

chAIR - Manned Multirotor Quadcopter

This page should document the published progress of Axel Borg, a Swedish engineer building his own DIY quadrocopter.

Demo Video on Youtube: <https://www.youtube.com/watch?v=wDJC99mb0SU>

Specs

- **Flightcontrol:** 5x KK 2.1 running stock 1.6 firmware
- **Motors:** 76x Multistar Elite 5010 274Kv
- **Motor Controllers:** 76x afro 20A HV ¹⁾
- **Propellers:** 17x5 or 18x5.5 Quanam DJI style CF ²⁾ ³⁾
- **Batteries:** 80x Multistar 4S 5.2Ah, 6.18kWh ⁴⁾
- **Remote Controllers:** 5x Turnigy TGY-i6S Digital Proportional Radio Control System
- **Weight:**
 - Vehicle: 58kg excl. batteries
 - Battery: 35kg
- **Load:** Tested with 93kg ⁵⁾

Construction

- Aluminum tubing 6063 T6
- Aluminum rod 6082 T6
- 4.5kN break kevlar rope for Chair
- Bridge nylon 3D printed parts
- Aluminum pop rivets

Battery

- 80 packs, each 5.2Ah, 4x3.7V
- 4 sub assemblies
- super plugs with 15 XT60 connectors, forced by a screw with bearing
- each pack is balanced individually

Charger

- 20x Turnigy 35W balance chargers
- 2x Turnigy 540W power supply
- 2x50-Pin D-Sub Connectors for each of the 4 Packs

Motors

- 274 rpm/V
- 28A
- 22-30V
- 630W
- 4mm shaft

Comment from axbor22 on Hobbyking:

Love this motor. I run them on 8S, 20A Afro HV controllers and a 18x 5.5 Quantum DJI style CF prop

- 1000g thrust at 9.8g/w
- 2000g around at 7.7g/W
- 4600g peak thrust (!) at 4.7g/W

with newly charged batteries, two 4S 8000mAh zippys in series. Amazing that the Afro 20A ESC seems to be able to withstand the 31A peak current draw. First time I found HobbyKing products to be underrated 😊

ESC - Motor Controller

- Current Draw: 20A Continuous
- Voltage Range: 3-8s Lipoly
- BEC: N/A OPTO
- Input Freq: 1KHz
- Firmware: afro_HV.hex
- Discharge wire/plugs: 16AWG/Male 3.5mm
- Motor wire/plugs: 17AWG/Female 3.5mm
- Weight: 28g (Included wire, plug, heat shrink)
- Size: 65x27x11mm (with capacitor)

Dynamics

Tilted Motors

The motors are tilted by 6° to get a better handling, see video part 18.

Redundancy

My assumption:

Electrically the whole thing is split into 5 more or less equal quadrocopters

- 5 remote controls, potentiometers on a DIY 3D-Printed Joystick, mechanically coupled
- 5 RC receivers

- 5 Flight controllers
- 76 Motors: Each of the 4 „super rotors“ has 19 Motors, where 4 flight controllers controll 4 motors, and 1 flight controller controls 3 motors.

Videos

Sorted: newest on top:

- [Part 25 - Round flight](#)
- [Professional video footage and interview \(swedish this time -sorry\)](#)
- [Demo Video](#)
- [Part 23 Media Day 1](#)
- [Part 22 - Second Flight, Pilot View](#)
- [Part 21 - Flying and Turning](#)
- [Part 20 - First Flight](#)
- [Part 19 - Load Test 93kg, Reduced Motorset \(60 vs. 76\)](#)
- [Part 18 - Tests, tilted Motors, Joystick](#)
- [Part 17 - Pictures, Cabeling, Ropes](#)
- [Part 16 - Construction and Tools](#)
- [Part 15 - Charger, Battery Connectors, Chair](#)

[english](#), [technical](#), [quadrocopter](#), [flight](#), [project](#)

1)

with one extra 63V 330uF low ESR capacitor fitted to each ESC to handle the long current path from battery to ESC

2)

432mm/5° or 460mm, 5.5° pitch

3)

In Video Part 16, he speaks about 17, „x5°, 18x5.5 is from his comment on the motors, see [motors](#)

4)

4 modules: 20 pieces of 5.2Ah,4S; first 2 of these in parallel, then in series → 5 groups in each with 8S,10.4Ah

5)

<https://www.youtube.com/watch?v=v78LQJQF7yk>

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