



PCTI Lunar Wheels

Mrs. Albarez's PLTW Engineering Class

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PURPOSE

This design was created to provide astronauts with wheels for a simple carrier because NASA is in need for a new one.

CRITERIA & CONSTRAINTS

- Survive and function in a temperature range of -250°F to 250°F
- Lightweight but durable
- Can handle speeds of 10-12 mph
- Diameter: 6"-12" & Width: 2"-6"

INSPIRATION



- Airless tires
- Avoid problems with air pressure/ flat tire
 - Mimicked the idea of airless tires with springs



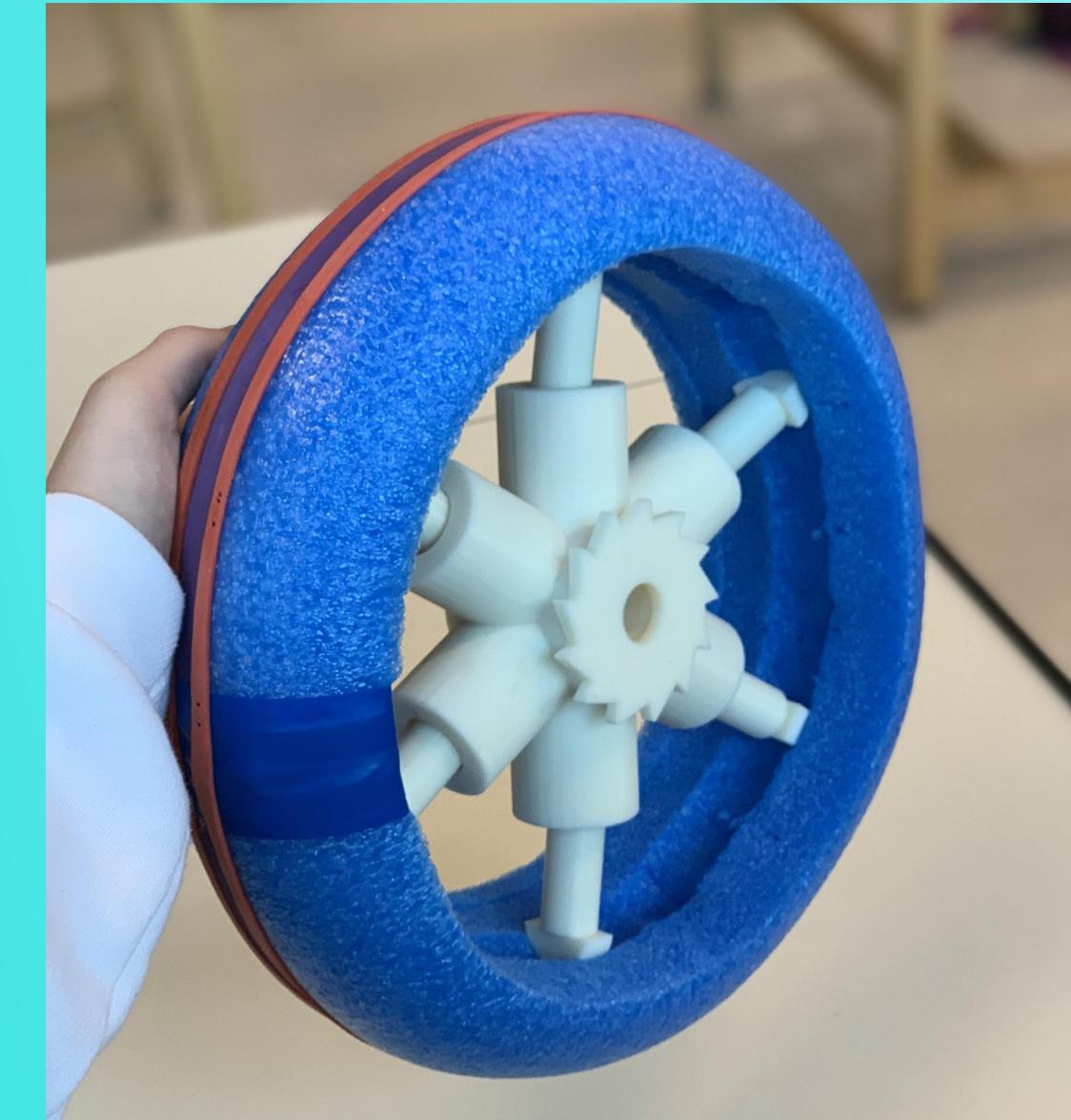
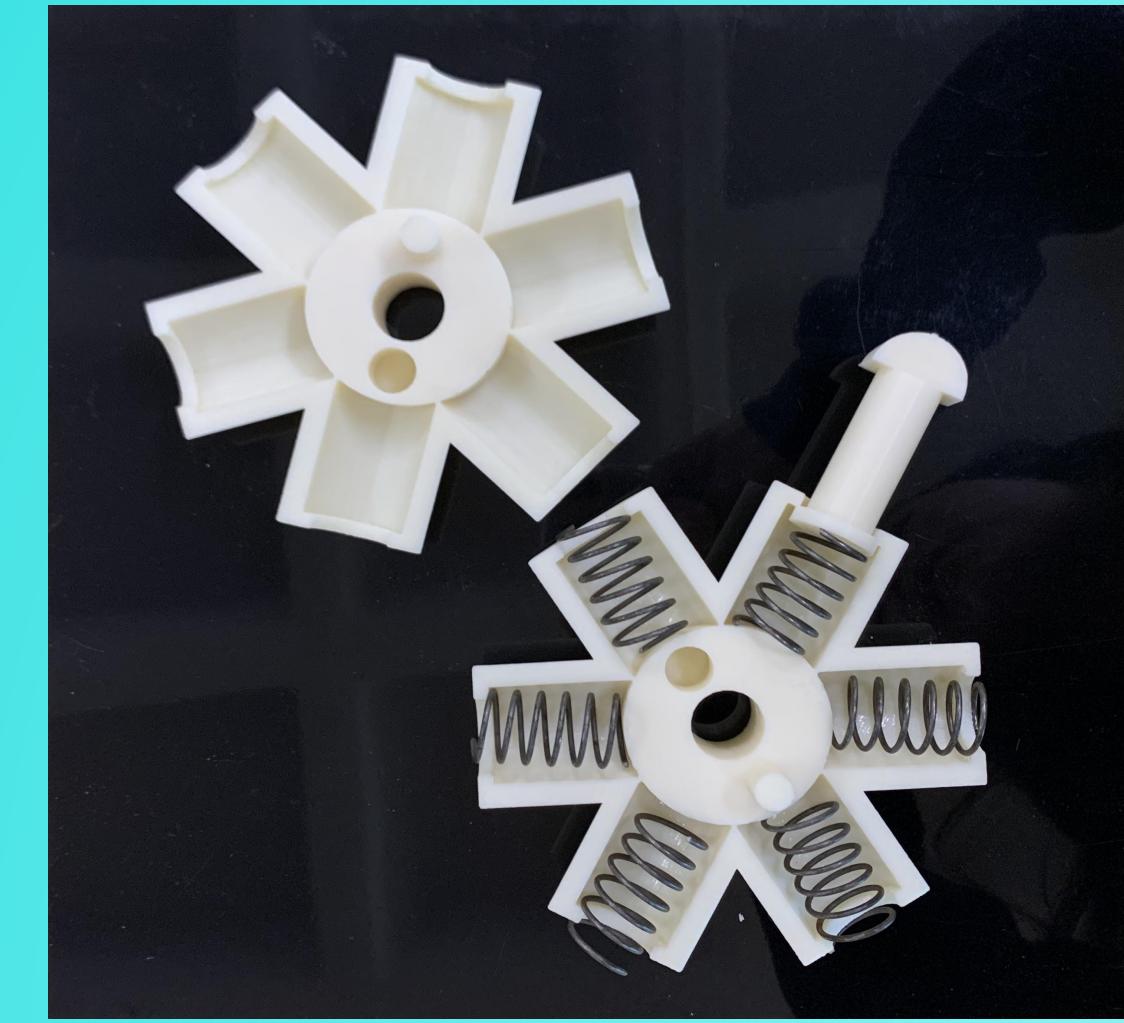
- Shopping cart wheel
- Axle connection
 - Can turn easily



- Zip tie
- Locking mechanism that moves forward but cannot move back
 - Got the idea for a ratchet gear

DESCRIPTION

This Lunar Wheel prototype will work on a wagon as a carrier. We also solved how the axle will attach. This design uses springs to allow the wheel to conform to its terrain, mimicking air in rubber tires without the air and rubber due to constraints on the moon.



