

Brian Rock, Arnav Vast, Sachit Puntambekar, Konrad Hrabina, Dhruv Lal

Problem Definition

- In *Mass Casualty Incidents (MCIs)*, emergency responders need to carry 100 pounds of supplies with them in the field.
- Multiple patients need onsite care in MCIs
- Constantly caring for patients while carrying heavy supplies easily fatigues first responders and supplies can run out.

Project Vision

Enable first responders to provide better on-site treatments to patients by reducing their fatigue from carrying supplies and eliminating the need to make supply runs.

Background

MCIs cause a surge in patient volume that standard field resources are unable to support. To combat this, every US State Homeland Security district is equipped with at least one MCI trailer.



Innovation



- Directs resources towards patient care
- Fills current market void
- Reduces first responders fatigue buildup
- Eliminates return trips for on-site field treatment

Benchmarks



Stryker Gurney



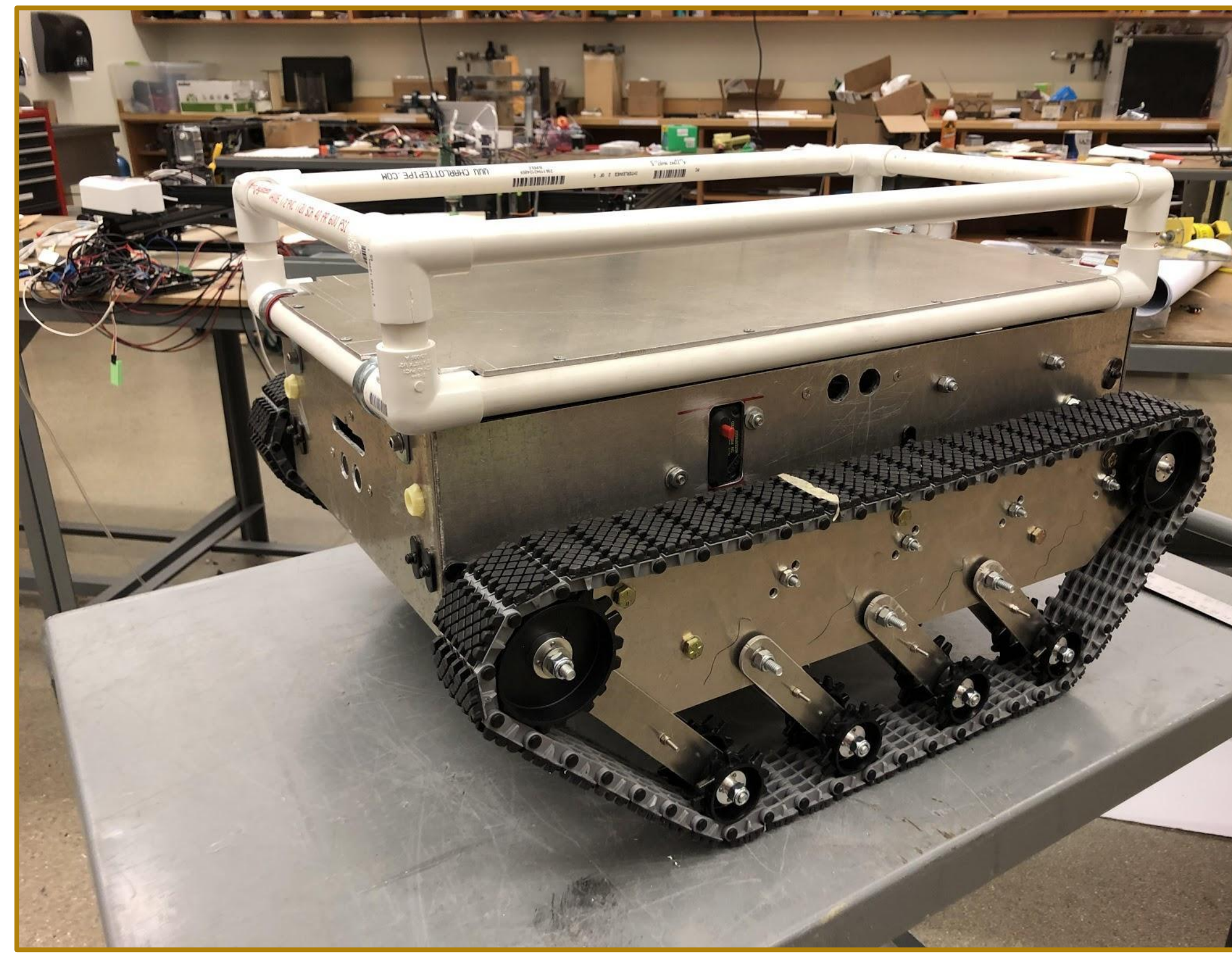
Starship



TUG

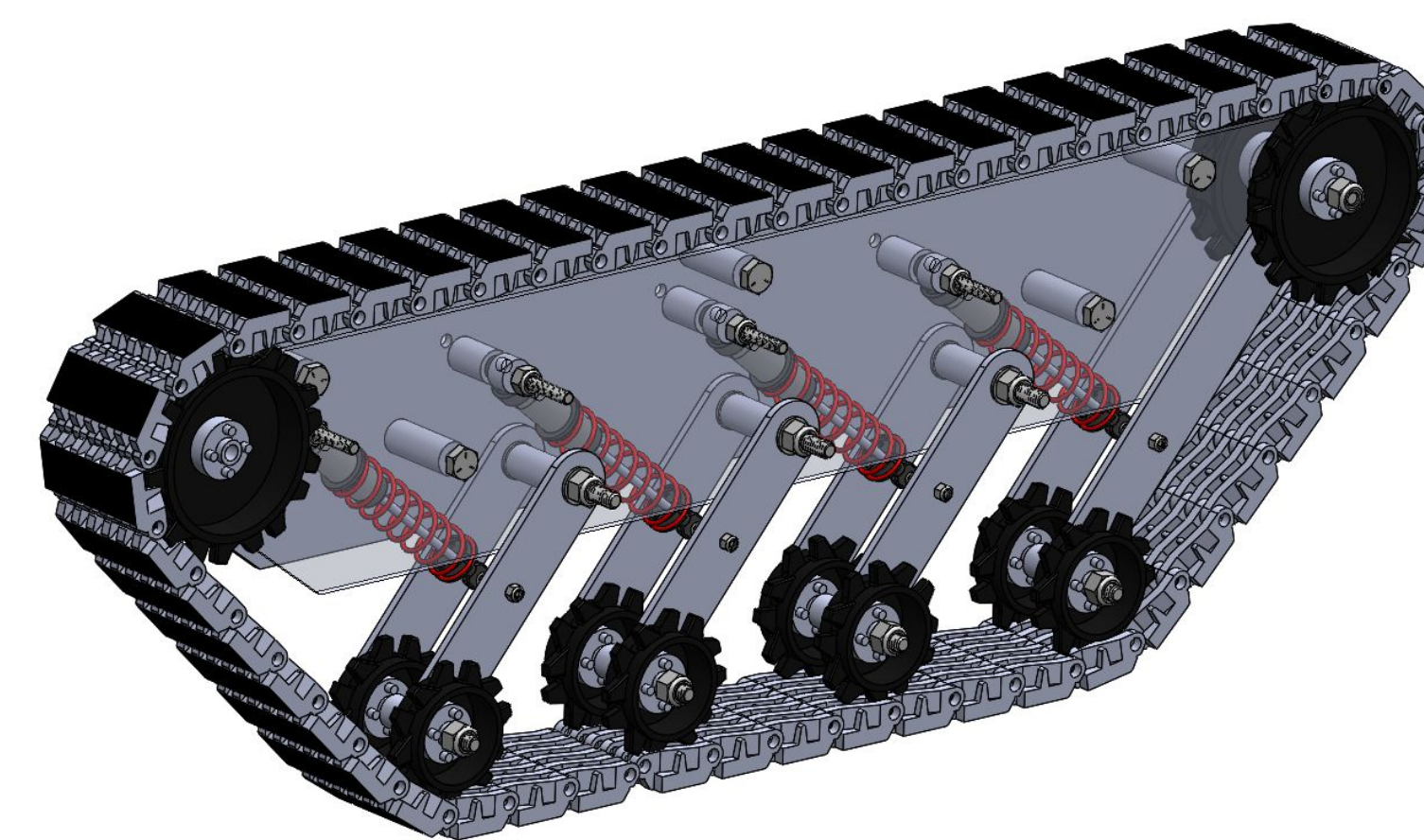
Customer Needs	Competitors			Phoenix Robotics
	Stryker Gurney	Starship	TUG by Attheon	PESA
Carry Stokes Basket				
Remote Operated/Autonomous				
Carry 200 Pounds				
Battery Life > 2 Hours				
Traverses Complex Terrain				
Recon Ability				
Reasonable Cost				
Fit in Standard MCI Trailer				

