



Peer-graded Assignment

Model a simple chassis



For this challenge, I created a simple chassis similar to the one created in this **3D Model Creation with Autodesk Fusion 360** course. The main body was created as guided in the course tutorials and the overall parameters arrived to be under the given limit.

Below we can see the body properties of the chassis created which has a mass of about **232.5 g** and as to my preference, I took the **Z Plane** to be my top plane hence the center of mass aside in Z Plane with **42.908 mm** while X and Y Plane having negligible masses of **4E-3 mm** and **3E-3 mm** respectively due to minuscule errors but that is fine as there would not be much effect by that.

Properties of the Main Xstar Chassis

Bodies (1)

Area 1.668E+05 mm²
Density 0.001 g / mm³
Mass 232.441 g
Volume 2.075E+05 mm³
Physical Material Nylon 6
Appearance Carbon Fiber - Twill

Bounding Box

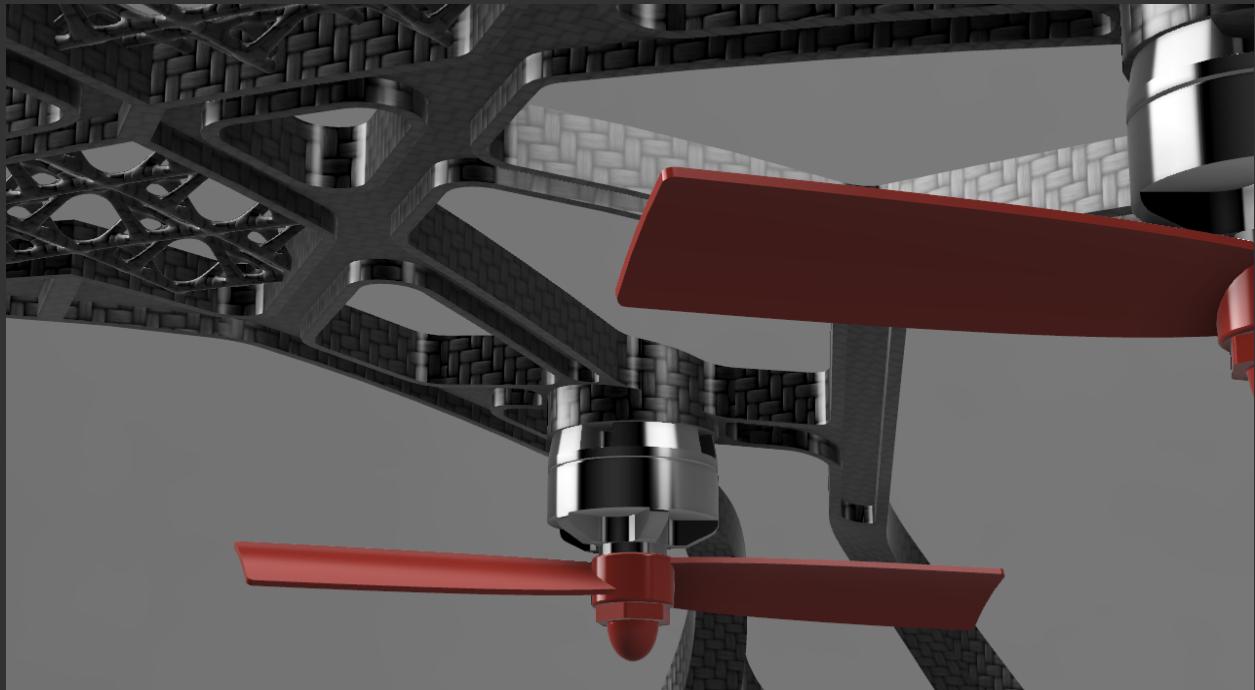
Length 418.267 mm
Width 458.567 mm
Height 77.805 mm
Center of Mass 0.004 mm, 0.003 mm, 42.908 mm

Moment of Inertia at Center of Mass (g mm²)

