

# AUTONOMOUS SEEDING QUADCOPTER

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# FINAL 3D DESIGN



# OBJECTIVES AND MOTIVATIONS

## MAIN OBJECTIVE

Develop a fully autonomous and precise seed-planting drone.



## MOTIVATIONS

Growing global food demand (FAO projection for 2050)



Improve on current drones



# SPECIFIC OBJECTIVES

## MAXIMUM LOAD

Maximum load of  
lettuce seeds of  
80g.

## AUTONOMY

Autonomy of 10  
minutes

## ACCURACY

Positioning  
Accuracy of 2,5m

## AUTONOMOUS

Autonomous  
Movement &  
Seeding

# MOTOR SPECIFICATIONS

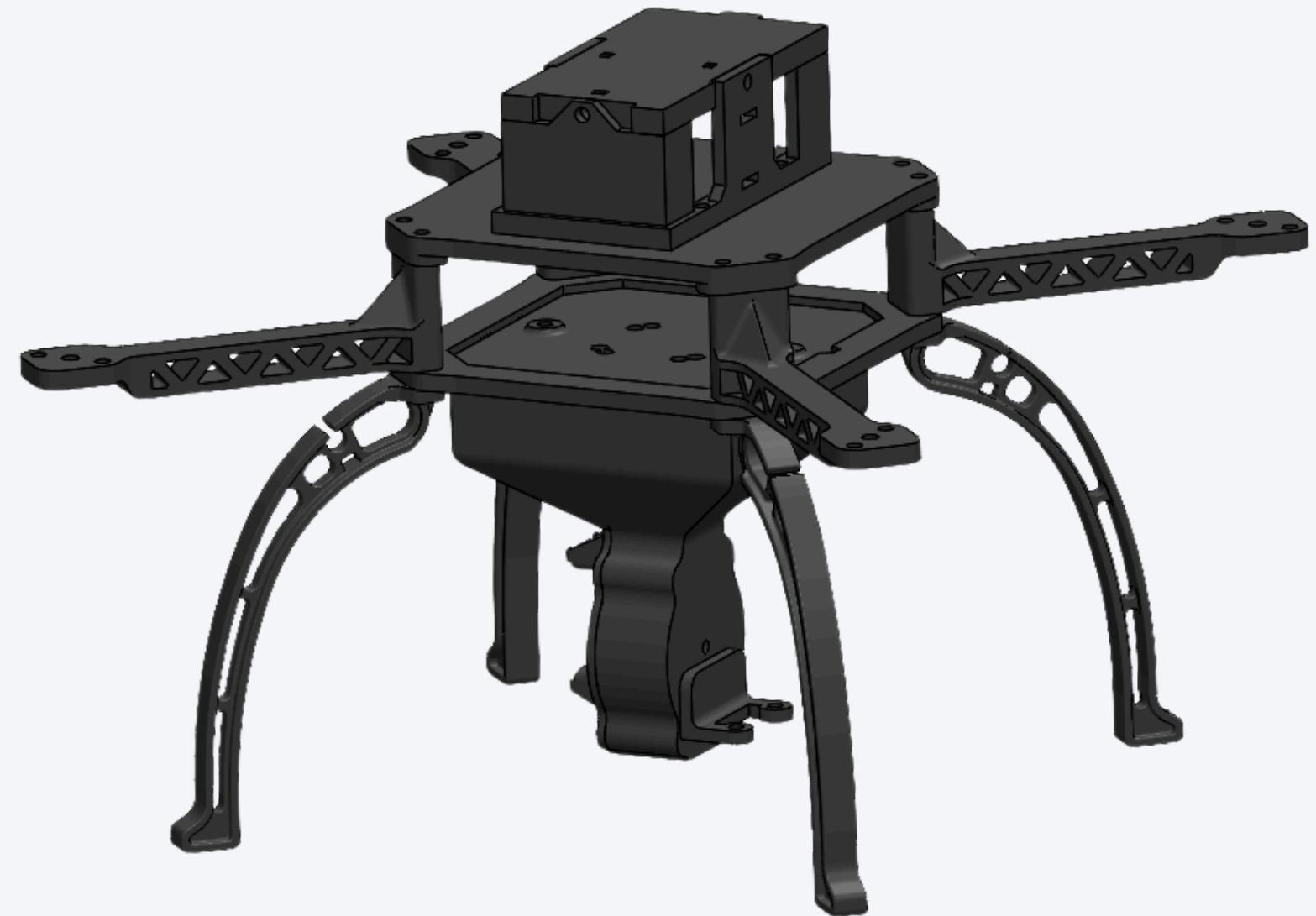
**Initial Drone Specifications:**

Dorn weight	600 g
Load weight	200g
Total weight	800g
Thrust ratio	2:1
Thrust needed	1600g
Thrust x motor	400g
Propeller dimensions	5x4x3
Frame size (Diagonal)	21,21 cm

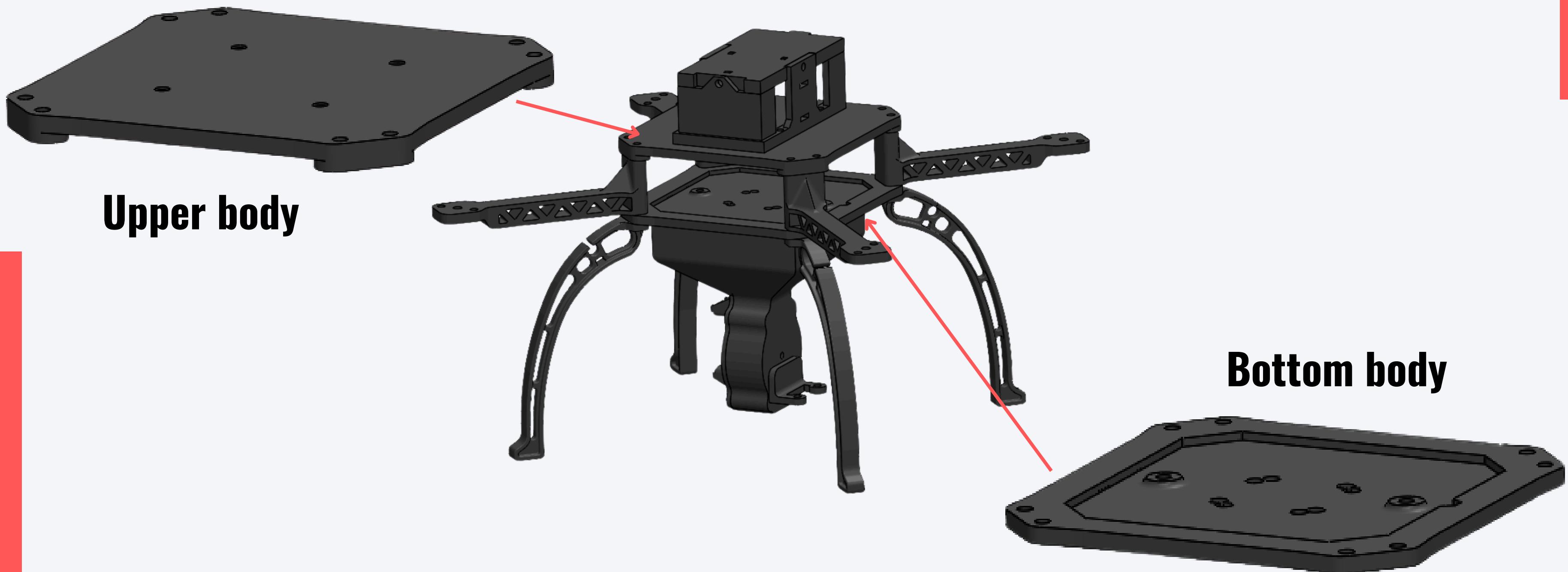
**Total Drive**
**Drive Weight:**
**784 g**
**Thrust-Weight:**
**2.6 : 1**
**Current @ Hover:**
**15.66 A**

