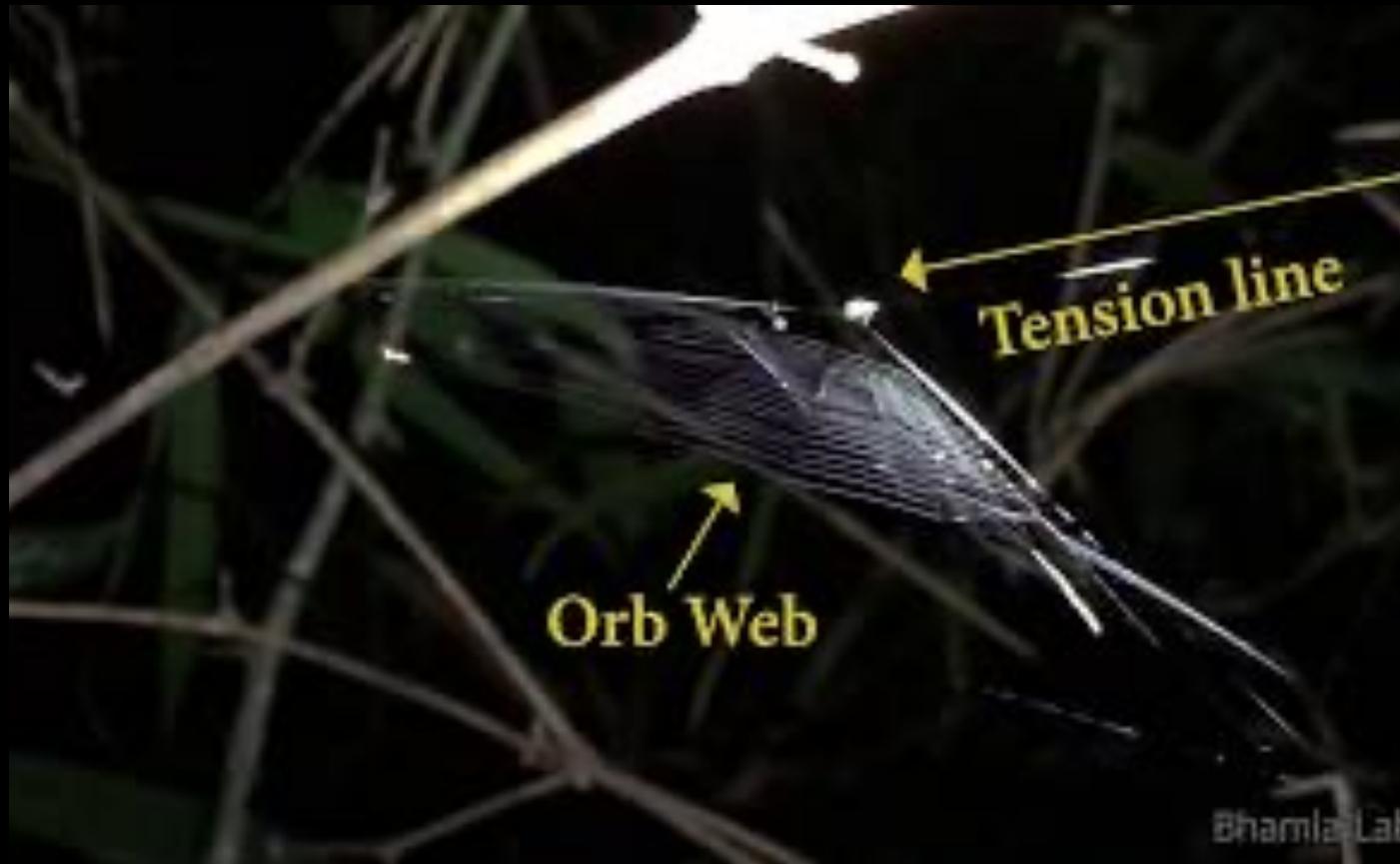


# Slingshot Spider

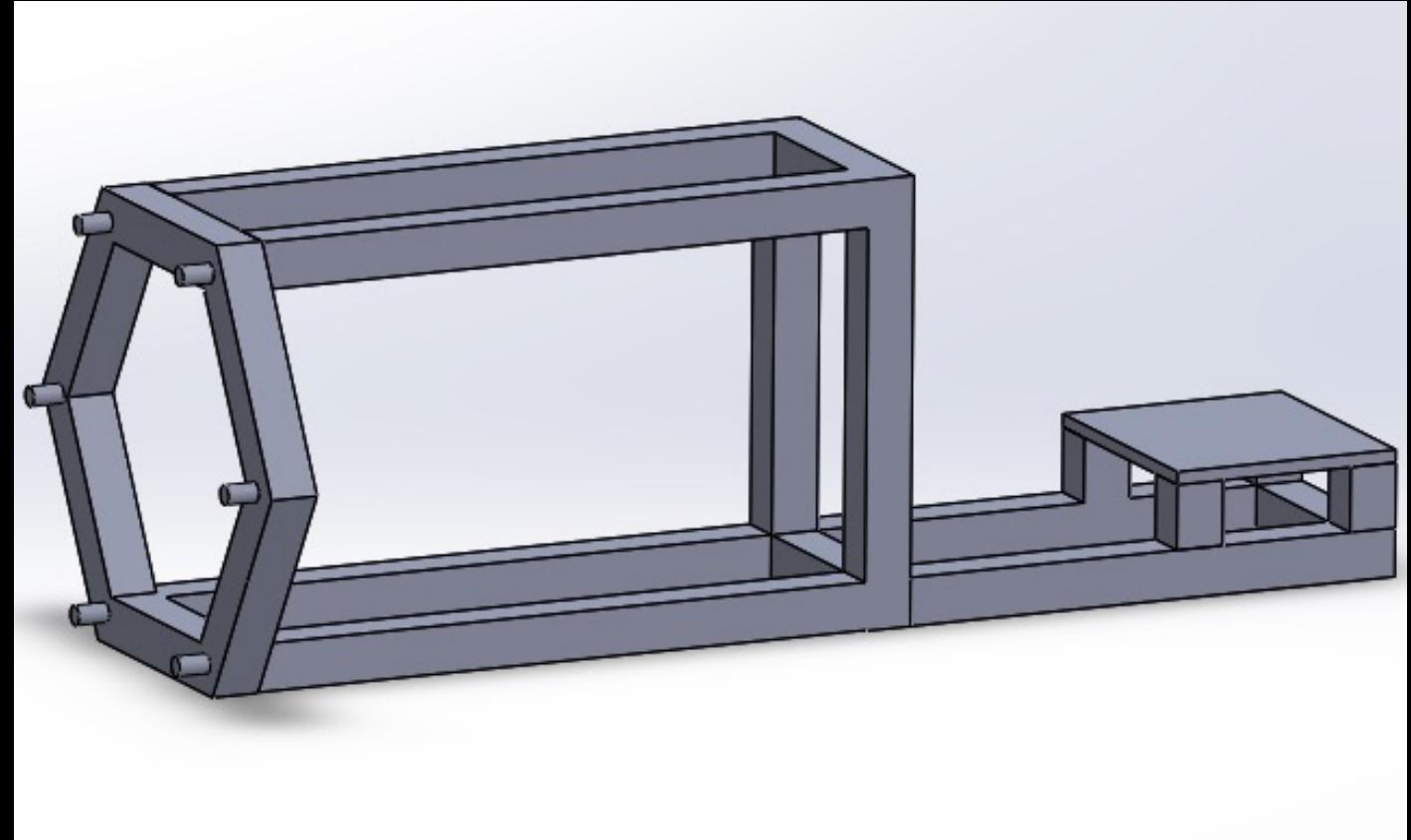


Team: Manuel, Gunnar, John, Tesfay, Tom, and Justin

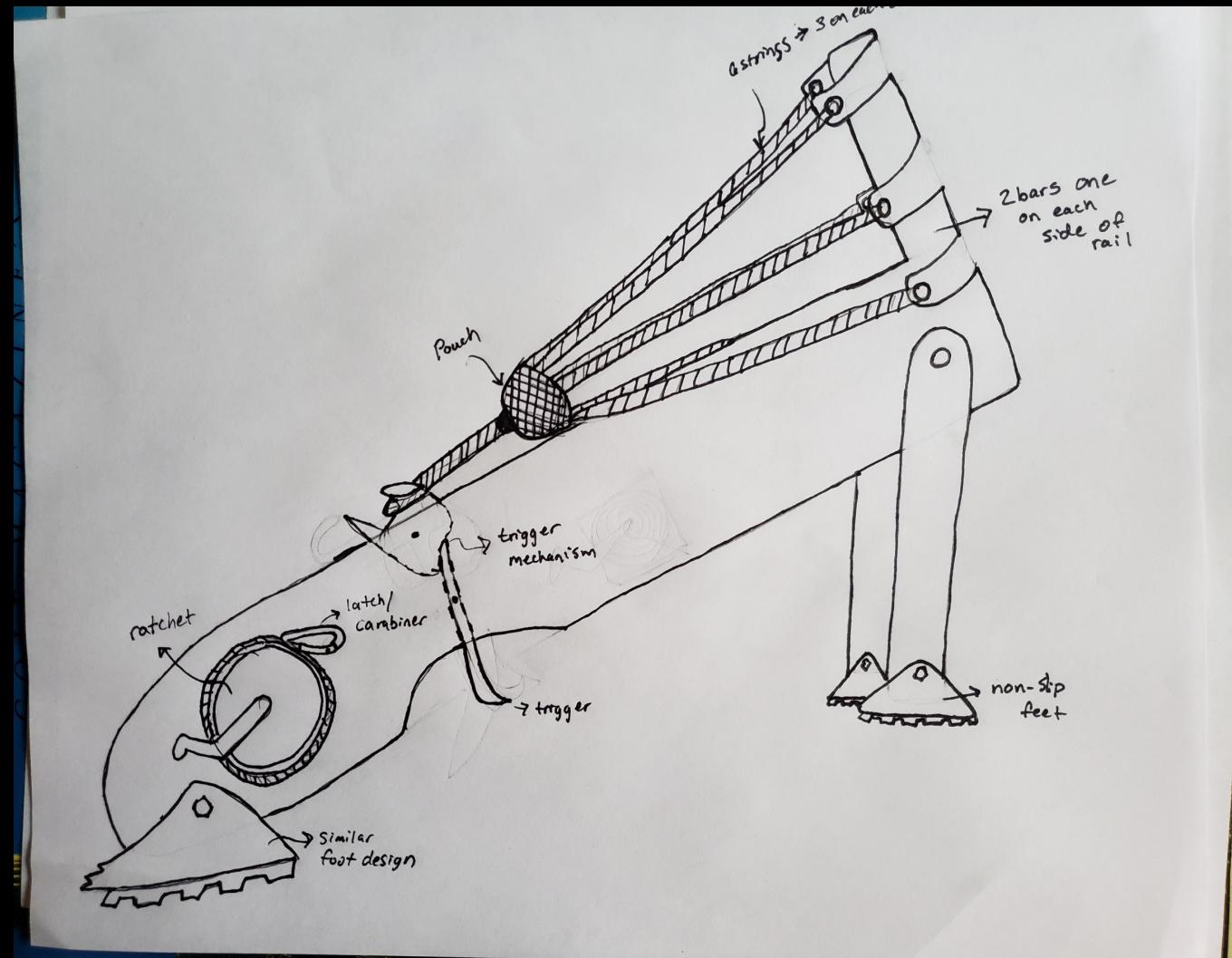
# Background of Slingshot Spider



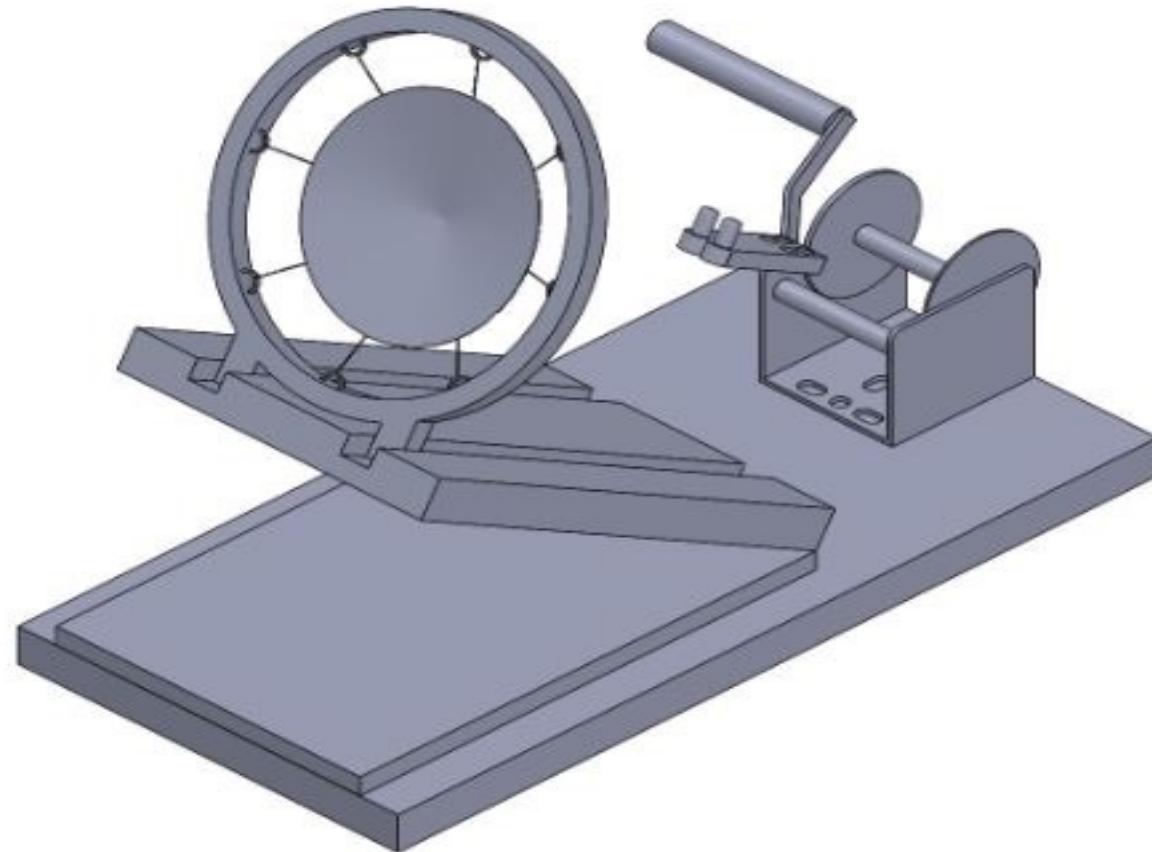
# Design Idea 1



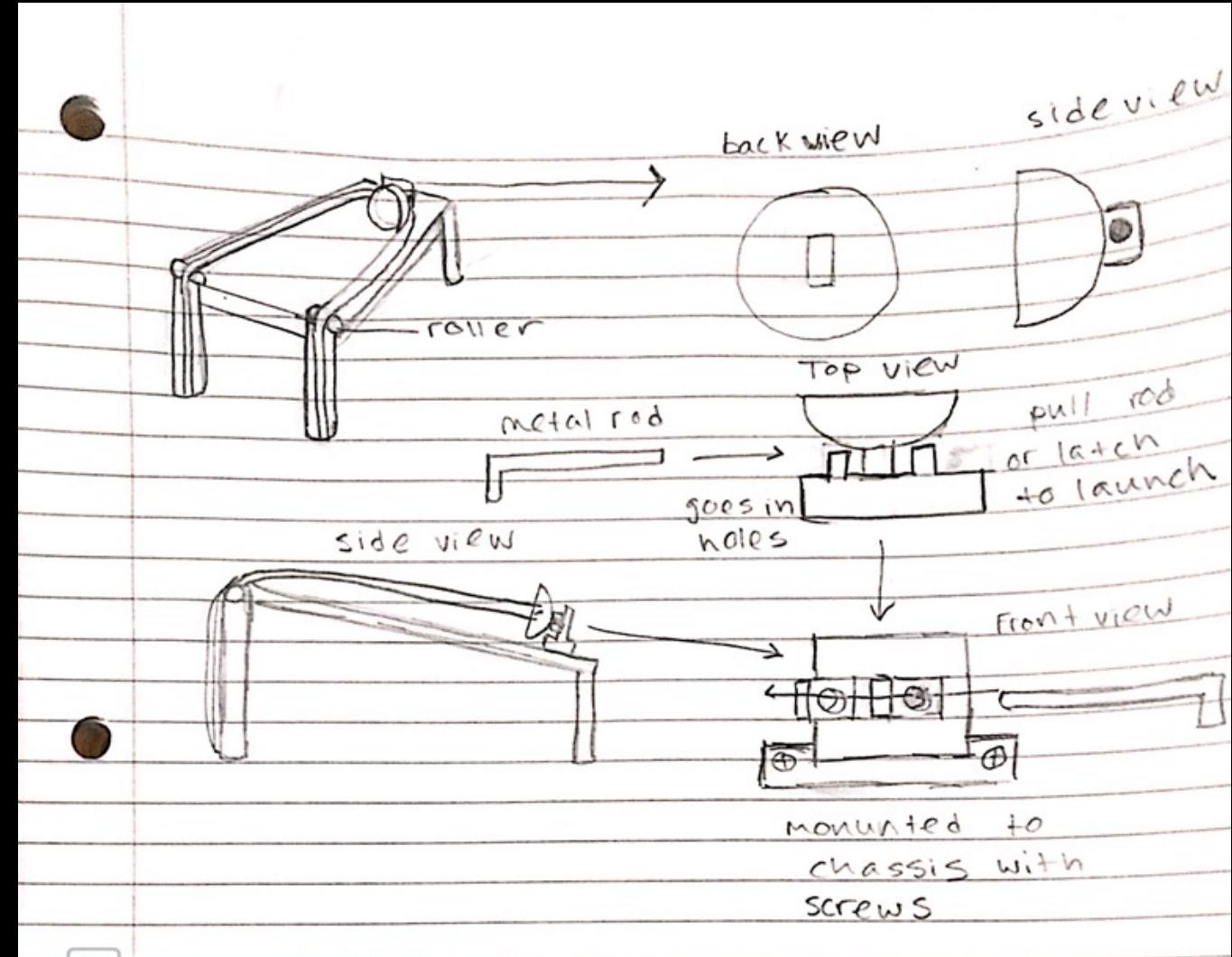
# Design Idea 2



# Design Idea 3

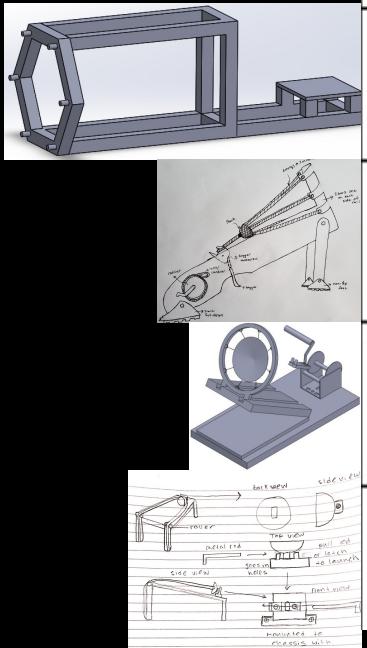


