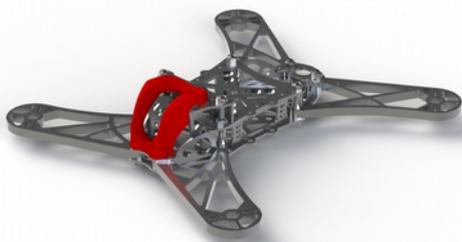


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## Introduction



Thank you for purchasing the Rebel 220 quad racer frame.

The Rebel 220 design focus has been to push the design limits of what can be achieved with a 7075-T6 aluminium alloy frame. Minimalistic size and design concept with tight tolerances has been a guiding light to save weight, make the frame strong with thorough load distribution design, keep centre of gravity correct and ease of servicing.

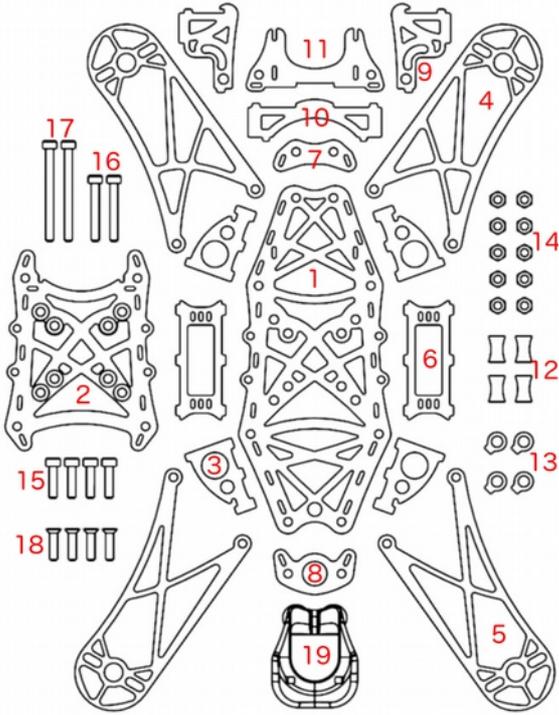
As usual, this at low cost *without comprising quality*.

## Features

- Slight long-X design, 220mm diagonal.
- 115 g assembled frame weight.
- FC and ESCs/4in1-ESC inside the frame.
- Aerodynamically efficient arms.
- 5” prop optimised.
- Easy access for VTX and FC connections
- All type specific fasteners included.
- No PDB needed - electronic ground in the frame.
- Optimised for Foxeer series enclosed flight cams, 15-80° tilt.
- Optional on top- or belly mounting of battery, for optimizing centre of gravity when flying with additional HDcam.



**Included**



| Item | Pcs | Name                  | Code |
|------|-----|-----------------------|------|
| 1    | 1x  | Hull Board            | HB   |
| 2    | 1x  | Hull Board Tray       | HBT  |
| 3    | 4x  | Rail Raiser           | RR   |
| 4    | 2x  | Arm                   | A    |
| 5    | 2x  | Arm Rear              | AR   |
| 6    | 2x  | Longside Riser        | LR   |
| 7    | 1x  | Frame Pan             | FP   |
| 8    | 1x  | Frame Pan Rear        | FPR  |
| 9    | 2x  | Cam Rail              | CR   |
| 10   | 1x  | Tray Wall             | TW   |
| 11   | 1x  | Cam Tray              | CT   |
| 12   | 4x  | Spacer 10mm           |      |
| 13   | 4x  | Cable Shue            |      |
| 14   | 10x | Lock Nut M3           |      |
| 15   | 4x  | Screw M3x12           |      |
| 16   | 2x  | Screw M3x22 Aluminium |      |
| 17   | 2x  | Screw M3x35 Steel     |      |
| 18   | 4x  | Screw M3x12 Polymer   |      |
| 19   | 1x  | Flight Camera Guard   |      |

## The Build

### Guidelines

The tolerances are very tight on this build, to accommodate for a straight and force distributing frame to withstand crashes. At the first assembly, it can sometimes be hard to fit all flanges in their grooves, and additional filing might be needed to achieve a perfect fit. However, be gentle with the filing, as this action is irreversible.

