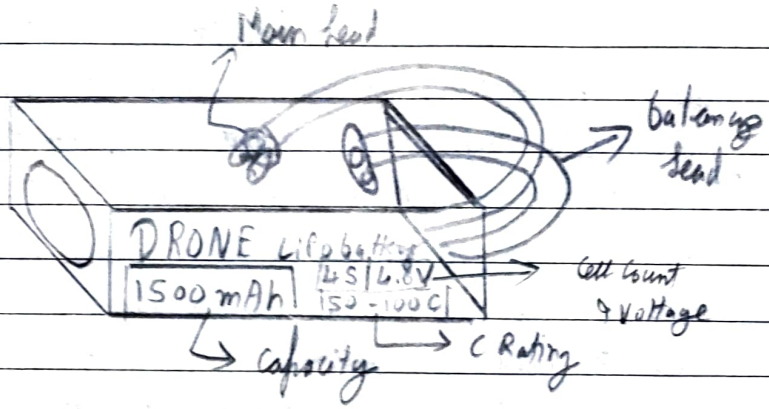
There are many reasons why LiPo battery might ~~fratch~~ catch on fire. That tends to only happen when you dont handle them properly or when they are physically damaged. If you're gentle with your batteries you should be okay.

The basic about LiPo battery for Mini Quad:-

Lithum polymer battery (LiPo) have high energy density, high discharge rate & light weight make them a great candidate or RC application.

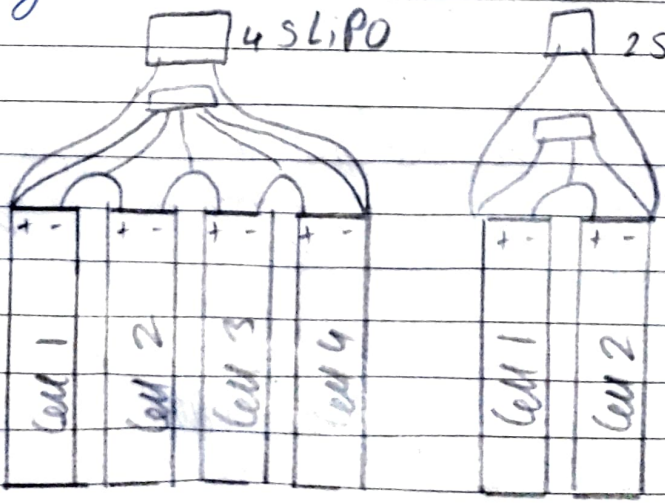
As the LiPO is the single heaviest component on your quad, you will reach a stage where you get diminishing return and the battery is too heavy for your craft to carry efficiently

You can read & understand their specification.



Battery voltage & cell count(s)

LiPo battery exist in cells, each LiPO cell has a nominal voltage of 3.7V. If higher voltage is required, these cell can be connected in series to form a single battery.



1S = 1 cell = 3.7V
2S = 2 cell = 7.4V
3S = 3 cell = 11.1V
4S = 4 cell = 14.8V
5S = 5 cell = 18.5V
6S = 6 cell = 22.2V

4S cell/4S (14.8V) is the most common voltage for flying almost any size drone at the moment.

LiPO battery capacity & Size -

The capacity of a LiPO battery is measured in mAH (milli-amp hours). "mAH" is basically an indication of how much current you can draw from the battery for an hour until it's empty.

Increasing your battery capacity might give you longer flight time, but it will also get heavier in weight & larger in physical size. There is a trade-off between capacity & weight, that affects flight time & agility of the aircraft.

C Rating (Discharge Rate)

Lipo battery for quadcopters these days all come with a C rating. By knowing the C Rate and capacity of a battery, we can in theory calculate the safe continuous max discharge current of a LiPO battery.

C Rating is yet another crucial aspect that need to be checked before you decide to settle for any battery for your quadcopter. However, this does not necessarily imply that

those with the highest C-Rating are the best since they are heavier.

Maximum Discharge current = C Rating X Capacity

For ex, an 1300 mAh 50C battery has an estimated continuous max discharge current of 65 A.

If C is too low, the battery will have a hard time delivering the current to your motor, & your quad will be under powered. When C rating is higher than what's required, you won't gain much performance improvement.

