Battery overview

Battery picked

Two 6S batteries are more affordable to find, and allow for the batteries to be placed in disparate locations There is also the thermal dissapation benifits for having two seperate batteries. We picked this battery as it has roughly half the voltage we needed, and was small enought that it could fit in the encolsure.

https://www.banggood.com/ZOP-POWER-22_2V-8000mAh-60C-6S-Lipo-Battery-With-XT60-Plug-For-RC-Model-p-1328629.html

Stats:

- Watt hour capacity: 177.6Wh each
- Cell count: 6S
- Voltage: 22.2V
- Size: 90x46x158mm
- Mass: 1.24Kg

2 batteries in parallel, 355.2Wh

The batteries will be in series, so the capacity will be 178Wh together, but the operating voltage will be will be 44.4V.

Battery charging

https://electronics.stackexchange.com/questions/115795/charging-batteries-in-parallel-when-they-are-connected-in-series-in-the-circuit Since we have two seeprate batteries that are being used in parralel, we will either need a charger that can handle a 12S system or we will have to do some TDMA parralel charging. https://www.flitetest.com/articles/Parallel_Charging_Your_LiPo_Batteries Charger: CHANGED https://www.banggood.com/ToolkitRC-URUAV-M800-300W-15A-DC-Smart-1-8S-Lipo-Battery-Balance-Charger-Discharger-With-Voltage-Servo-Checker-Receiver-Signal-Tester-Quick-Charger-Function-p-1588415.html?rmmds=search&ID=6280172&cur_warehouse=CN This charger has a higher current rating - to drop charge times (did some more maths). OLD charger: https://uk.banggood.com/SKYRC-e680-80W-8A-ACDC-Balance-Charger-Discharger-for-1-6S-Lipo-Battery-p-1526977.html?gmcCountry=GB&currency=GBP&createTmp=1&utm_source=googleshopping&utm_medium=gbg-all-0218&ad_id=332556156911&gclid=Cj0KCQiAkKnyBRDwARIsALtxe7jVKPeWvrknm1ky1uDgQWFhhl

Battery charging mode

When in operation, the batteries are in series to get the correct operating voltage, but for charging they need to be in parralel for the charger to work.

Battery microcontroller

Low power, separate coin battery supply, min lifespan 5 years https://www.digikey.co.uk/product-detail/en/stmicroelectronics/STM8L152C6T6/497-10512-ND/2269726

Power supply CR2032 - 225 mAh, 3V nominal

LED indicator:

- Off - hibernating
- On - functioning
- Blinking - dead

Battery status monitor:

- 2 ADC, voltage
- 1 Ammeter, current

Battery capacity line, report both battery voltages to arduino Battery draw line, report current usage

Battery states

Battery system state

- Hibernation (battery isolated,LED indicator)
- Idle state (battery live, V+S,V-S, V+P, V-P all off)
- Charge state (V+P, V-P on, V+S,V-S off)
- Drive state (V+P, V-P off, V+S,V-S on)
- Battery disabled state (All off, LED indicator) - wake Arduino state reason?

Battery switch

Used multiple N channel power MOSFETs as a high side switch

Use gate drivers: https://www.analog.com/en/about-adi/news-room/press-releases/2017/fast-60v-high-side-n-channel-mosfet-driver-provides-100-duty-cycle-capability.html LTC7004

Use power mosfets FDC6324L