Do not use thread lock, as all screw joints are secured with lock nuts.

The supplied aluminium screws are not as strong as the steel ones. They can take up to 0.75Nm in torque, and tightening close to that limit will only make them more prone to rip their threads in a crash. Tighten the aluminium screws only as much as need to make things stay together without any slack. The steel screws can be tighten a lot to accommodate the shear forces in crasches. During initial flights, the assembly might get a bit loose due to that the aluminium frame's oxide layers are being loosen during the "break in" period. Tighten as needed.

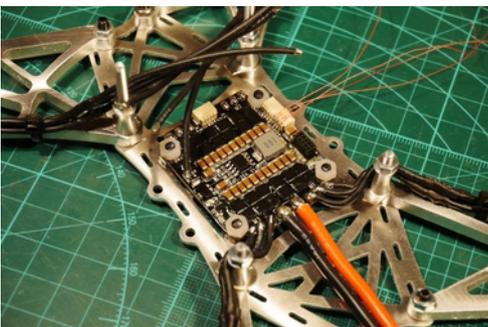
The FC, without any pins, is intended to be fastened with supplied countersunk plastic screws to the 'Hull Board Tray'. The ESCs are meant to be distributed underneath the FC in a square pattern, held in place by straight tie straps running across the interior between the two 'Longside Risers', or with double side adhesive foam tape.

Alternatively, a 4in1 ESC PCB can be attached to the 'Hull Board' through the dedicated countersunk holes.

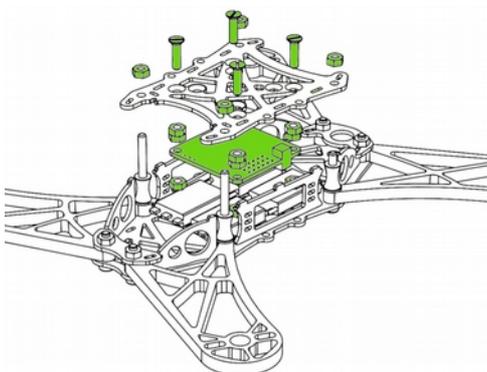
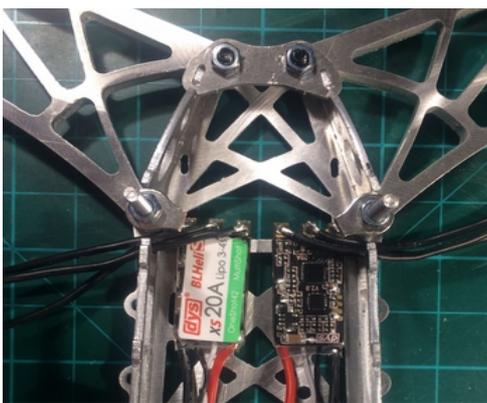
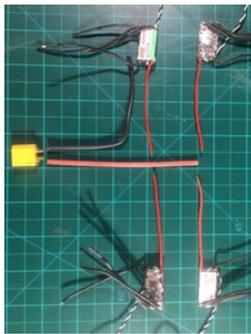
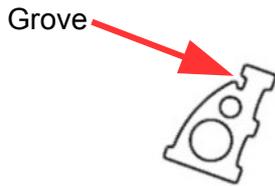
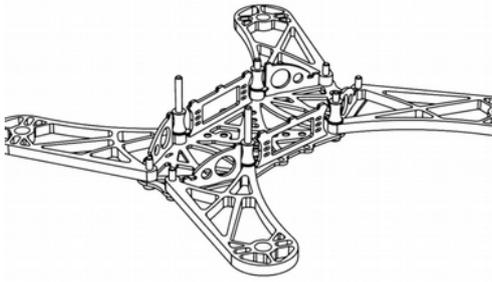
**OPTION**

The phase cables to the motors, are intended to be routed between the waist-shaped spacers and the "Longside Risers", so that they can be easily removed from the frame without soldering when servicing.