<b>General</b>	Model Weight: 800 g incl. Drive 28.2 oz	# of Rotors: 4 flat	Frame Size: 212.13 mm 8.35 inch	FCU Tilt Limit: no limit	Field Elevation: 500 m.ASL 1640 ft.ASL	Air Temperature: 25 °C 77 °F	Pressure (QNH): 1013 hPa 29.91 inHg	
<b>Battery Cell</b>	Type (Cont. / max. C) - charge state: LiPo 5000mAh - 80/120C - normal	Configuration: 3 S 1 P	Cell Capacity: 5000 mAh 5000 mAh total	max. discharge: 85%	Resistance: 0.0026 Ohm	Voltage: 3.7 V	C-Rate: 80 C cont. 120 C max	Weight: 143 g 5 oz
<b>Controller</b>	Type: max 30A	Current: 30 A cont. 30 A max	Resistance: 0.008 Ohm	Weight: 40 g 1.4 oz	<b>Accessories</b>	Current drain: 0 A	Weight: 0 g 0 oz	
<b>Motor</b>	Manufacturer - Type (Kv) - Cooling: (= discontinued) EMAX - Ecoll 2306-2400 (2400) good	KV (w/o torque): 2400 rpm/V	no-load Current: 1.8 A @ 10 V	Limit (up to 15s): 740 W	Resistance: 0.047 Ohm	Case Length: 19 mm 0.75 inch	# mag. Poles: 14 1.1 oz	Weight: 31 g 1.1 oz
<b>Propeller</b>	Type - yoke twist: Generic - normal	Diameter: 5 inch 127 mm	Pitch: 3 inch 76.2 mm	# Blades: 3	PConst / TConst: 1.15 / 1.0	Gear Ratio: 1 : 1	calculate	