I_{xx} = 4.481E+06
I_{xy} = -53.95
I_{xz} = 17.877
I_{yx} = -53.95
I_{yy} = 4.020E+06
I_{yz} = 15.72
I_{zx} = 17.877
I_{zy} = 15.72
I_{zz} = 8.212E+06

Moment of Inertia at Origin (g mm²)

I_{xx} = 4.909E+06
I_{xy} = -53.953
I_{xz} = -25.989
I_{yx} = -53.953
I_{yy} = 4.448E+06
I_{yz} = -16.886
I_{zx} = -25.989
I_{zy} = -16.886
I_{zz} = 8.212E+06



I chose the **DYS MR2205-2750kV** motor with a 2-blade propeller. Given above are the properties of both the motor components namely the motor and its propeller together. We can see that it comes to approx **24.5 g**. Hence in total with the four **DYS MR2205-2750kV motors**, the mass comes around **97.606 g** and is also shown below.

Properties of the Motor and Propeller Body

Bodies (2)

Area	8104.704 mm ²
Density	0.003 g / mm ³
Density	5.120E-04 g / mm ³
Mass	24.401 g
Volume	1.153E+04 mm ³
Physical Material	Aluminum 6061
Physical Material	Birch
Appearance	Plastic - Translucent Glossy (Red)
Appearance	Stainless Steel - Polished

Properties of the 4 Motor and Propeller Bodies

Bodies (8)

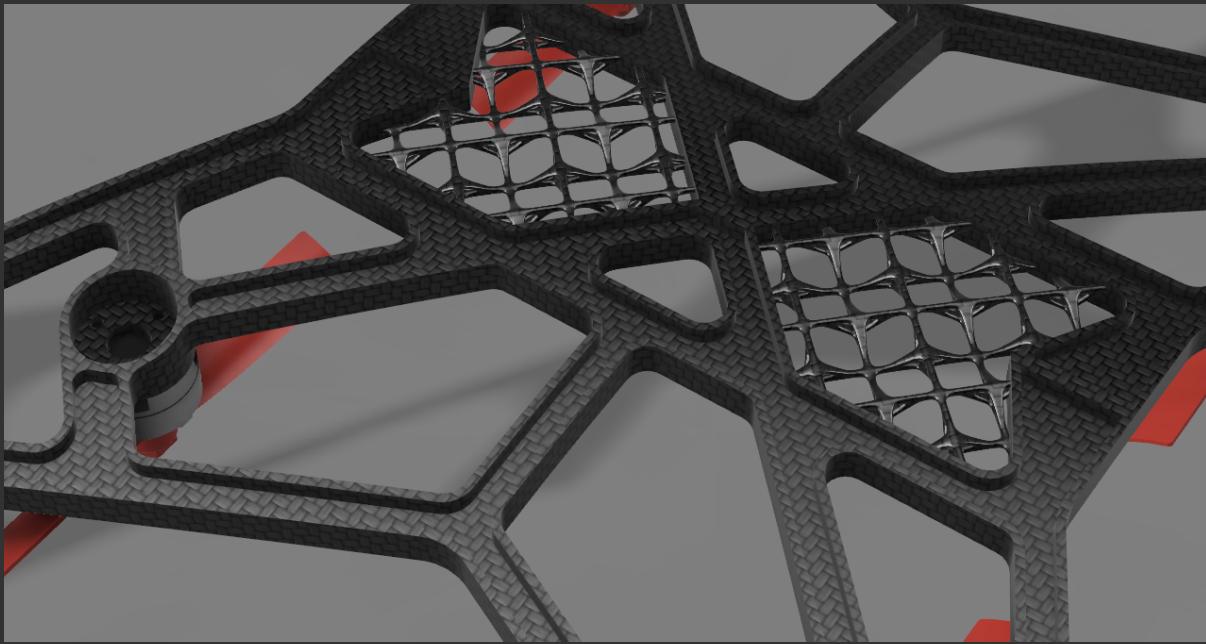
Area	3.242E+04 mm^2
Density	0.003 g / mm^3
Density	5.120E-04 g / mm^3
Mass	97.606 g
Volume	4.610E+04 mm^3
Physical Material	Aluminum 6061
Physical Material	Birch
Appearance	Plastic - Translucent Glossy (Red)
Appearance	Stainless Steel - Polished

The total body mass arrives to be approx **330 g**, Making it come under the given threshold and also should satisfy the 8:1 thrust criteria.
Given below is the total body mass of the Drone.