Please see Appendix 1 or 2 for a general electrical distribution.



Sample of phase cables soldered to a  
DYS 4in1.



### Suggested build sequence

Start with placing all supplied metal screws into the 'Hull Board' while holding it into your hand. These screws hold the arms, cable shoes and spacers.

Flip the 'Hull Board' with all the screws on its other side on your build surface, and continue with placing the arms as shown. Now place one cable shoe and one spacer on each for the four screws closest to the frame centre. (Spacer-Cable shoe order is as You see fit.) Continue with all four 'Rail Raisers' in their positions. In the groves of the 'Rail Raisers', place the 'Frame Pan' and 'Frame Pan Rear' and press gently down towards each arm's end. This might be a tricky part!

Temporarily, fasten the arms to the screws with nuts. This is just to make the frame handling for the electrical layout easier

OPTION

Its now time to plan the electrical layout. (See Appendix 1 and 2.)

Starting at the battery, the power receptor is intended to be attached to the frame with tie straps in the end, between the two loops on the side of the 'Hull Boards', depending wether You're aiming to have your battery on top or below the frame. The ground lead is routed to any of the cable shoes for connection. The + wire goes to the ESCs, and a branch leading to a voltage regulator (if you have OPTO ESCs) and FPV gear.

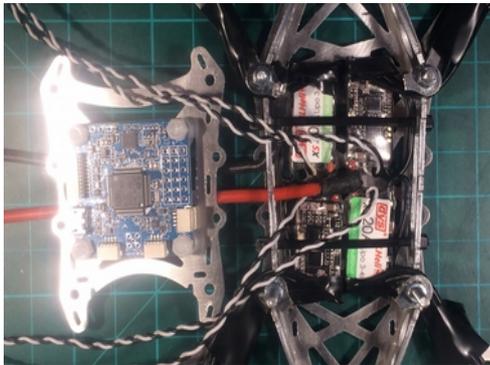
To start with, place adequate amount of battery cable to the preferred side<sup>1</sup> of the 'Hull Board' and distribute the cables in the frame to the ESCs and cable shoes. Make sure enough length is cut to accommodate soldering and possible slack for disassembly during maintenance.

Place the two 'Longside Risers' in the associated grooves.

Fasten Your FC to the 'Hull Board Tray' with the supplied countersunk polymer screw. Use one plastic nut to fasten the screw to the "Hull Board Tray", another one to make space for the FC and the "Hull Board Tray, and the third one to fasten the FC to the screw. **Make sure You can access the USB port on your FC thought the square hole in the "Longside Risers"**. Place it on top of the frame with the FC

WARNING

<sup>1</sup> Depending on what side You choose to have you USB connection for the FC – just to avoid congestion.

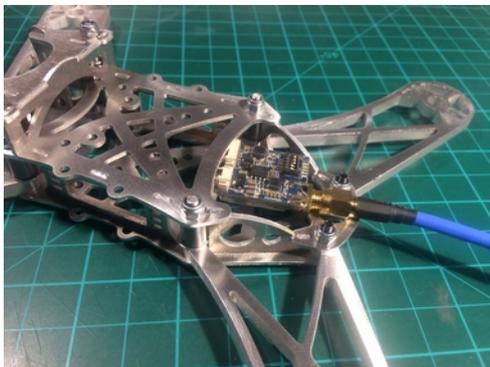


facing down. Align the grooves with the 'Longside Riser' tabs. Motor phase cables are meant to be routed on the outside of the spacers, and tie strapped to the centre facing arm spokes. Its recommended to have a cable sock or equivalent cable protection on the motor phase cables.