# STRUCTURE



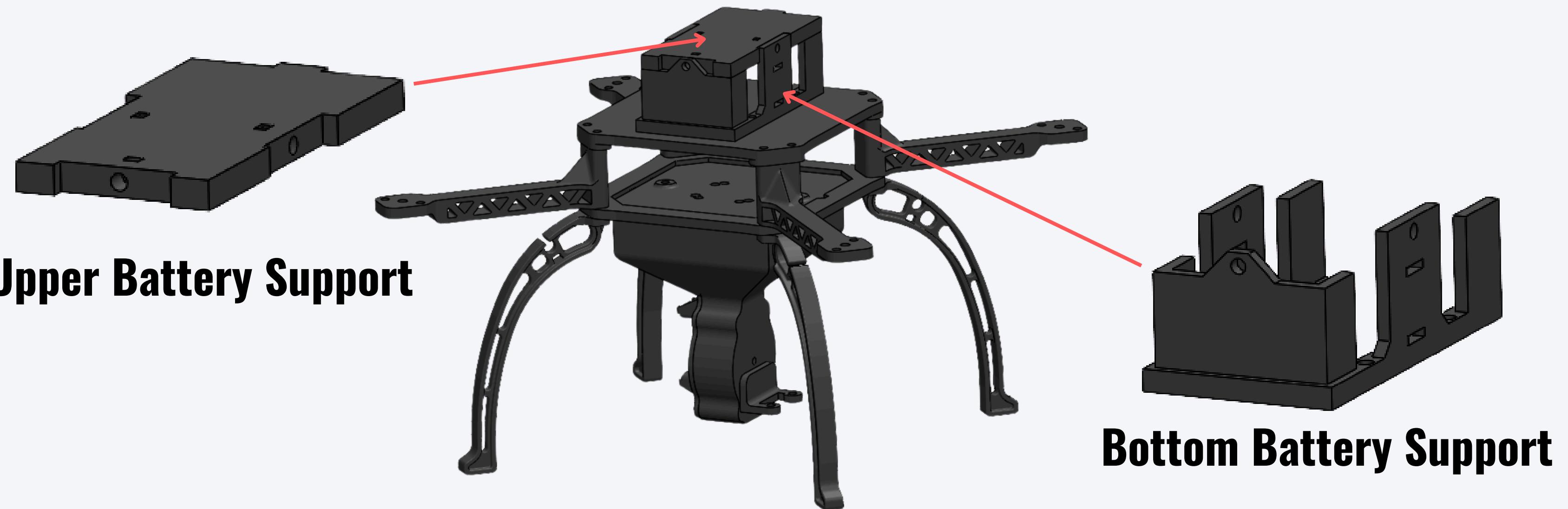
# STRUCTURE



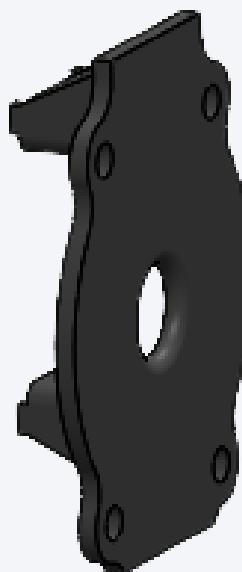
# STRUCTURE



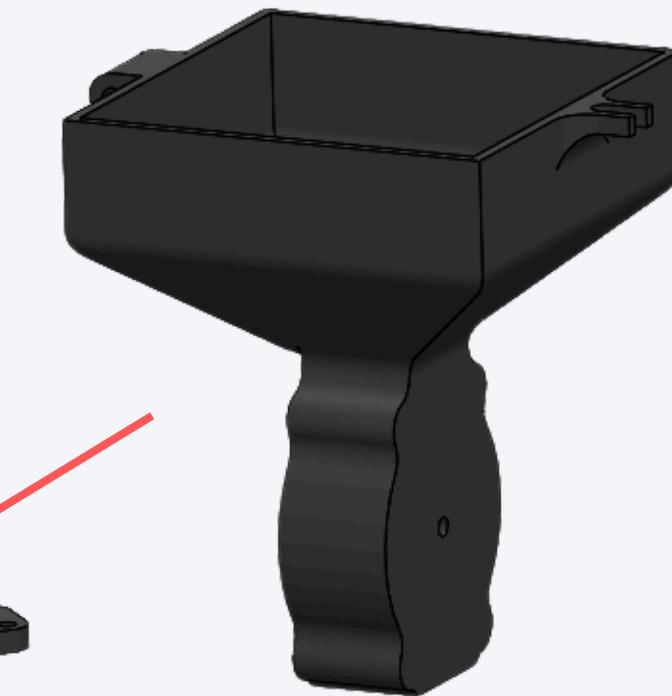
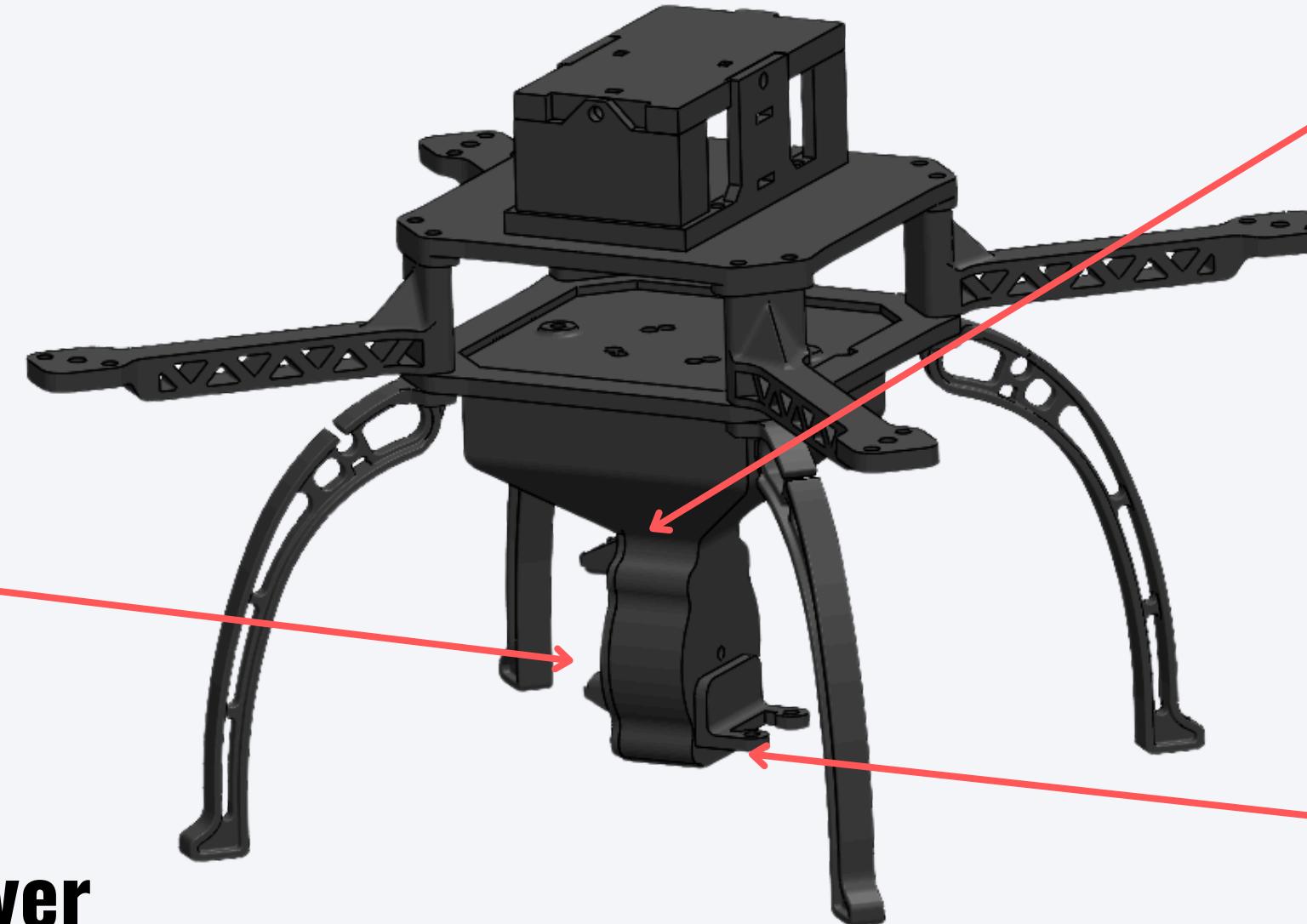
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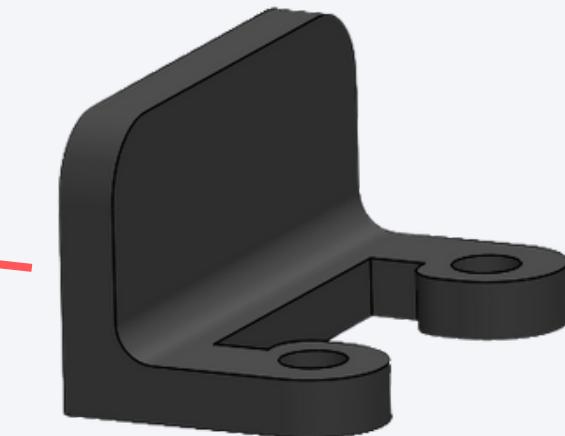
# STRUCTURE



