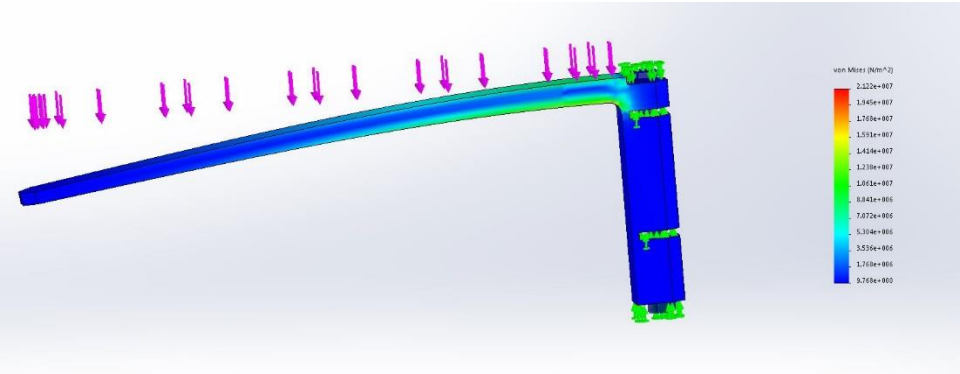
JOURNAL #3

GOALS

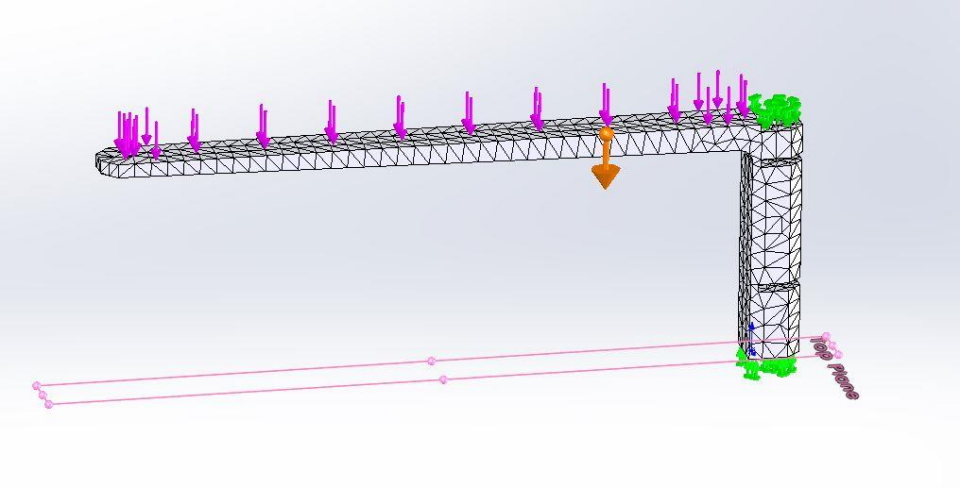
- Work on final design with hand sketches and Solidworks models
- Brainstorm design features such as landing gear or package drop system with hand sketches
- Learn Solidworks simulation and begin stress testing quadcopter parts

RESEARCH

The bulk of my research has surrounded Solidworks. I've learned some small things with materials. My adviser, Mike Mojica, explained to me that overriding mass properties would apply to assemblies. This is incredibly useful for replicating our pre-bought components in Solidworks. Because of the complexity of most of these parts, I can't model them perfectly, so I am replicating them as well as possible and overriding their mass. This is important for testing our final design and finding center of mass. I've worked much more with the simulation tools of Solidworks and have ran several tests. Some examples can be seen below. Because I'm not sure of what material or design I'll end with, these tests will change greatly. At this point, they are just good practice testing how different settings affect the test. I'm also working with changing material properties. For example, I created Garolite (G-10) in Solidworks and have used it for testing. The most difficult aspect of this is finding the correct material properties