OPTION

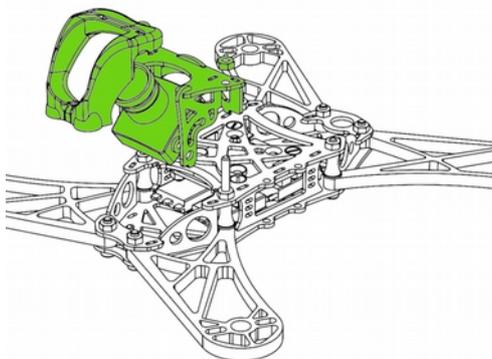
Arrange the signal cables from each ESC to reach it's dedicated pad on the FC. It's advisable have enough signal cable length to allow removal of the 'Hull Board Tray' with attached FC for easy maintenance access into the compartment.

Finally, route all FPV related electronics throughout the frame.



The VTX is intended to be mounted aft of the ESCs, with the antenna SMA nut tie strapped tightly lying in the big hole in part 'Frame Pan Rear'. Don't fasten the VTX circuit board, only the SMA antenna bolt is to be fasten with crossed tie straps. The flight cam is intended to be fastened with it's supplied mounting screws without bracket to the flight cam structure prior being attached to the frame. **Be aware that some camera mounting screws can go too far into the camera housing, destroying the internal electronics, if mounted without supplied bracket.**

WARNING



RCTX and BEC is intended to be hosed underneath the VTX, or where ever suitable depending on your choice of equipment.

Once all cable routing and soldering is done, continue the assembly by placing the 'Hull Board Tray' in top and mount the four lock nuts on the aluminium and steel screws.

**Remember to not tighten the two aluminium screws too much, as they can't take that much of tightening torque!**

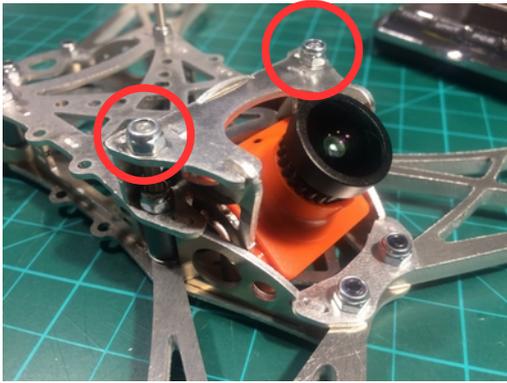
WARNING

It's highly recommended to use a clamping device and a cloth to carefully press the different parts together, before tightening the nuts, as shown in the picture.



Once the frame parts have been assembled, stick one tie strap into each column of holes at the side of the 'Longside Riser' at appropriate height, to prevent the ESCs from moving up and down towards the FC. On the other side, secure the tie strap end with a cut off tie strap head. Also, fasten the battery connector in the side loops. **Remember to insulate the cables/solder spots at the battery connector thoroughly to prevent any short circuit against the aluminium frame parts.**

WARNING



The final stage is to attach the flight camera structure.

The very top nuts, holding the flight cam structure in place, can not be tighten much at all, as it will bend the “Cam Tray” edges.

**WARNING**

Be sure that no equipment, such as cables, antennae, tie straps, pilot dolls or any other thinkable stuff gets in the way of the propellers. Also, it's advisable to place some velcro or rubbery surface on the Hull Board Tray and the battery, to prevent it from moving once strapped to the Rebel220.

The last appendix in this manual contains a selection of various photos of a suggested completed Rebel220 FPV racer.

Enjoy your flights :D



## General advice

This product can be a danger to yourself and others, including property, if not used carefully. It is strongly advised for spectators (especially children) to wear safety glasses in close proximity of the flying site. Any child (user or spectator) should be supervised by adults at all times.