**Rotative Valve Cover**



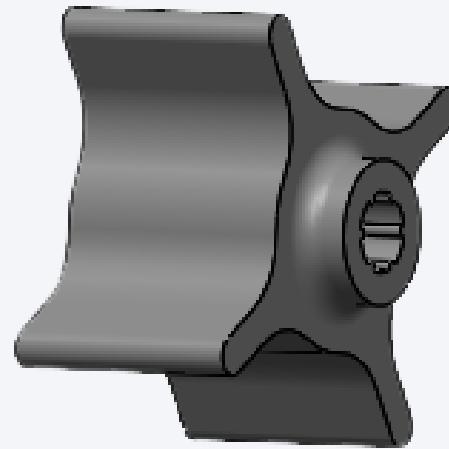
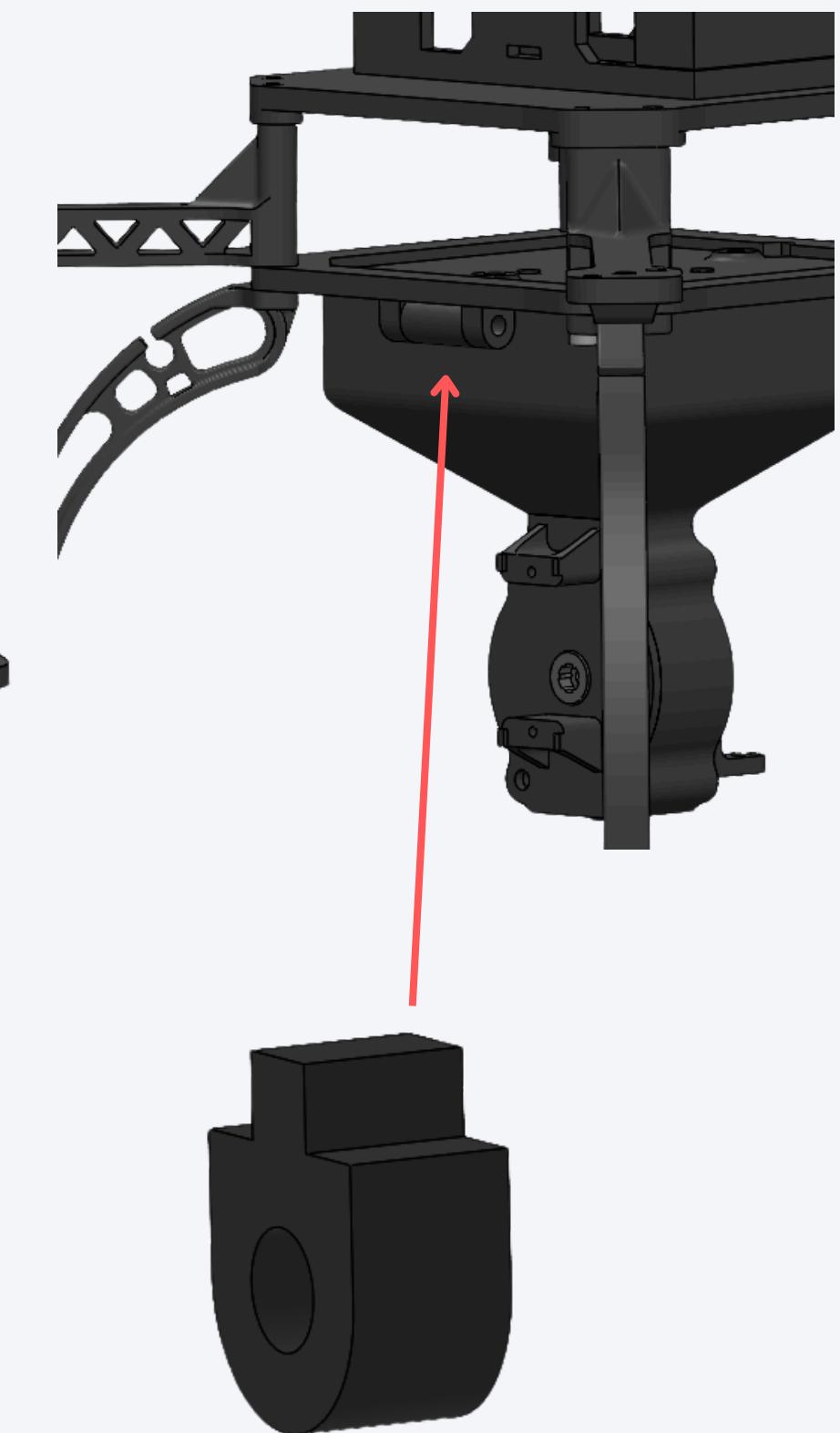
**Hopper + Rotative  
Valve Enclosure**