# Design Idea 4



# Decision Matrix

|                  | Safety   | Performance | Reliability | Build Difficulty | Rank |
|------------------|----------|-------------|-------------|------------------|------|
| Weighting Factor | .20      | .4          | .25         | .15              | 1.0  |
| Design 1         | 8<br>1.6 | 8<br>3.2    | 9<br>2.25   | 7<br>1.05        | 8.1  |
| Design 2         | 7<br>1.4 | 4<br>1.6    | 5<br>1.25   | 7<br>1.05        | 5.3  |
| Design 3         | 8<br>1.6 | 7<br>2.8    | 4<br>1      | 5<br>.75         | 6.15 |
| Design 4         | 7<br>1.4 | 3<br>1.2    | 10<br>2.5   | 9<br>1.35        | 6.45 |



The technical drawings illustrate four different mechanical designs:

- Design 1:** A perspective view of a rectangular frame structure with internal components.
- Design 2:** A side-view diagram of a mechanical assembly with various parts and dimensions labeled.
- Design 3:** A top-down view of a circular component mounted on a base, with labels for "left wheel", "right wheel", "side view", and "center".
- Design 4:** A detailed side-view diagram showing internal mechanisms, including labels for "inner", "outer", "inner hub", "outer hub", "inner wheel", "outer wheel", "inner side", "outer side", "inner view", "outer view", and "inner side view".