WHEEL PROTOTYPE

Wheel:

- Two halves of the body 3D printed
- Compression springs loaded in each axle holder
- Axles fitted into the wheel body, fully extended with springs
- Ratchet gear attached to the wheel
- Pool noodle tire of the wheel can bend to assist the springs when conforming to terrain

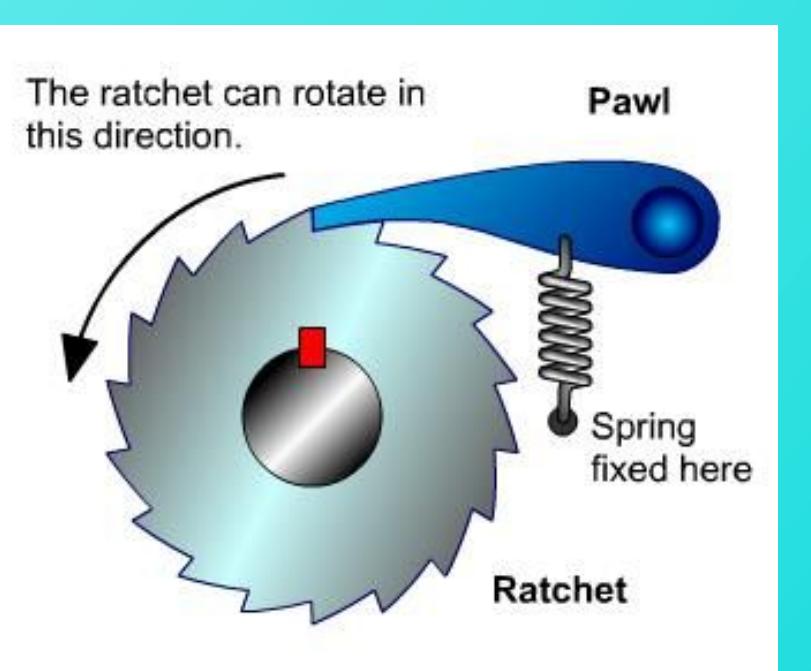
Axle Connection:

- Axle through wheel, joined together to connect at the top
- Ratchet will act with the sliding pawl when the wheel is on a slope, activating the gravity-induced locking mechanism
- Fender to prevent dust from kicking up

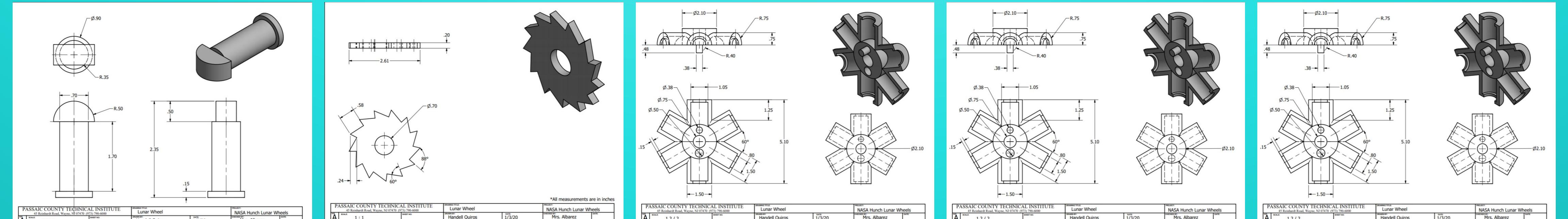


RATCHET GEAR AND PAWL EXPLAINED

The automatic ratchet gear and pawl system was implemented to accommodate the consideration of creating a way for the wheels to not slide down when the carrier following an astronaut traveling diagonally up a hill. A normal ratchet gear is activated by a pawl which impedes the motion of the ratchet in one direction. To have the wagon only be unable to move when moving uphill, the pawl has its motion impeded when the angle of the wagon is low, causing it to move up and away from the ratchet.