Prototype

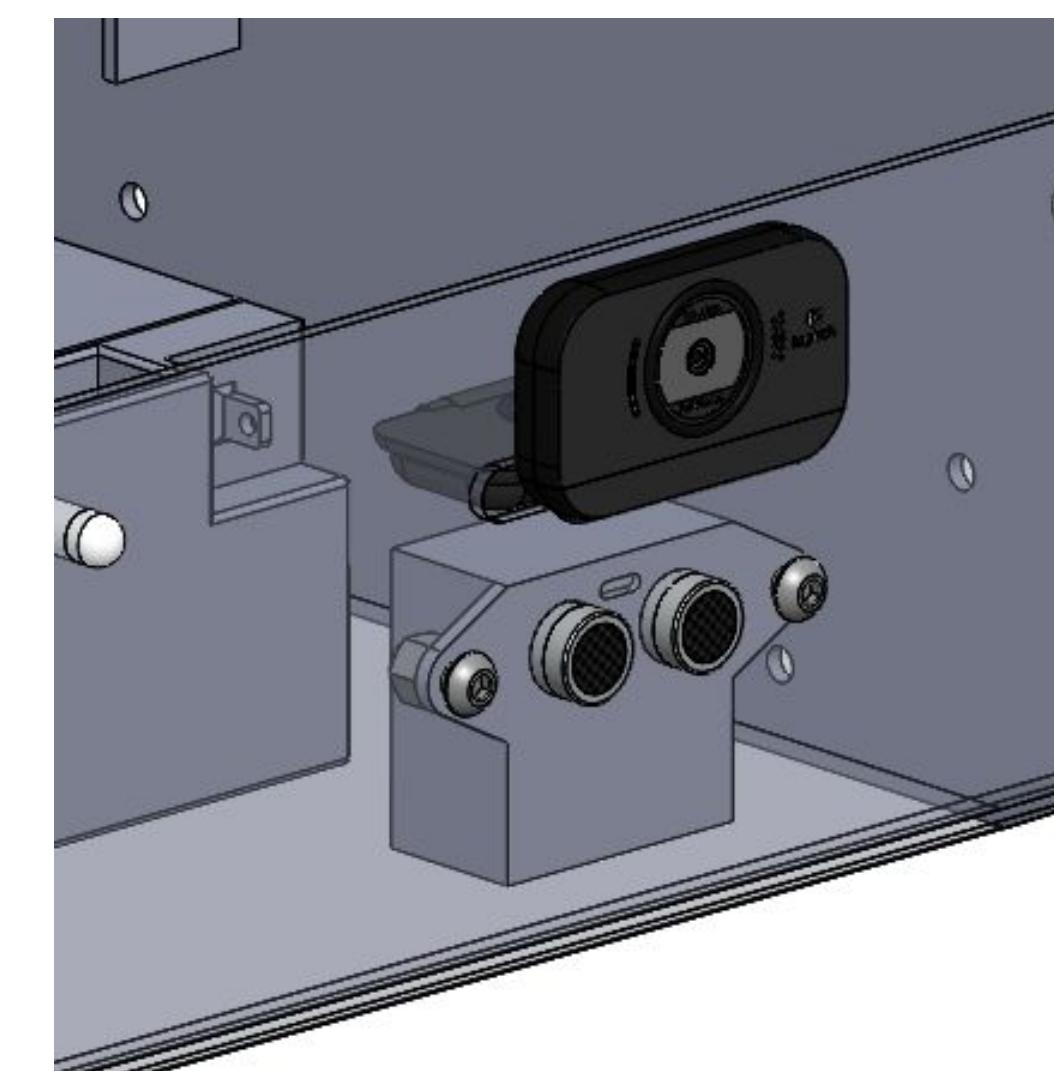


Design Specs & Features

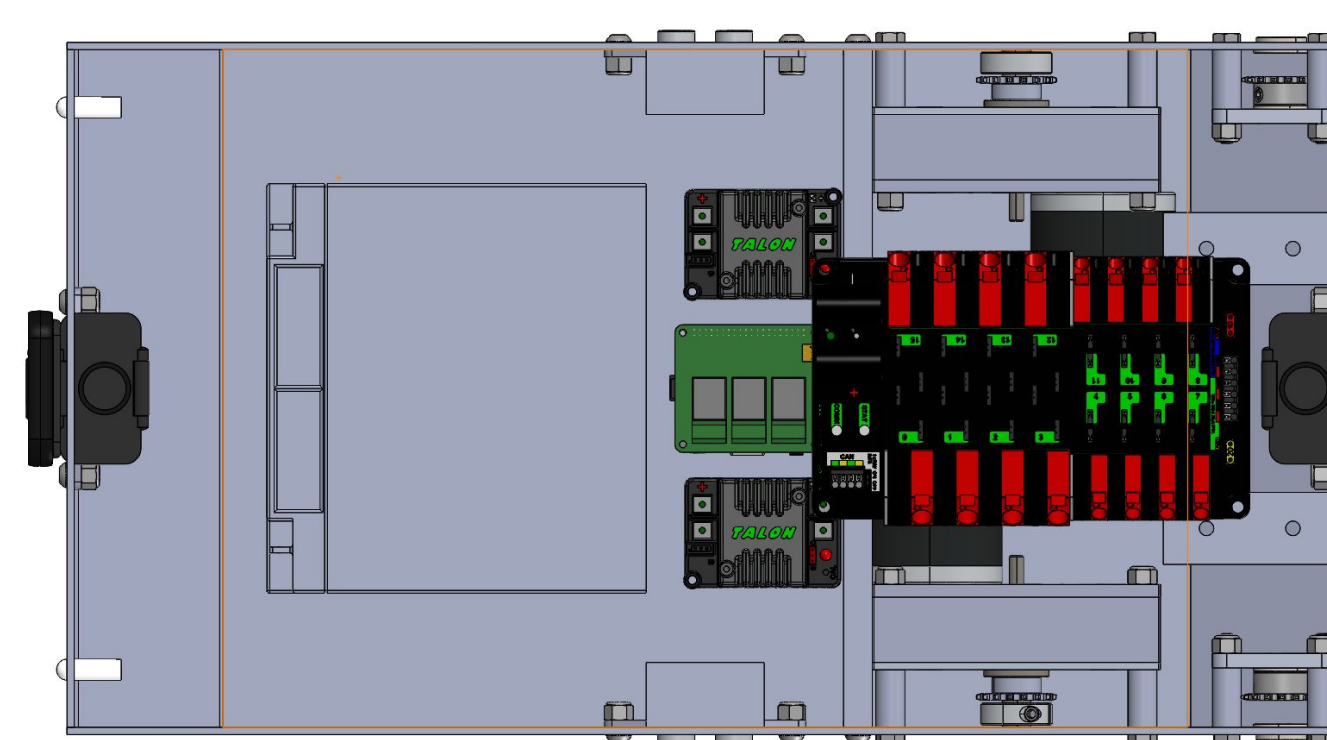
Tread System



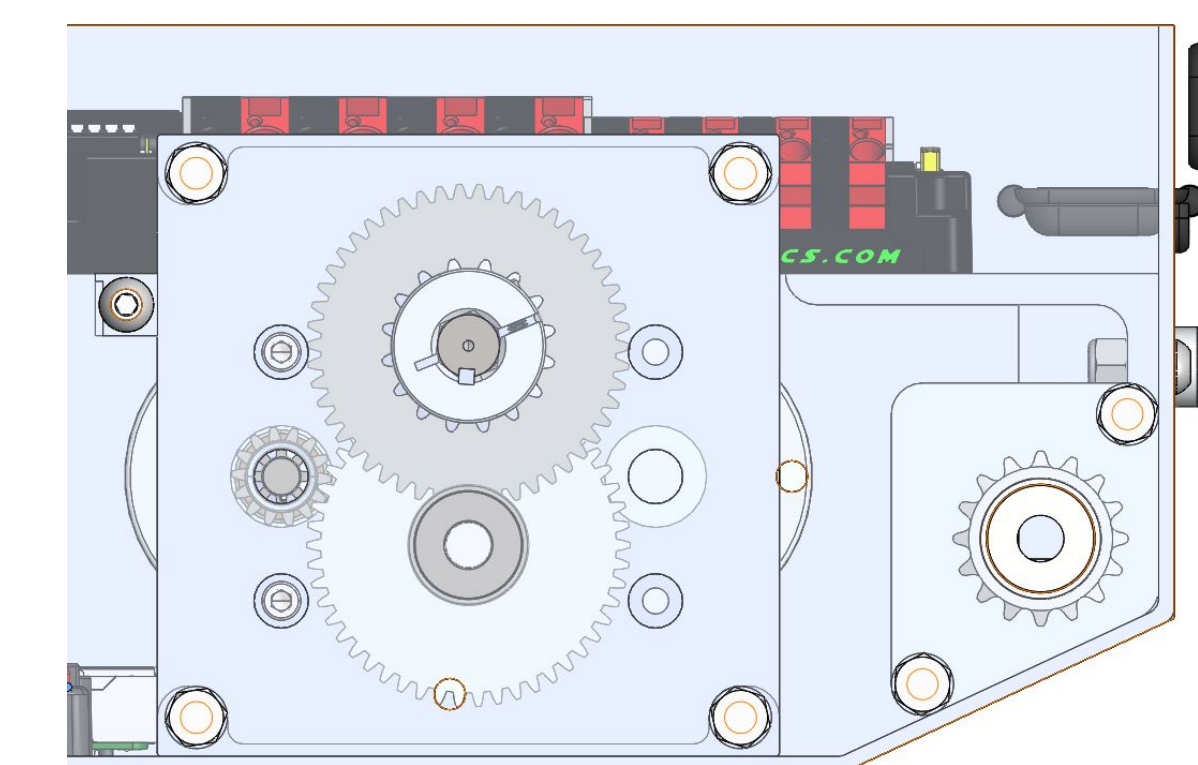
Vision Sensors