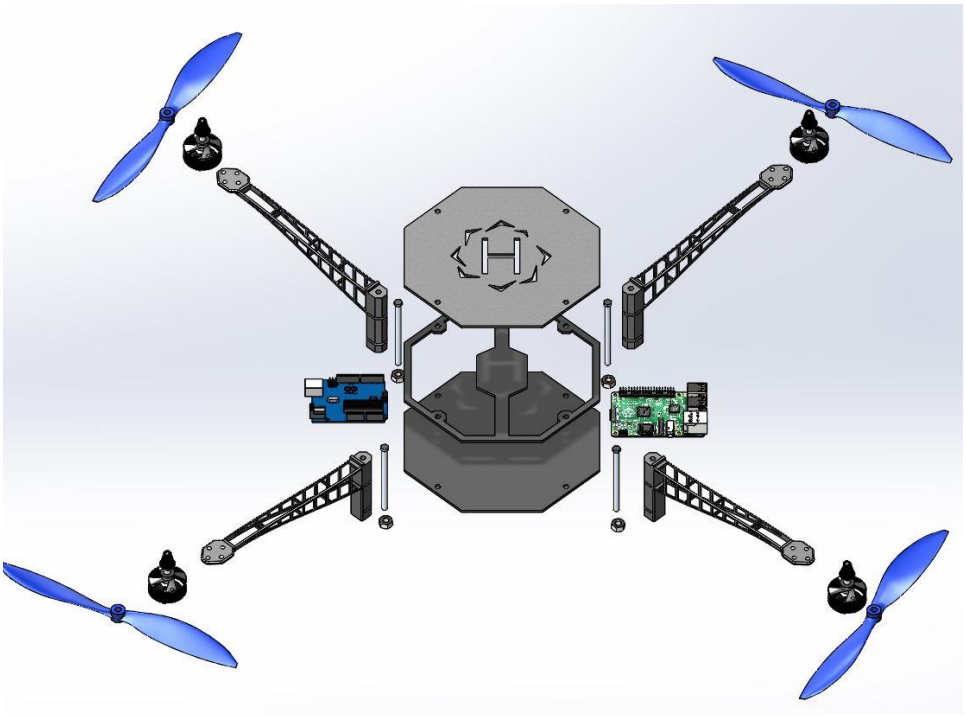


I tested the new arm design with what is the expected force from its own mass, the mass of the motor, and the force produced by the propeller generating thrust. This arm is made of ABS, so it is not entirely accurate.



This picture shows the setup of the test. Green arrows show where the object will be fixed (in this case it would be to the chassis). Pink arrows are forces from the motor and propeller generating thrust. The orange arrow is the force from the arms own mass. The black lines patterned around the arm is the mesh. Because this was a simple test, the mesh is relatively rough, meaning the test is less accurate.

The current design of the final quadcopter is more similar to our current design. It incorporates multiple plates for mounting electronics. We plan to mill or laser cut the plates. If we use garolite, we will mill them using a CNC router. If we use acrylic to save time and money, we will laser cut them as we did for the first design. Hopefully we will be able to 3D print the arms using the carbon fiber printer. The arms have a hole running through them for a nut and bolt. They have notches for the plates to mount into. The bottoms of the arms can also act as landing gears.



This is an exploded view of the current iteration of the final design. This illustrates the mounting capabilities of the middle plate and the construction of the arms.

ACCOMPLISHMENTS

- Nearly completed final design
- Gained experience with Solidworks simulations

REFLECTION ON GOALS AND TIMELINE

Different aspects of the project are beginning to come together. I've been able to make much more progress on the design and research than I was able to in the past. This is mostly because I'm becoming more skilled at working with the quadcopter. For example, mounting electronics and wiring the components together used to take a decent amount of time. Now I'm more efficient when working with the system. I'm trying to translate this knowledge into the design of the quadcopter. As I learn more about how different components work together, I can better plan for how they should be situated on the board. Regarding the timeline, I am focusing mostly on the final design. I'm turning my attention away from the design features because those were meant to be a bonus to the project which I will work on if I have time. My first priority is the final chassis, then mounting microcontrollers and sensors, then design features last.