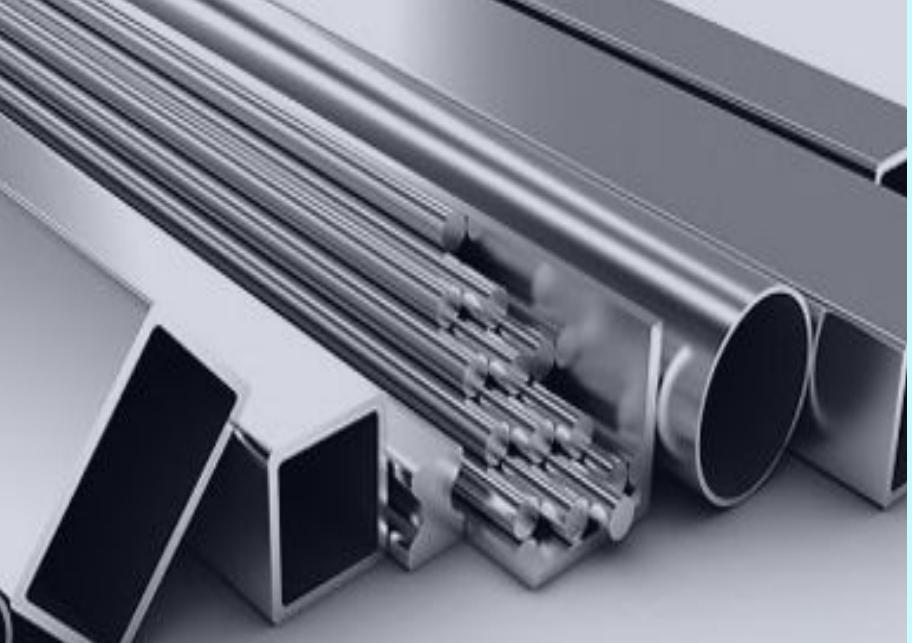


CAD SKETCHES

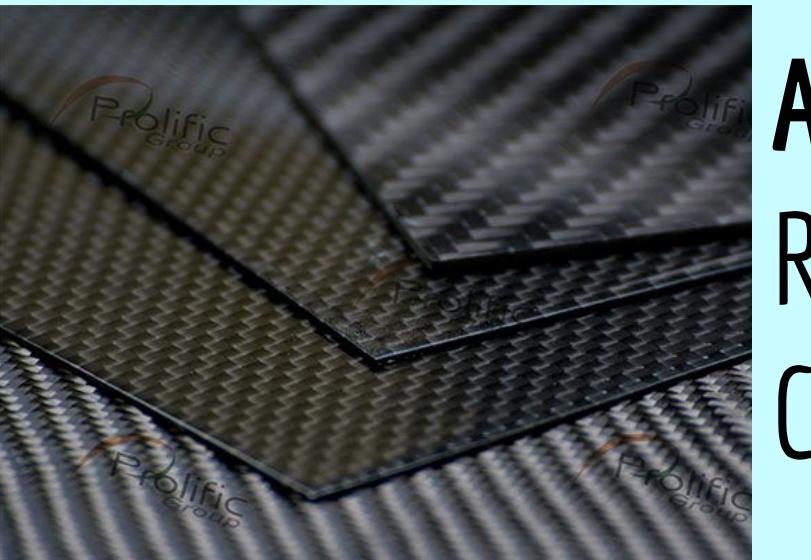


IDEAL MATERIALS

Wheel Body + Spokes & Ratchet Gear + Pawl:
High-alloy austenitic stainless steels



Axle Connector & Fender:
Reinforced Carbon-Carbon Composite



Springs: Elgiloy



Tire: NiTi shape memory alloy wire mesh

MATERIALS USED

Wheel Body, Spokes,
Ratchet Gear, Axel
Connection: ABS plastic
(3D printed)



Tire: pool noodle
Springs: steel alloy