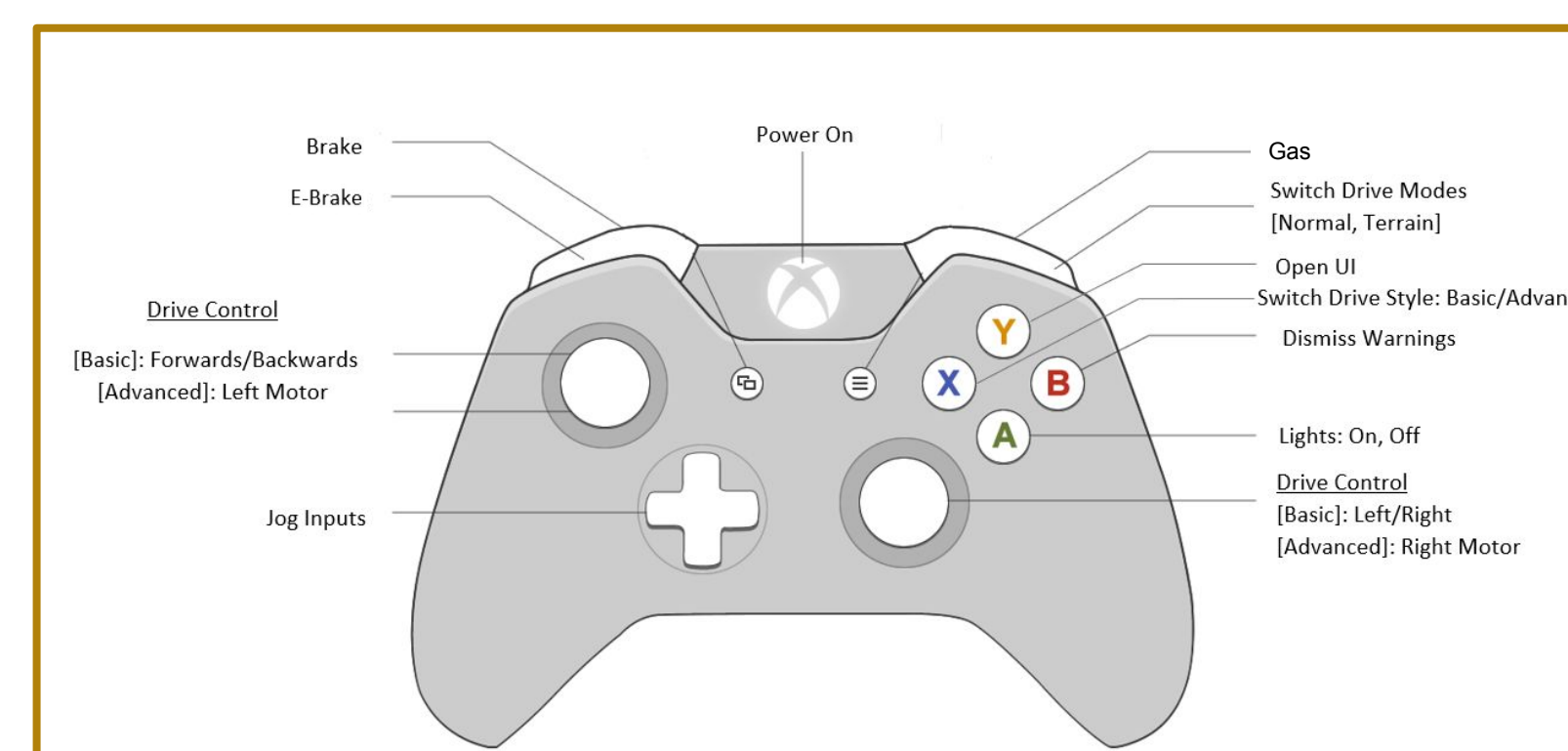
Chassis Layout



Gearbox and Output Shaft

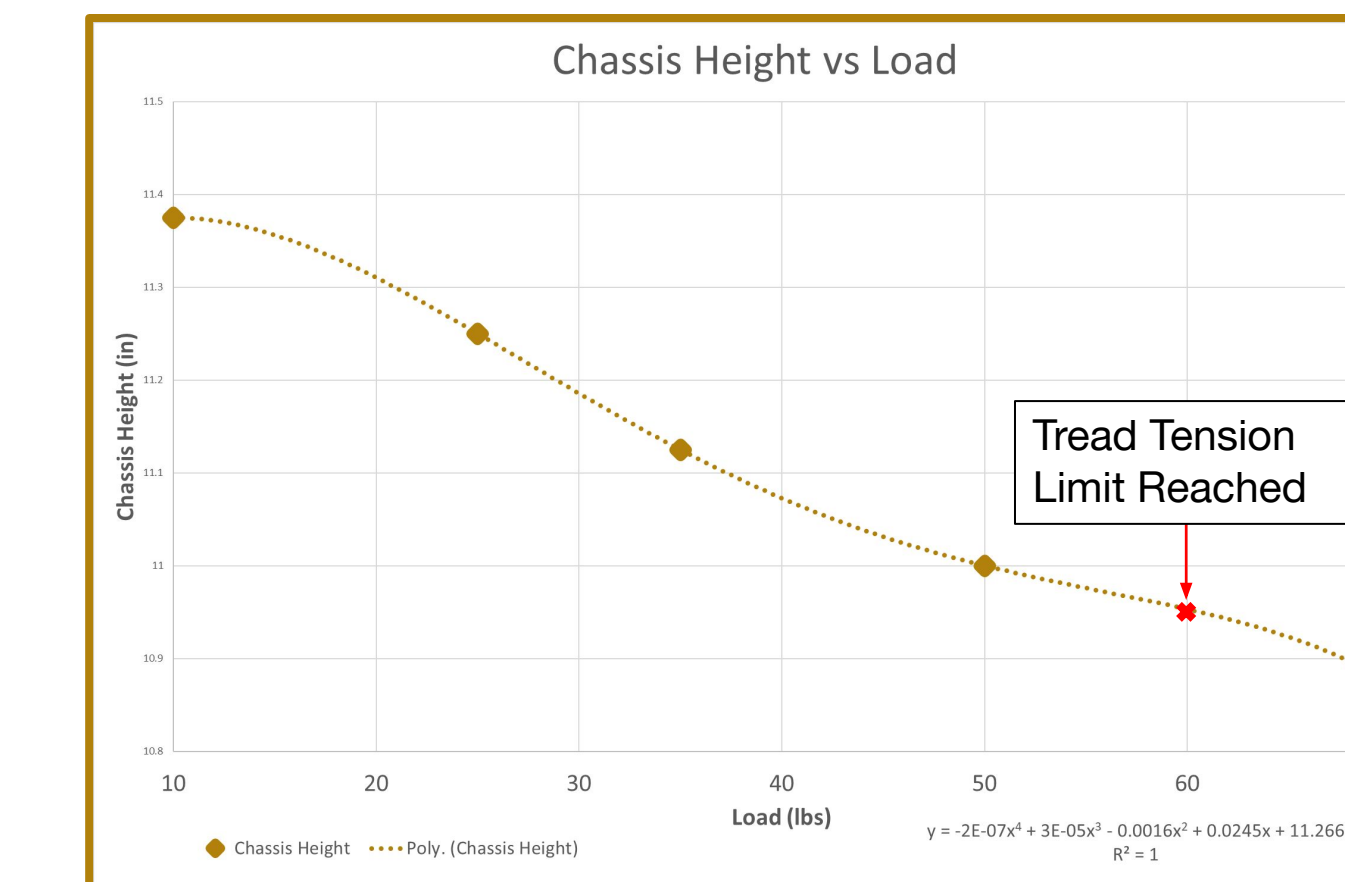


Controller Interface



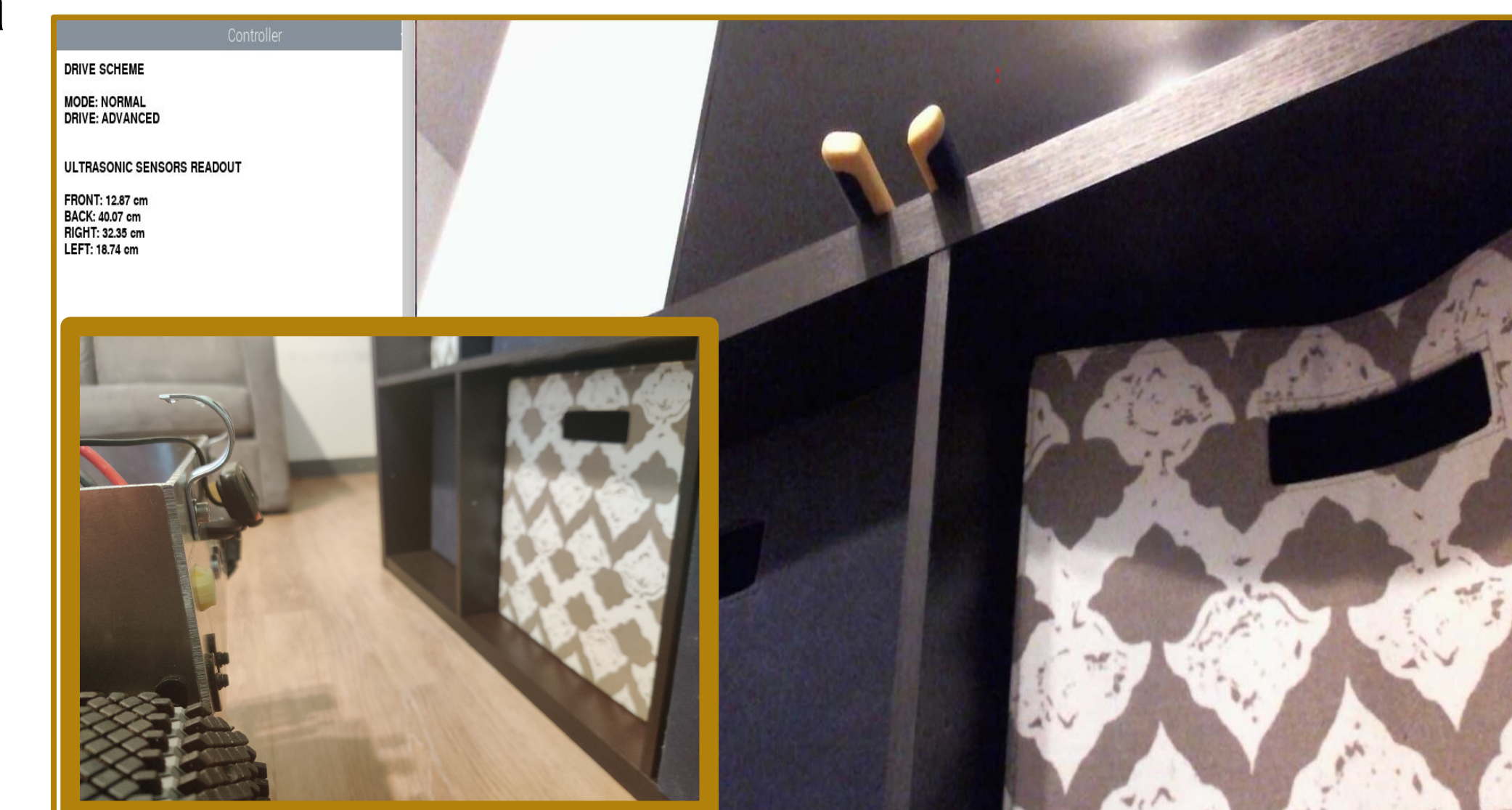