**Distance sensor support**

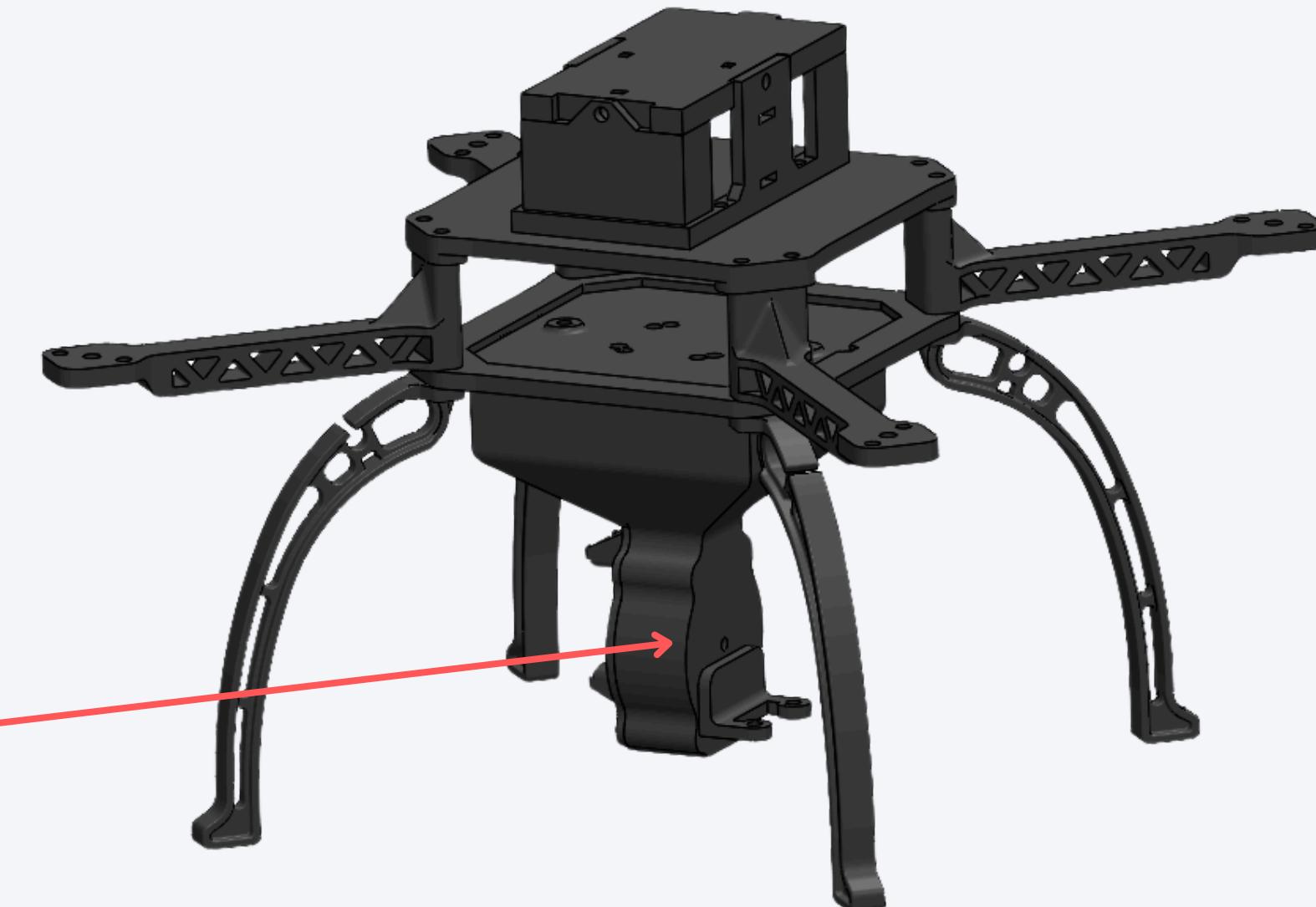
# STRUCTURE

Rear part of  
the structure



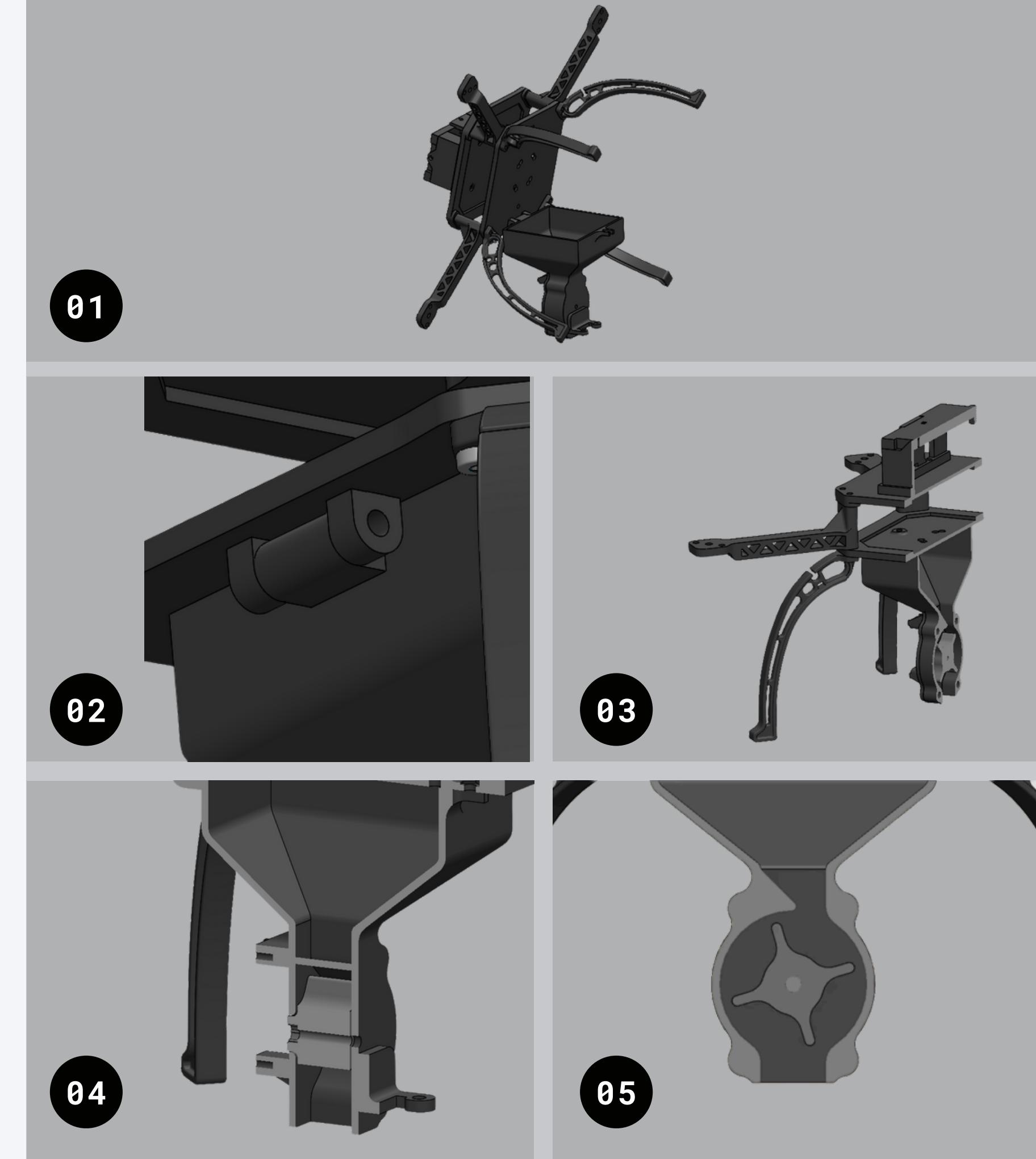
Rotative Valve

Hinge Joint

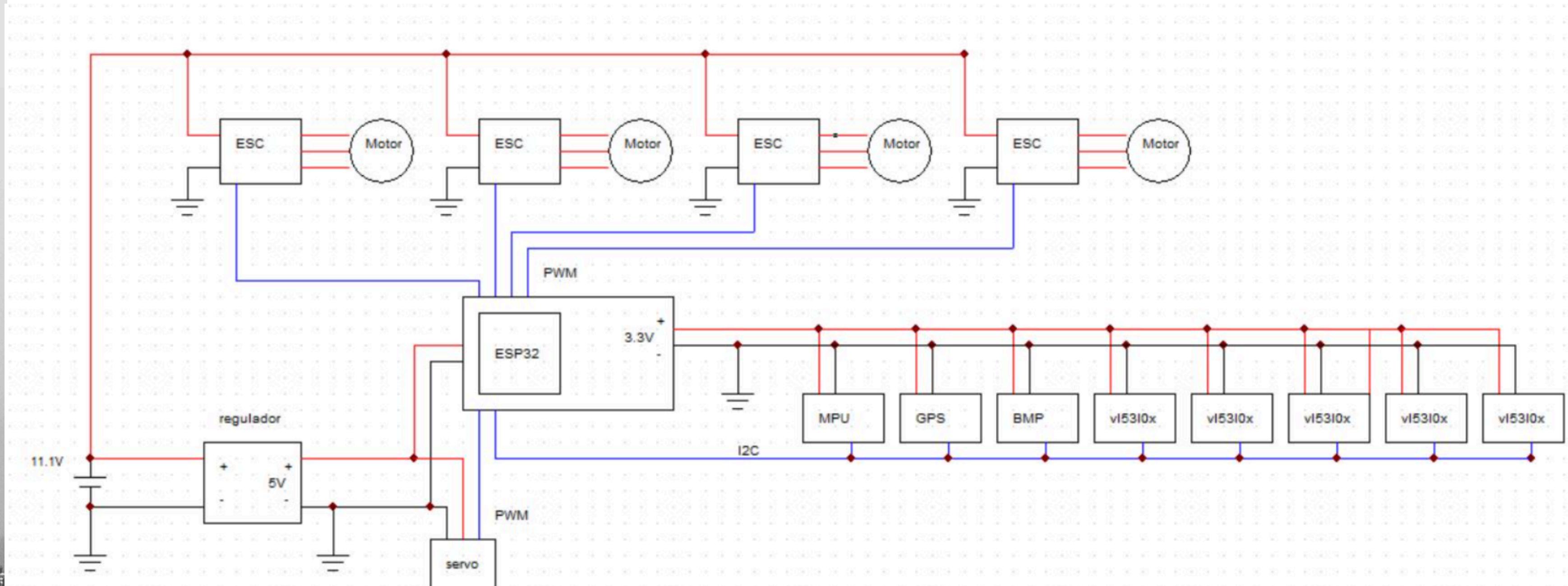