# Design Development

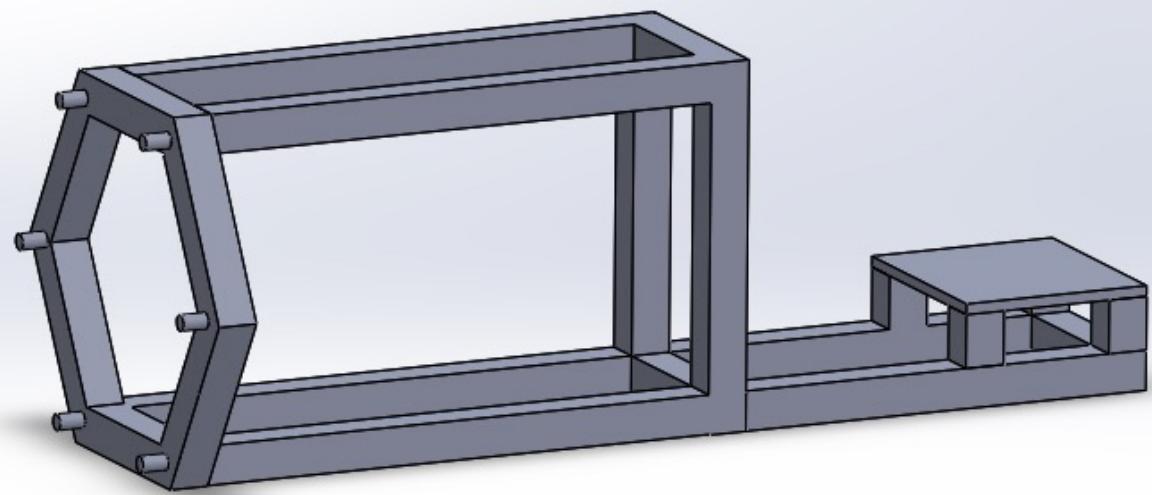


Figure 1

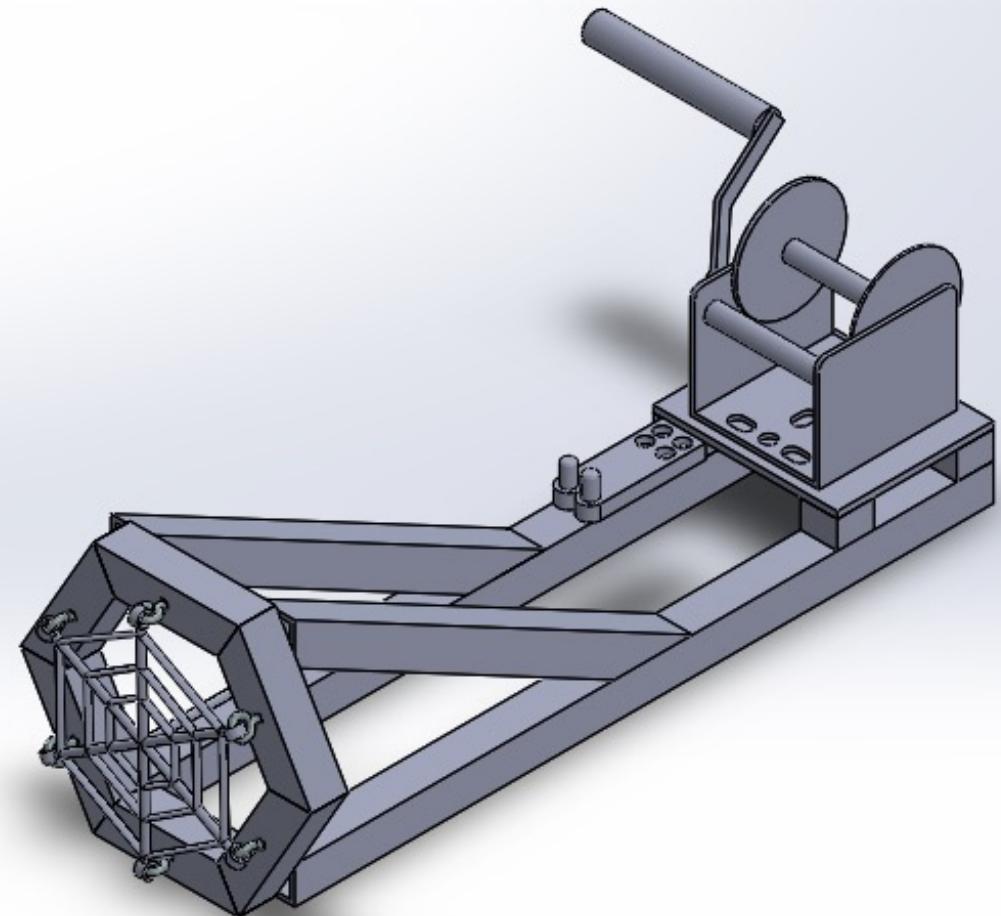
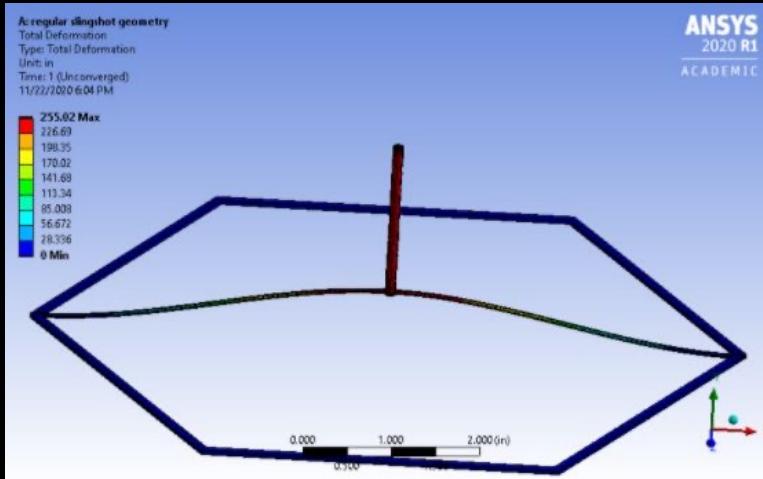
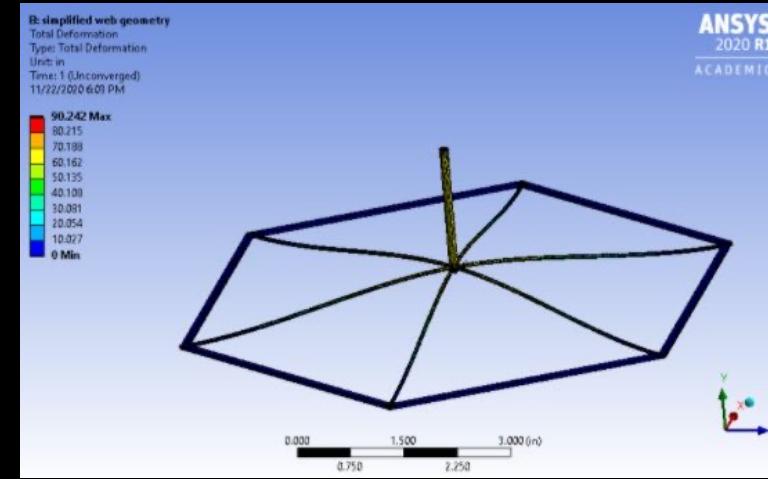