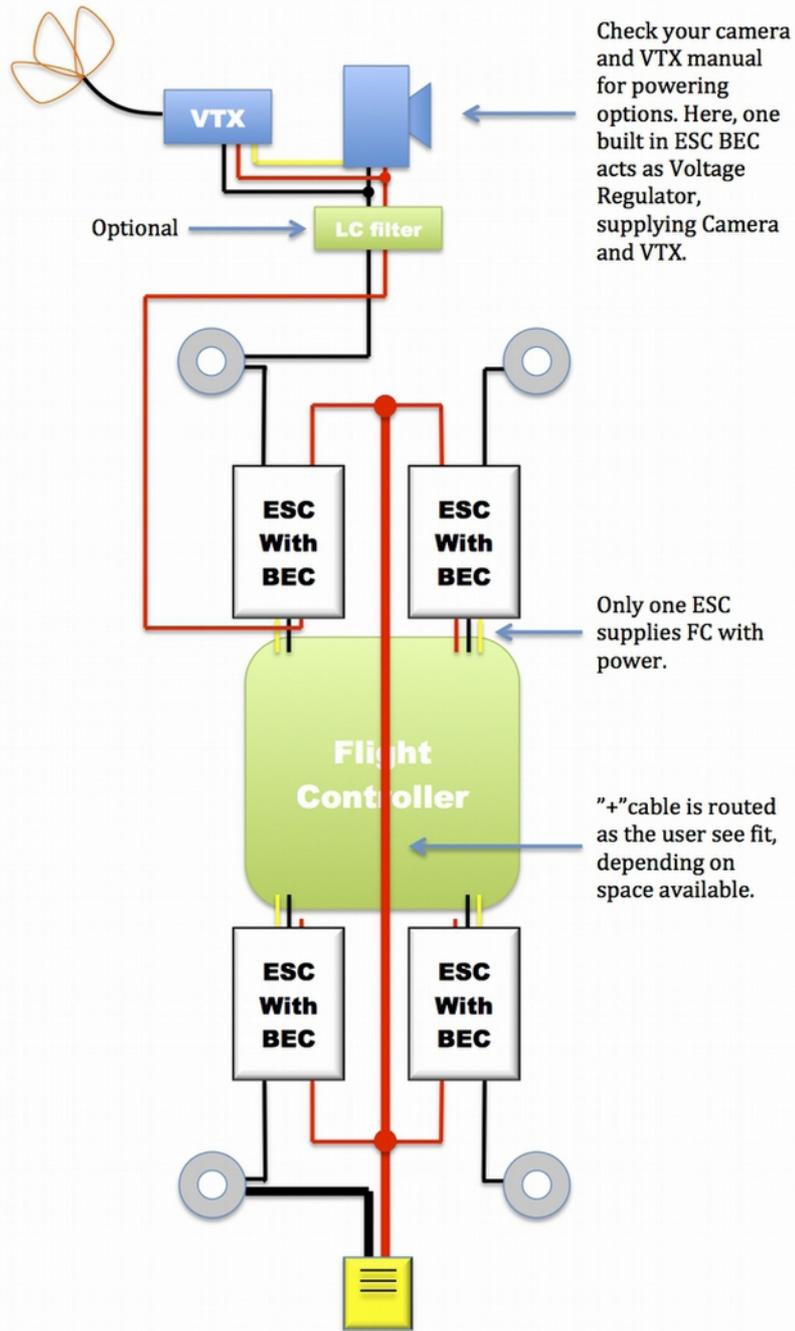
ADHERE TO YOUR COUNTRY'S RULES AND REGULATIONS FOR RADIO CONTROLLED FLIGHT. USE COMMON SENSE, DO NOT FLY CLOSE TO ANY HUMANS, ANIMALS, POWER LINES, BUILDINGS OR OTHER PROPERTIES NOT ALLOWED FOR RC ACTIVITIES. DO NOT FLY INTO CONTROLLED AIRSPACE AROUND AIRPORTS AND HELIPADS CLOSE TO INSTITUTIONS SUCH AS HOSPITALS, POLICE AND MILITARY INSTALLATIONS.

Remember, multi rotor hobbies are expanding rapidly. Keeping the public and officials on side by showing respect and responsible piloting, will allow all the freedom to conduct this awesome hobby long into the future.