- Utilization of Xbox controller for operator ease
- Two control modes for varying levels of maneuverability
- Early warning collision notification from ultrasonic array
- Automatic speed reduction from ultrasonic detection

Testing and Validation



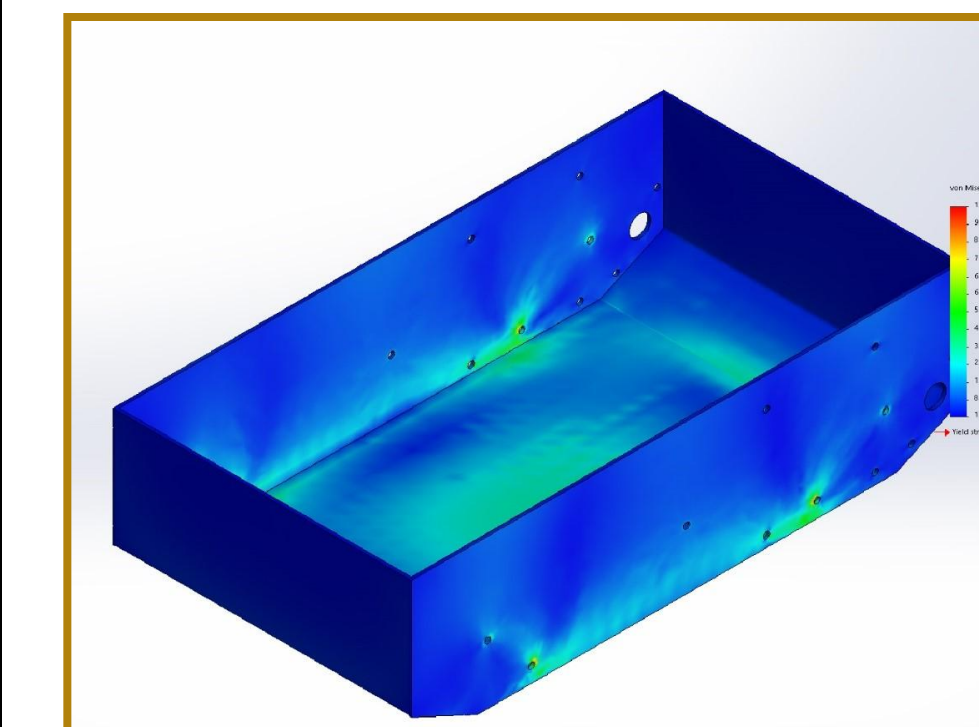
- Suspension test in relation to load
- Idle chassis was loaded to see how chassis would depress and tread would slack
- Springs of robot can support up to 60 pounds before tread displays major slack

- UI and camera scheme
- Updates with minimal delay
- Clearly details obstacles (1920x1080p)
- Detailed distances with noise filter