Figure 2

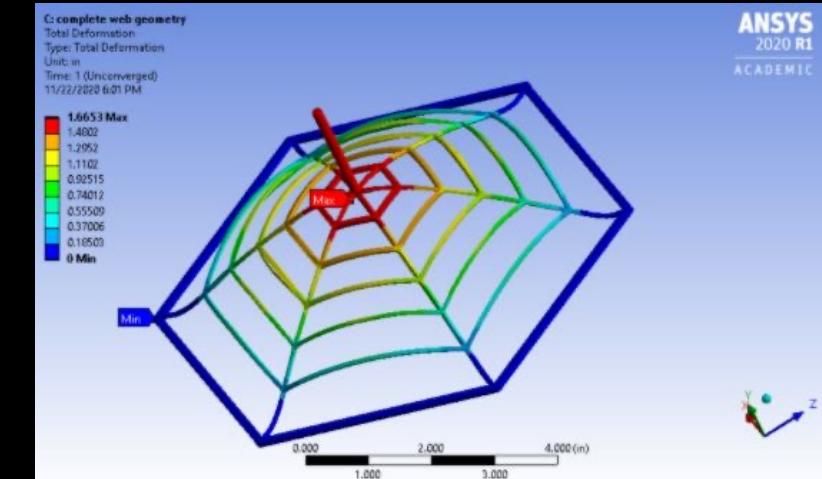
# Relationship Between Designs and Spring Constant k