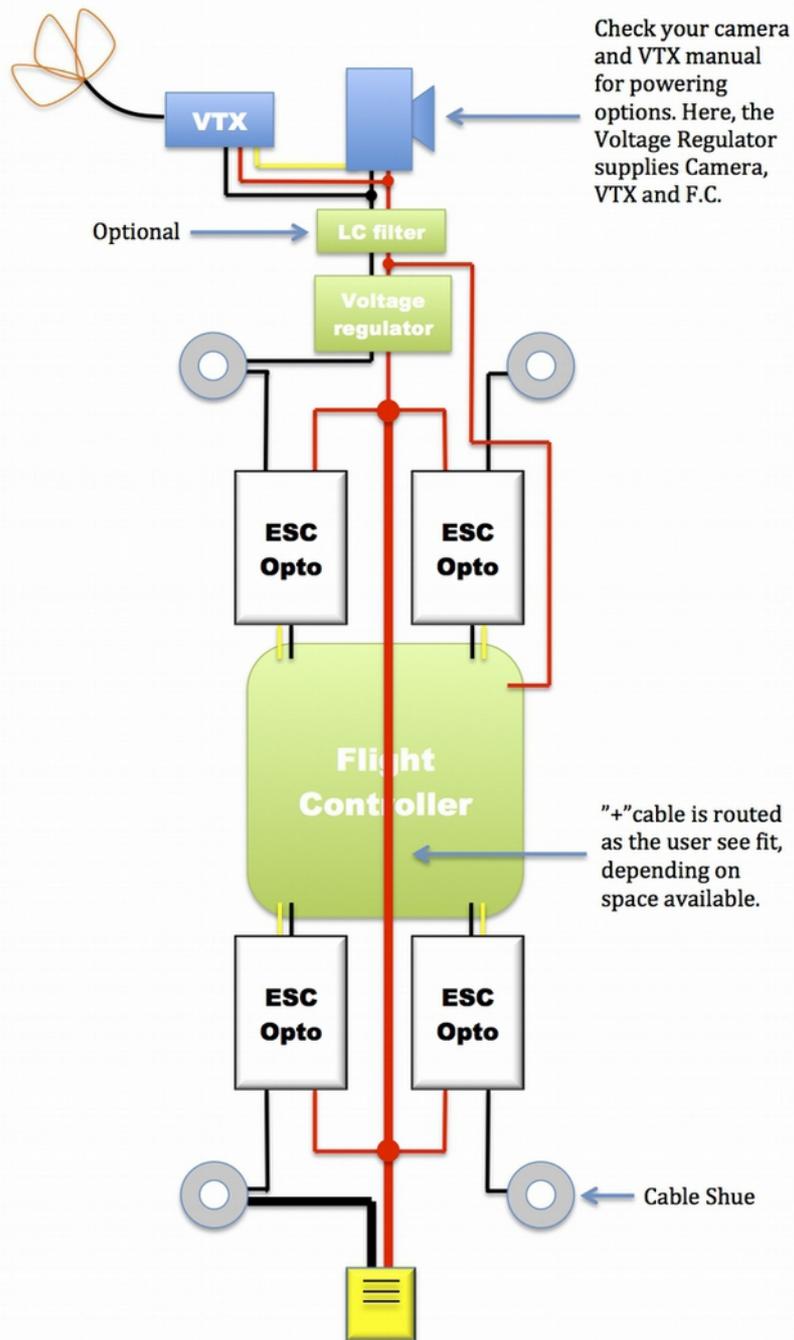
## Limitation of Liability

The purchaser bears all risk in the product upon purchase from FlightWorks™, including the purchaser's ability or competence to use the product. In no event, under any circumstances shall FlightWorks™ be liable for any direct, indirect, incidental, punitive or consequential damages of any kind caused by the operation of the product by the purchaser that results in damage to property and/or person(s) and/or legal charges. This applies whether arising due to an accident or bad judgement, lawful or unlawful use of the product or tort including negligence

Appendix 1. Electronics layout ESC with BEC.



Appendix 2. Electronics layout ESC OPTO.



**Appendix 3. Suggested Build.**

Photographer C. Eltvik