# STRUCTURE

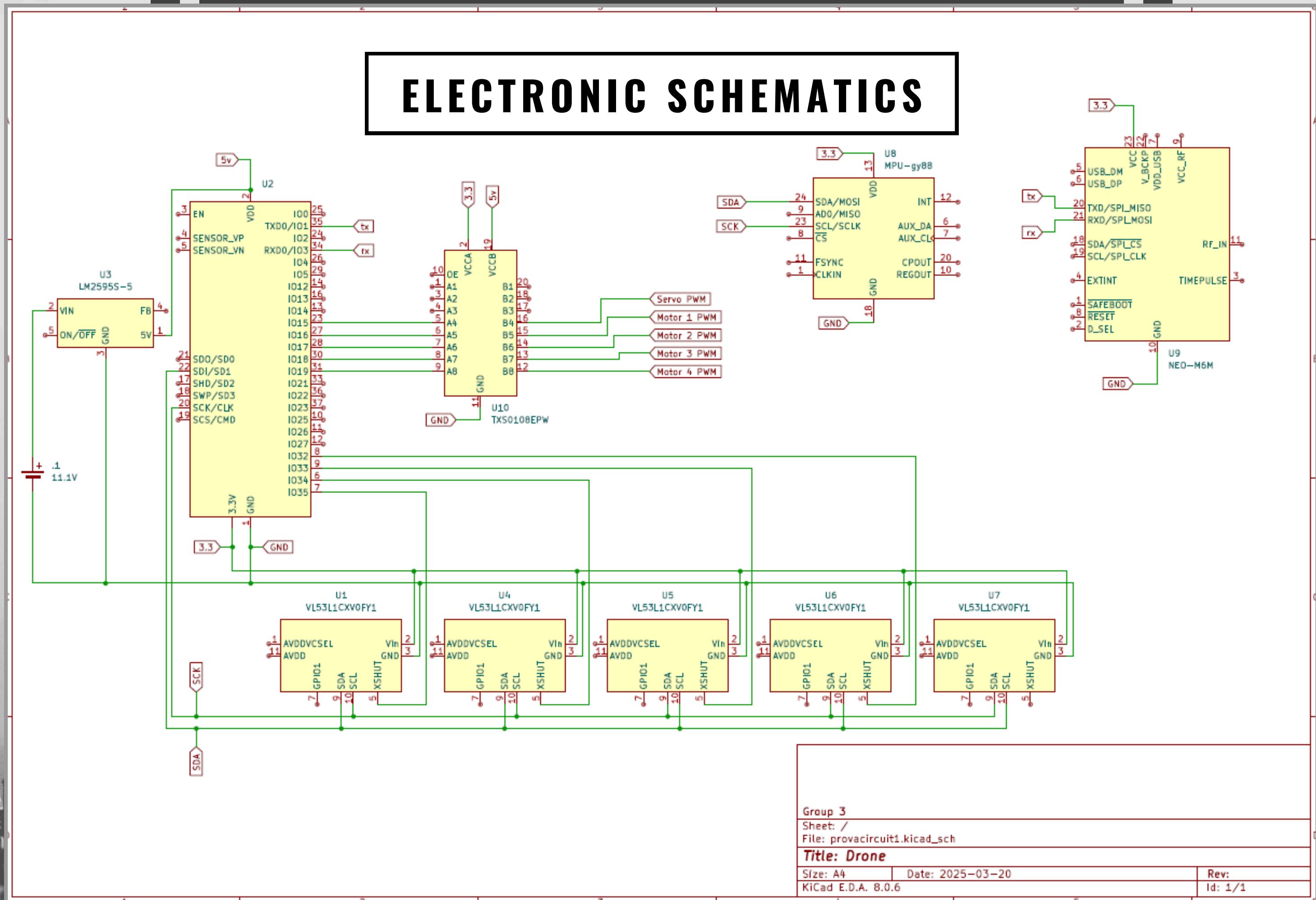
- 01 Loading Status.
- 02 Hinge system.
- 03 Full assembly section.
- 04 Partial section of the doser design.
- 05 Rotary valve simulation clip