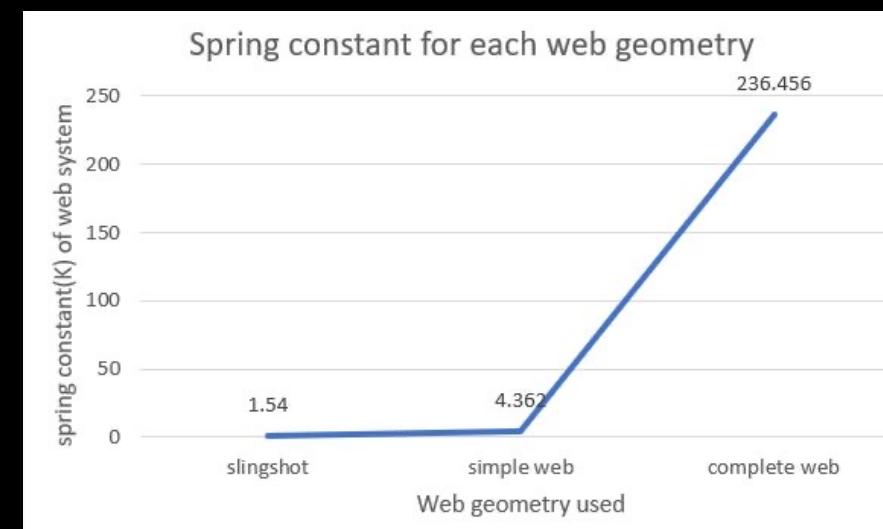
**Figure 1:** Sling shot style



**Figure 2:** Simple style



**Figure 3:** Complex style

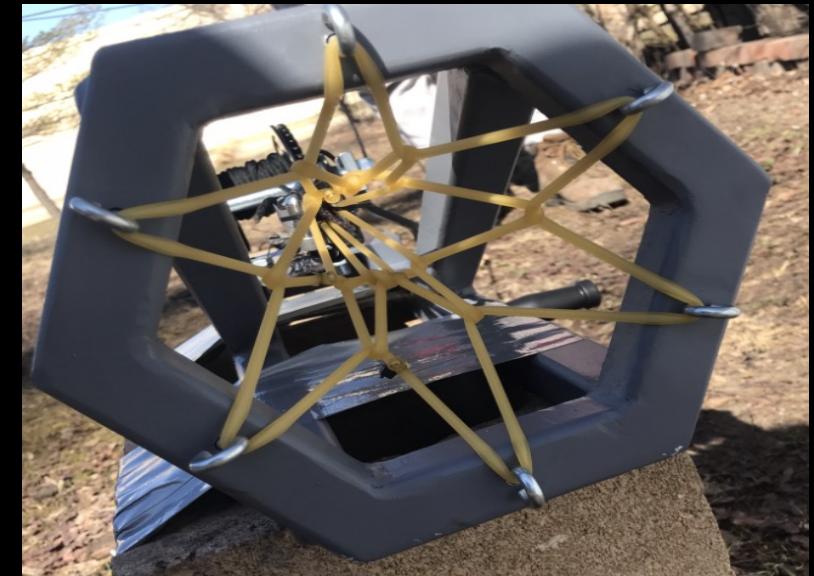


**Figure 4:** Spring constant k with each different design

# Material Selection for the Web

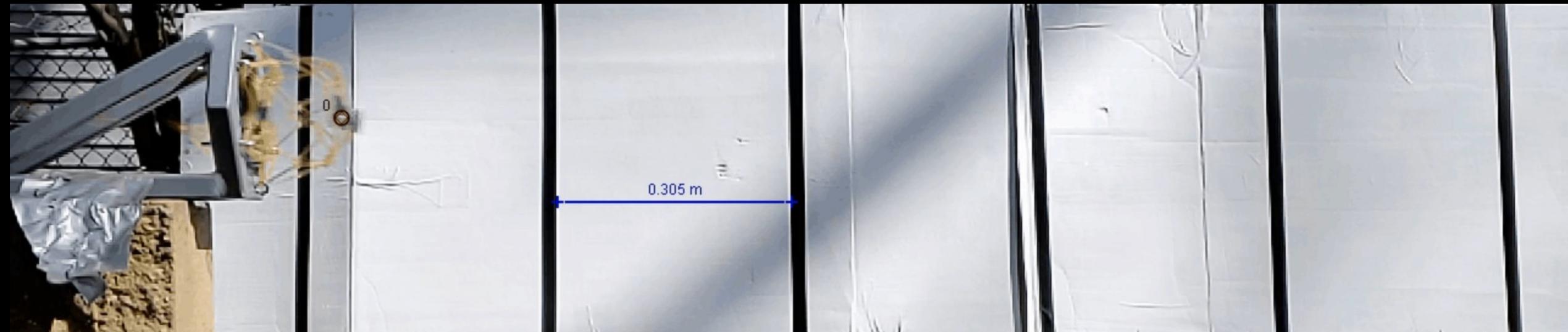


Paracord (nylon)



Rubber Tubing

# Experimental Methods



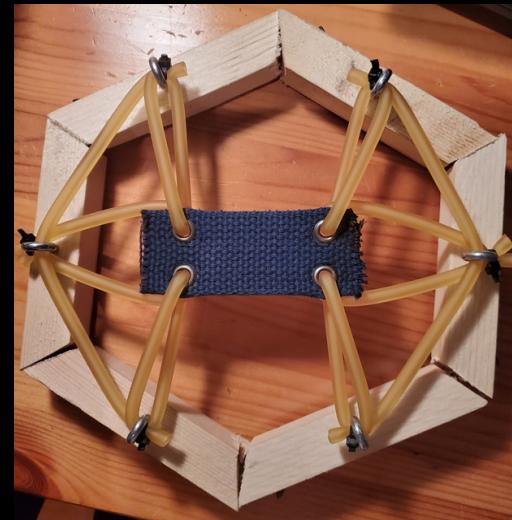
# Comparing Energy Density

|                   | Displacement<br>(m) | Velocity<br>(m/s) | Acceleration<br>(m/s <sup>2</sup> ) | Acceleration<br>(gs) | PE<br>(J) | E<br>(kJ/kg) |
|-------------------|---------------------|-------------------|-------------------------------------|----------------------|-----------|--------------|