Properties of the Total Drone Body

Bodies (9)

Area	1.992E+05 mm^2
Density	0.001 g / mm^3
Density	0.003 g / mm^3
Density	5.120E-04 g / mm^3
Mass	330.048 g
Volume	2.536E+05 mm^3
Physical Material	Aluminum 6061
Physical Material	Birch
Physical Material	Nylon 6
Appearance	Carbon Fiber - Twill
Appearance	Plastic - Translucent Glossy (Red)
Appearance	Stainless Steel - Polished



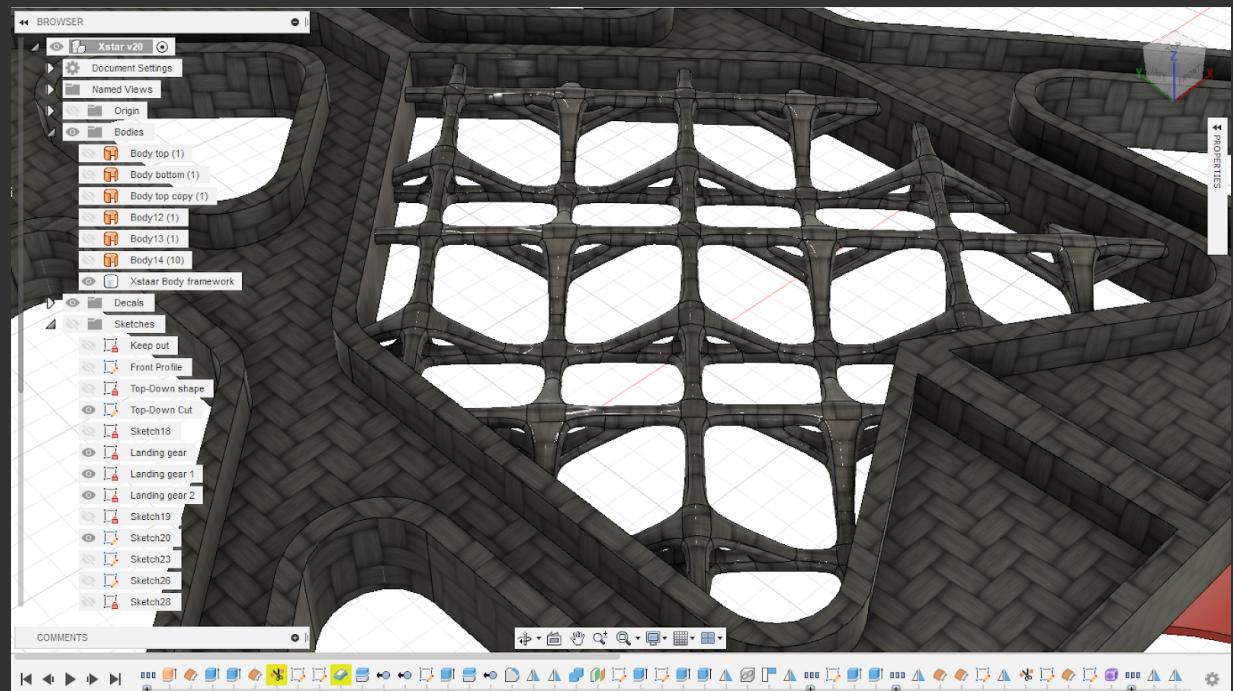
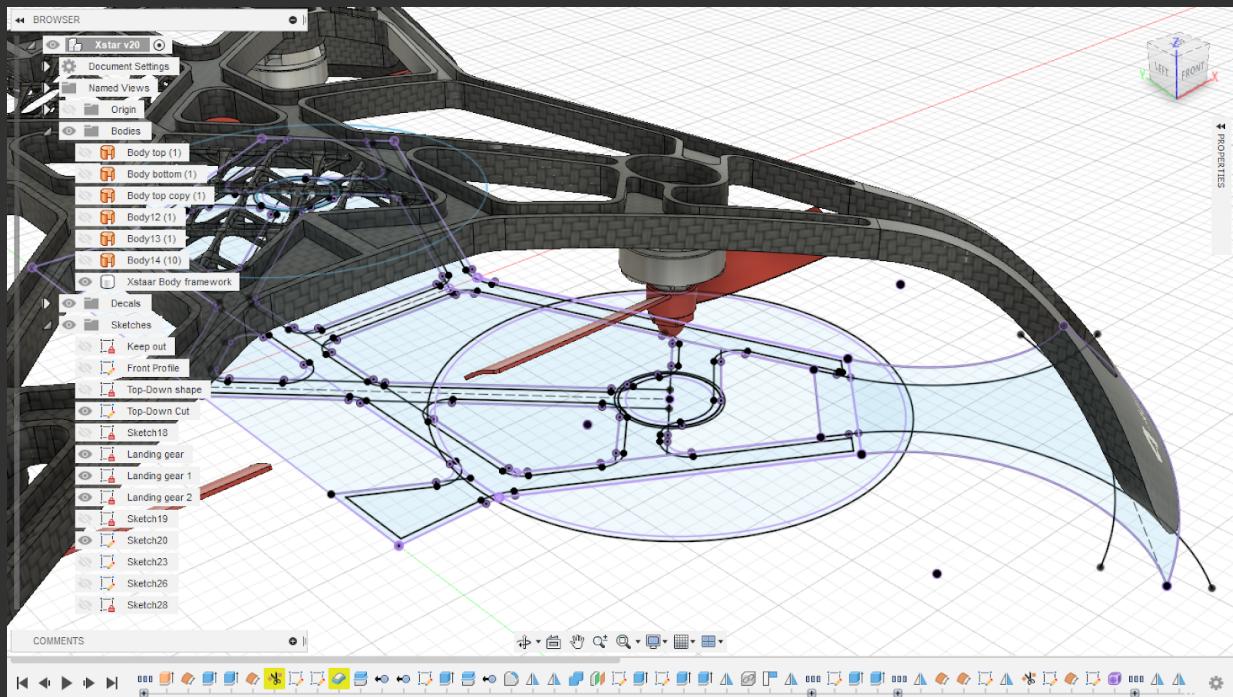
I am using a **Tattu LiPo 1800mAh 75C-150C 4S** battery which has a weight of 200 g and considering the motor weight of **24.401 g**, it has a maximum thrust of 1060 g with the propellers and battery. This should satisfy the **8:1** thrust criteria, **1060 g thrust x 4 motors = 4240 g thrust**. At 100% throttle, the motor draws 25.5 amps per motor or 102 amps total for the drone. At 75C and 1800mAh the battery can handle 135 amps. The maximum amp draw total for the 4 motors would be 102 amps.

Weighing 530 g with 4 motors, each motor needs to supply at least 82.5 g thrust to lift the drone. According to the thrust table, I have each motor that needs **4.66 amps** for 300 thrust. This should be more than enough for a steady flight. With 4 motors 18.64 amps, i.e 4.66×4 are needed for the 330g thrust. This would give a flight time of **5.793 minutes**.

The Racestar Rs30A lite is chosen for the ESCs. It can be used with 2-4S batteries and has a continuous current of 30A and a peak current of 35A. The continuous current would draw 120 total amps and the peak 140A. At 75C the battery would supply 135A and at 150C a maximum burst of 270A.

Each ESC weighs around **6g**. The PDB is a Realacc/Matek XPW 140A with dual BEC. It can supply 35A to each motor which matches the ESCs and It weighs **7g**. I have also chosen an SP Racing F3 flight controller weighing **6g**, and an FS-XB6 6 channel receiver weighing **4.5g**. Hence in total comes around 600 g of weight enough for the motors to propel the Drone.

Construction and Generative design images



<https://a360.co/3slwAhR>

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