# ELECTRONIC BLOC DIAGRAM

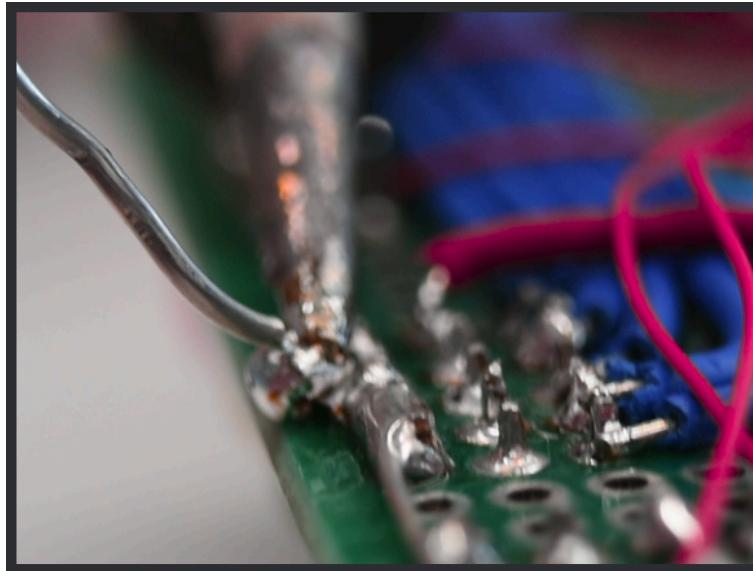


# ELECTRONIC SCHEMATICS

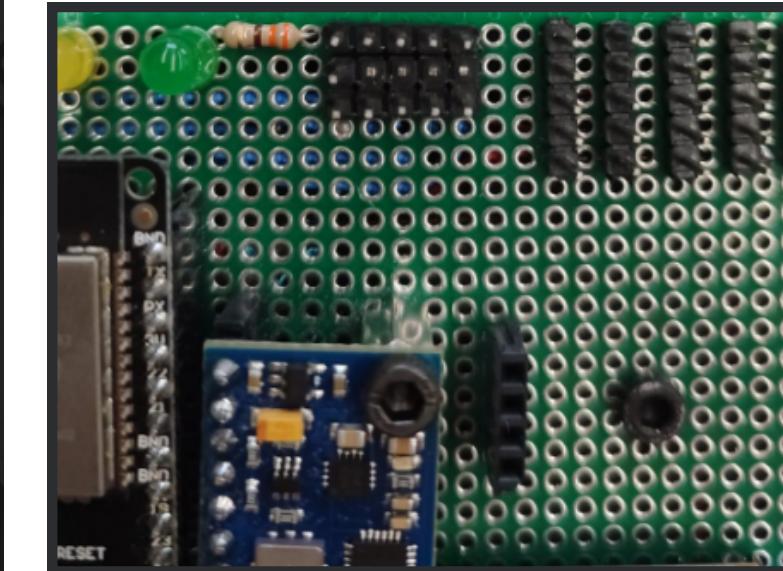


# PCB

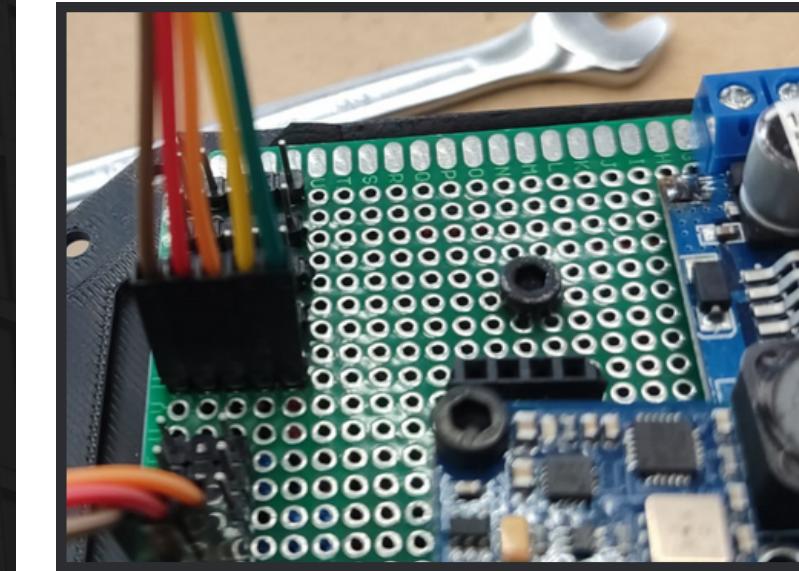
SOLDERED CIRCUIT  
ON A PERFORATED  
BOARD



EASY COMPONENT  
REMOVAL AND  
REPLACEMENT



SECURELY MOUNTED  
TO MINIMIZE  
VIBRATIONS



# ACTUATORS

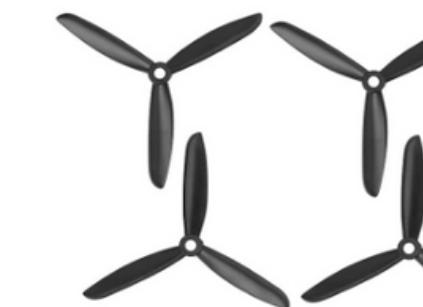
## 2300 KV BRUSHLESS MOTORS

- 11.1 V
- 9 Amps
- 2300KV



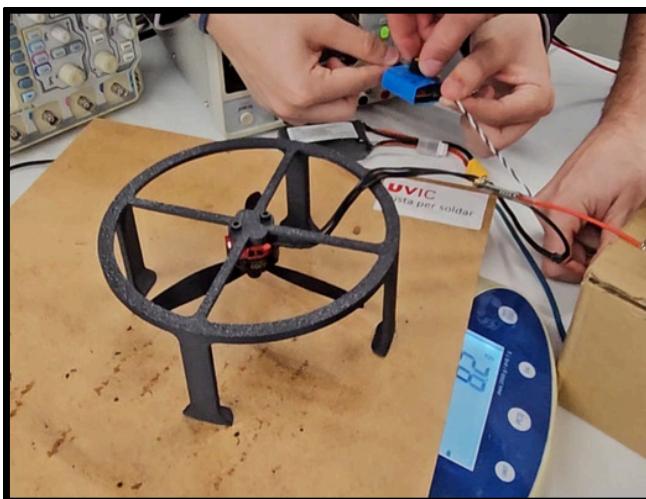
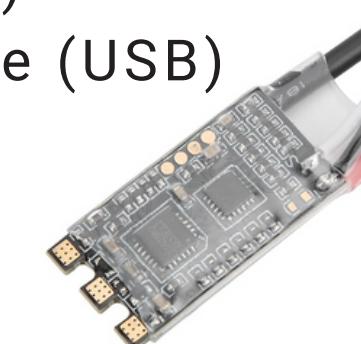
## PROPELLERS