| Web Design 1      | 0.3556              | 77.01             | 8340                                | 850                  | 16.33     | 0.72         |
| Web Design 2      | 0.4318              | 66.41             | 5107                                | 521                  | 23.85     | 0.60         |
| Sling Shot Spider | 0.0268              | 4.16              | 1163                                | 130                  | -         | 3.92         |

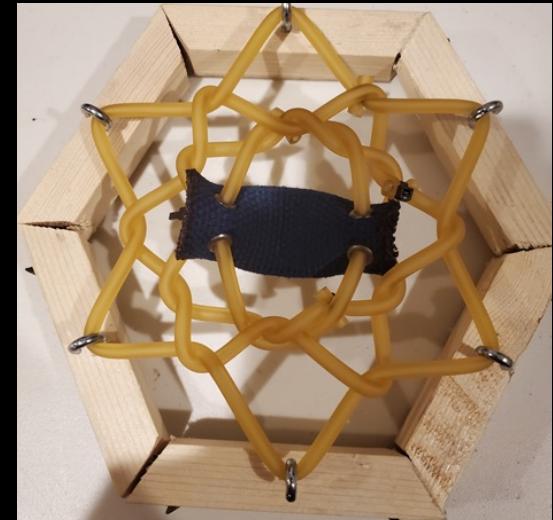
$$\bullet \quad a = \frac{V^2}{2\Delta X}$$

$$\bullet \quad k = \frac{F}{\Delta X}$$

$$\bullet \quad Pe = \frac{1}{2}k\Delta X^2$$



Web Design 1



Web Design 2

# Conclusion



Special Thanks: To Matthew Alonso for all his invaluable advice,  
Pranav Bhounsule for his knowledge and helpfulness, and  
Mycauley for his help with the Welding.