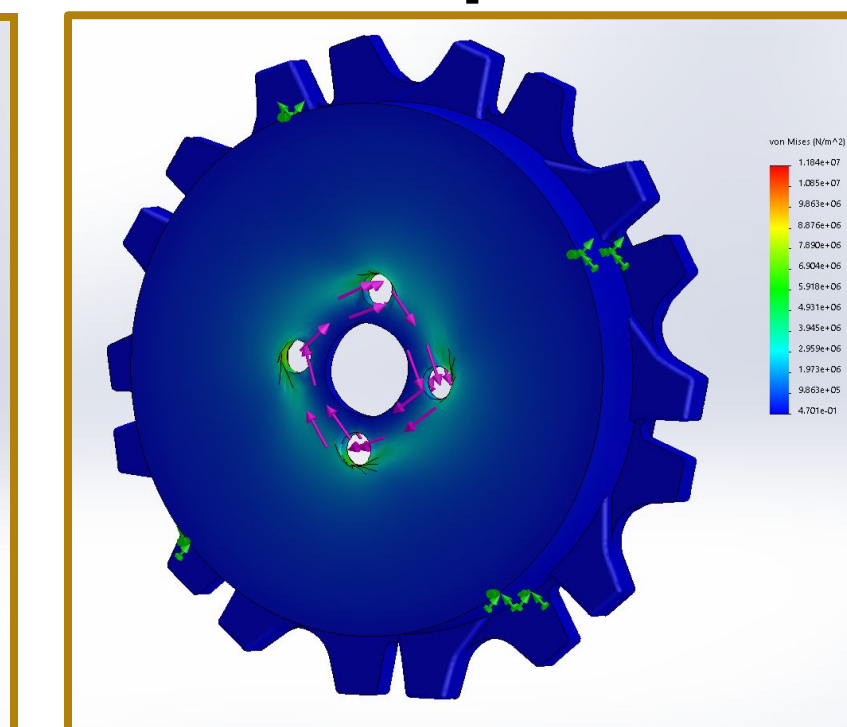


Analysis

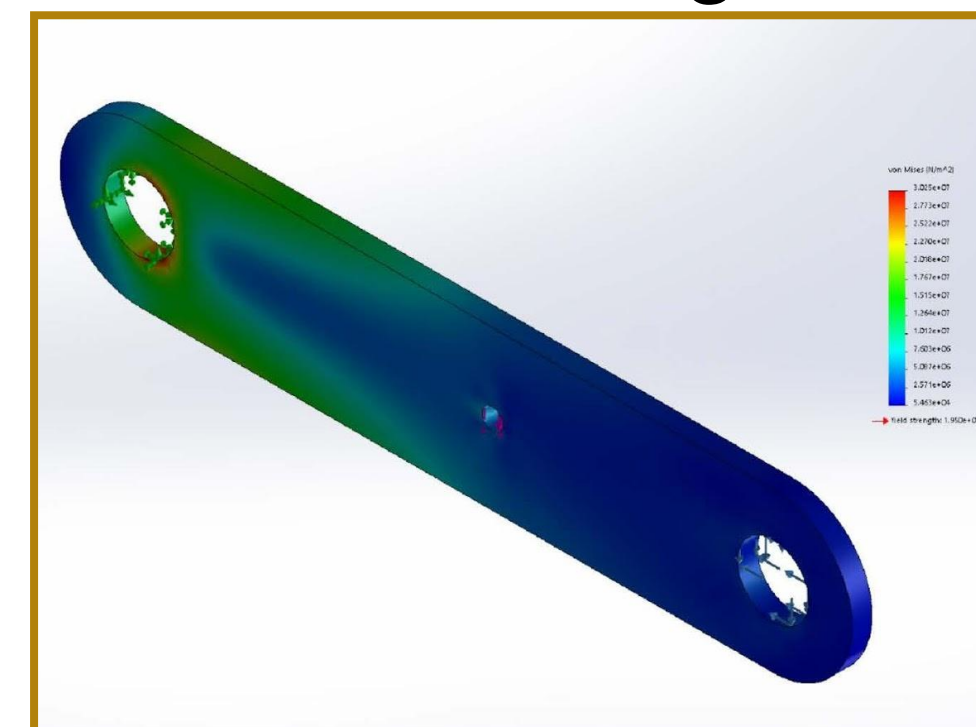
Chassis



Drive Sprocket



Bottom Leg



- Chassis able to support operating weight of 50 pounds
- Drive sprocket hub equally distributes operating torque load of 1.9 N-m to the sprocket without failure around the connecting holes
- Bottom legs are able to support operating weight and withstand impact force from dropping

Future Scope

- Integration of lidar to allow autonomous control mode capable of locating beacons worn by first responders
- Improve maneuvering capabilities to include going up and down stairs
- Customize swappable battery and increase accessibility
- Streamline electronics to a single PDB board
- Zigby wireless connection system