Flight Time Calculation:-

Quadcopter flight times = [Battery capacity x Battery Discharge / Average Amp Draw) X 60

a Battery Capacity: For calculator you have to take the battery's capacity in amp hours, To convert from mAh to Ah, battery capacity divide by 100

b Battery discharge - It's common practice to not discharge your LiPO batteries below 20% mAh during light; 80% that can also used during flight time.

c Average Amp Draw: Battery calculator - you work out the average amp draw you need to know two things. Carrying weight with battery weight & parameters of motor.

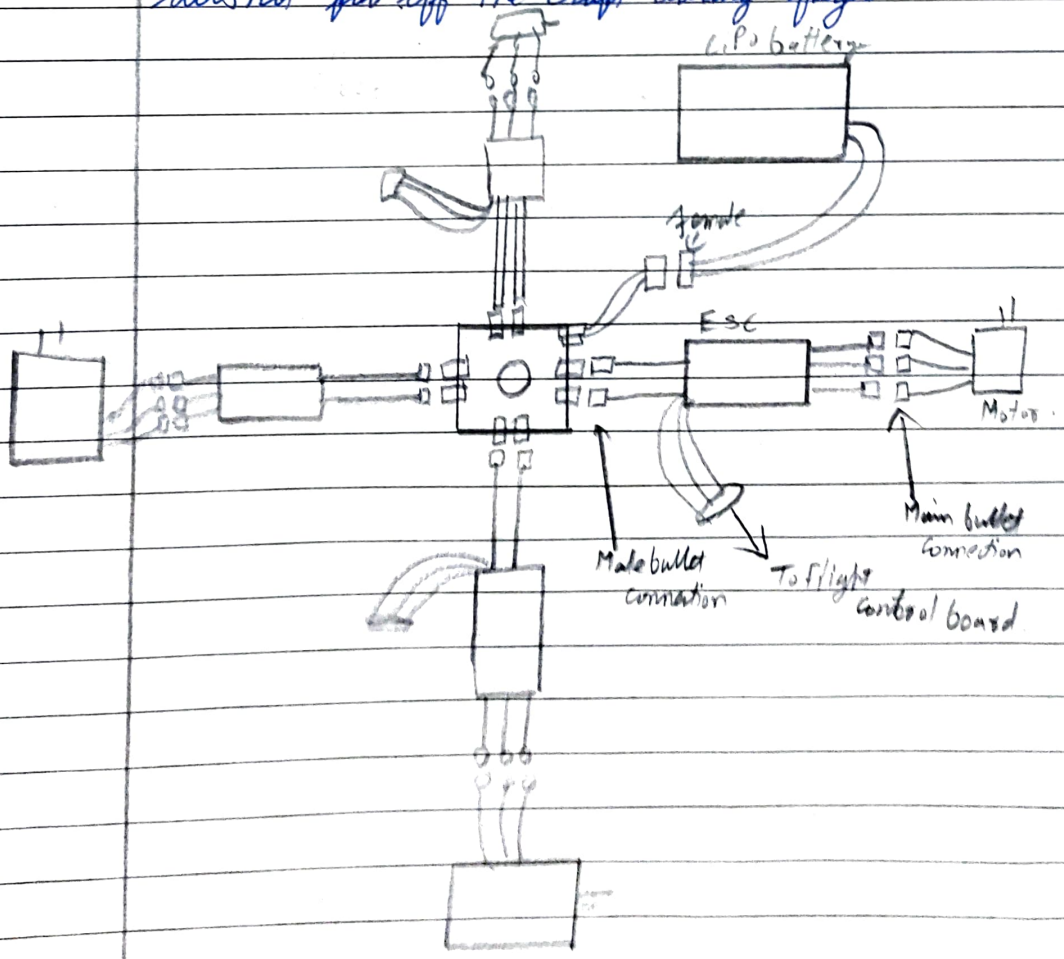
Part - 2 - Battery Connections

Connectors -

There are several battery connectors, the entire process of soldering battery connectors can be tiring & hectic at times.

Connection

It always important to fly with full battery. The battery will will fit comfortably in between the upper & lower frame. Use ties or Velcro straps to hold the battery in place. It's very important the battery does not fall off the craft during flight.



LiPO battery connection with the System.

Summary-

In this assignment we study of mAH battery capacity along with flight time measurement & battery relation.

The part of the experiment involved calculating mAH battery power & flight time. The battery is used in the second part of the experiment

The system's relation has been represented using a power delivery system.