- Diameter: 5 inch
- Pitch: 3 (14.3°)



## ESC CONTROLLERS

- PWM (50Hz)
- Programable (USB)



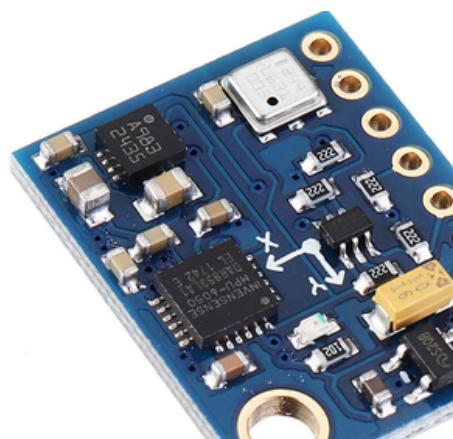
## THRUST

- 375g of thrust x motor at maximum power
- 1.5Kg of total thrust
- 2:1 Thrust-to-weight ratio

# SENSORS

## BMP + MPU

- MPU with gyro and accelerometer to detect drone angles on all three axes
- BMP barometer for measuring drone altitude



## TOF DISTANCE SENSORS

- Time-of-flight laser distance sensors to avoid collisions.
- Provide precise height measurement in the first 3 critical meters.



## GPS

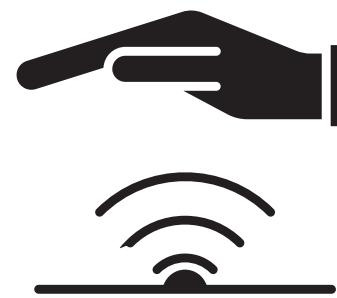
- To obtain position data with 2-meter precision



# CONTROL

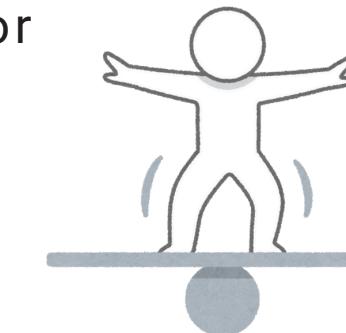
## SENSOR READING

- DIfferent tabs for managing each technology (initialization and reading)
- At the beginning of each iteration all sensors update measurements



## STABILIZATION CONTROL

- Once the measures are taken, a PID calculus is performed on each axis
- With the PID results each motor updates its power combining each axis error



## COMMAND BASED

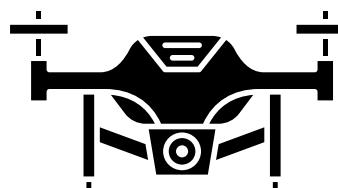
- As simply as downloading a Bluetooth Low Energy terminal in your device
- DIfferent commands like activating PID, emergency stop or seeding can be performed with a proper security distance



# CURRENT PROTOTYPE

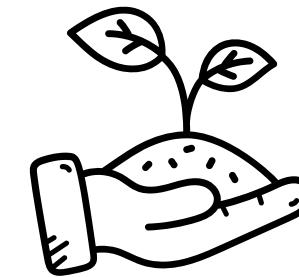
## STRUCTURE FULLY BUILT

- Structure ready to perfectly perform without any modification



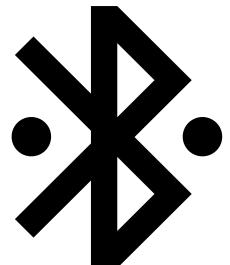
## FUNCTIONAL HOPPER

- The hopper is completely functional to deliver seed packs



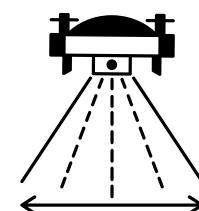
## BLUETOOTH CONTROL

- The drone is prepared to receive and respond to bluetooth commands



## IMU, DISTANCE AND HEIGHT

- These magnitudes are completely functional and with enough precision to perform a flight



## INESTABILITY

- At this moment the drone it's coded to self-balance but it isn't correctly calibrated



# COST OF THE PROJECT



## MANUFACTURING COST

Team member	Total hours
Albert Huescar	98h
Guillem Català	98h
Alvaro Hernández	96h
Pau Porcuna	93h
<b>TOTAL</b>	<b>385h</b>

20€/h x 385h = **7700€**

## MATERIALS AND COMPONENTS COST

Component	Quantity	Price Unity [€]	Subtotal [€]
Motor Servo dispenser	1	5,00 €	5,00 €
Lipo Battery 3S 3200mAh	1	25,50 €	25,50 €
ESP-32	1	11,99 €	11,99 €
MPU 6050	1	12,99 €	12,99 €
Distance Sensor	1	5,00 €	5,00 €
GPS Module	1	8,59 €	8,59 €
Motor/Propeller/Driver Pack	1	90,66 €	90,66 €
11.1V to 5V Regulator	1	3,00 €	3,00 €
Barometer BME280	1	7,99 €	7,99 €
Propellers	2	3,00 €	6,00 €
Filament	1	21,45€	21,45€
Screws and Threaded Inserts	1	5€	5€
<b>TOTAL</b>	<b>11</b>		<b>203.17€</b>

## TOTAL COST

CATEGORY	COST (€)
Material and components cost	203.17€
Labor cost per hour	7700€
<b>TOTAL VALUE</b>	<b>7903.17 €</b>

# GITHUB REPOSITORY

Link: <https://github.com/Integrated-Project-2-2025-UVic-UCC/Group-3>



# BIBLIOGRAPHY

- Microcontrollers: <https://www.espressif.com/>
- Arduino IDE: <https://www.arduino.cc/>
- GPS: <https://www.luisllamas.es/localizacion-gps-con-arduino-y-los-modulos-gps-neo-6/>
- MPU6050 & BMP085: [https://hetpro-store.com/gy-88/?srsltid=AfmBOorQ1bdcOfbNcwNwFgnZn-oYI7aQBLE6Um9fwC\\_TUiqvwHxLnXwT](https://hetpro-store.com/gy-88/?srsltid=AfmBOorQ1bdcOfbNcwNwFgnZn-oYI7aQBLE6Um9fwC_TUiqvwHxLnXwT)
- Similar project: <https://www.youtube.com/CarbonAeronautics>



**THANK YOU  
FOR YOUR  
ATTENTION**