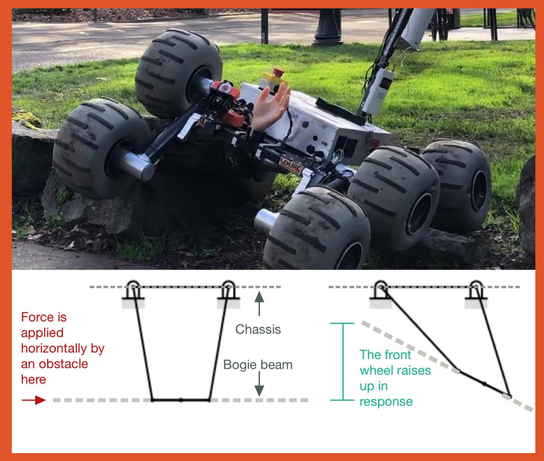
MARS ROVER SUSPENSION REDESIGN

Over two terms we designed and manufactured a solution that consists of a locking mechanism and a suspension system to meet our design requirements.

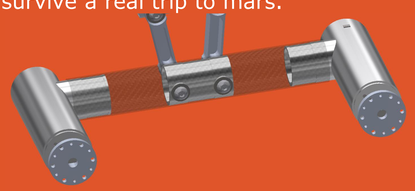
Triple-Bogies

Instead of heavy springs and dampers, the rover uses a triple-bogie system. A bogie is the part that holds 2 wheels and rotates at its center axis. The two front bogies are held by swing arms. They allow the front bogie to articulate and allows the front wheel to easily climb over obstacles.



Material

Carbon fiber is well known for its high strength and very low weight. Because of this the bogies are made of a mix of carbon fiber and aluminum. Unfortunately, the carbon fiber we used would not survive a real trip to mars.



Design

Since carbon fiber does not handle point loads well, aluminum inserts where needed to strengthen the mounting points. Without these inserts, the carbon fiber would crack over time around the holes.

WHAT IS THIS PROJECT?

This project was initialized by the OSU Robotics Club to redesign the suspension system of its mars rover. The club participates in the annual Canadian International Rover Challenge where teams and their rovers compete against each other in different challenges. The capstone team was tasked with creating a new suspension system that was lighter and prevents the rover from tipping forward; while also staying under budget.

HOW OUR SOLUTION MET KEY CUSTOMER REQUIREMENTS.

- The new suspension reduces the weight by 40% compared to the old suspension
- With the new locking mechanism the rover no longer tips forward.
- Unfortunately, the final cost of the system was over budget. But only by $16.

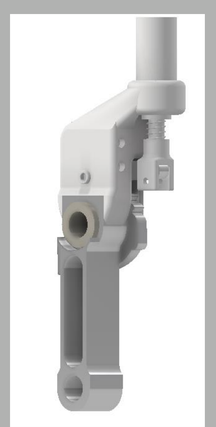
Locking Mechanism

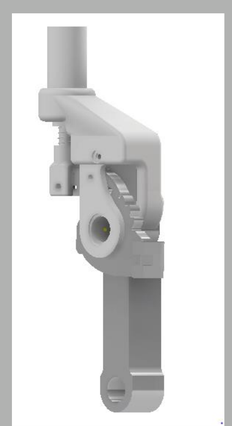
In order to prevent the rover from tipping forward we designed a locking mechanism that shifts the rotation point from the chassis of the rover to the front wheels.

The locking mechanism is comprised mostly of water jet and machined aluminum with a 3D printed PLA solenoid bracket.

Design

The locking mechanism uses a ratchet gear and pawl system to prevent rotation. A solenoid drives the pawl to engage the ratchet gear so that rotation is prevented in only one direction. The locking mechanism is installed on both front bogies so that if the rover is on uneven terrain there will be no imbalances.





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