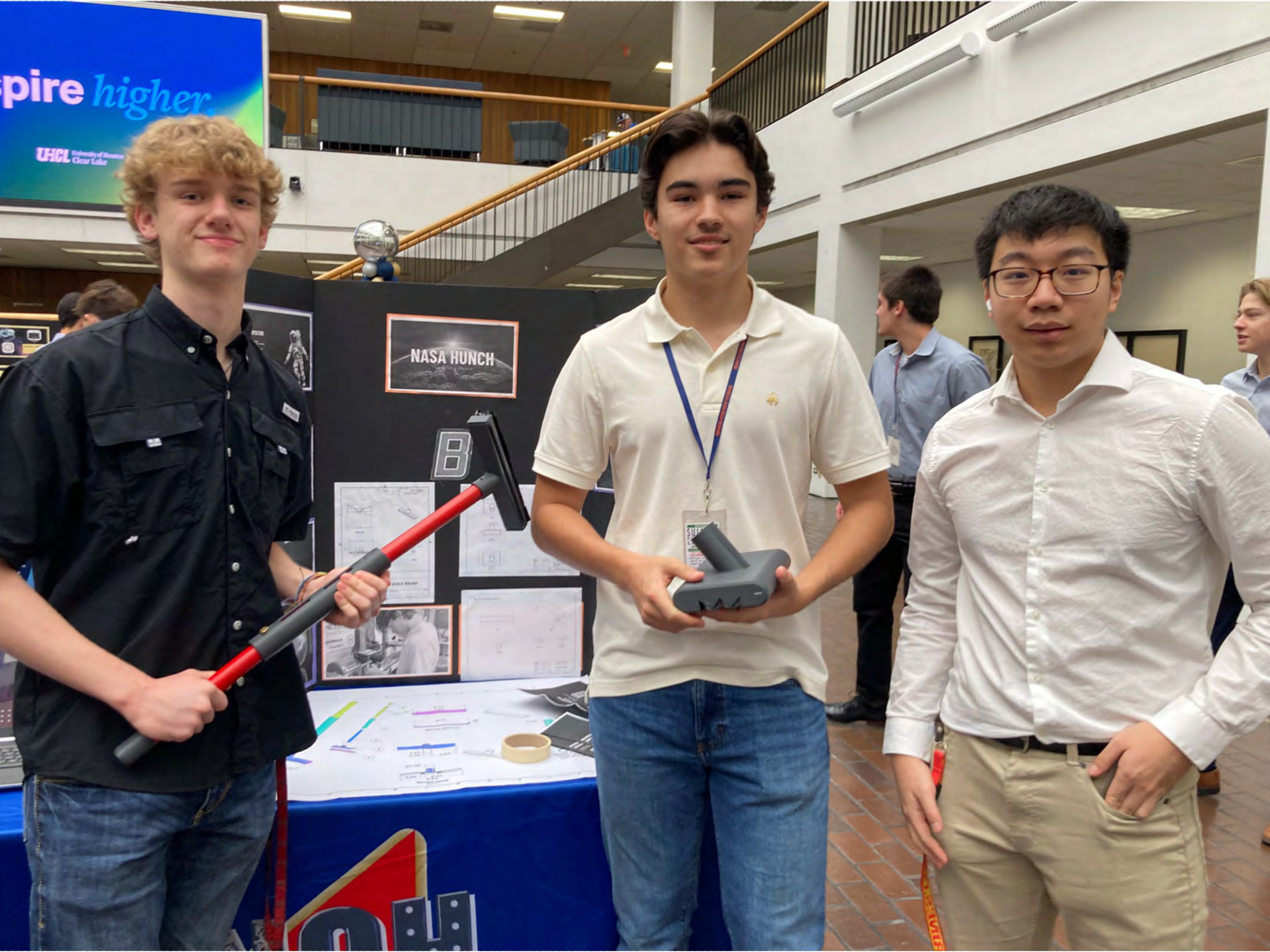

spire higher.
UHCL University of Houston Clear Lake
NASA HUNCH

REGOLITH
SEPARATOR
BRIDGELAND HIGH SCHOOL - MR LAUGHLIN
PROMPT
PROJECT
Extra Information
NASA HUNCH
High school students

higher.
UHCL University of Houston Clear Lake
LUNAR CAMPER
LUNAR ROVER
THE SEPARATION OF ICE
LUNAR REGOLITH
Prototype
to Create Hardware


OLD MODEL
Lunar
RESEARCH TRAILER
NEW MODEL
Current Design
Can attach to and be used by a lunar base
Smaller in shipping without sacrificing space for astronauts
Lighter
Storage, power, and essential systems built in
No astronaut help required in set up
Designed to attach to NASA's current LTV
But the astronauts involved will only have a small area of operations while there- They can't go far from their base
NASA


SCORPEX
DESCRIPTION
MATERIALS
HUNCH
students United with NASA to


HAIL TO THE
VICTORS
M
TALC
POWDER

Chemistry
Computer Science
ADDITIVE
MANUFACT URING
NASA
HUNCH
No more than 6 inches?
LUNAR
CAMPER/LAB
Gantt Chart
Element A:
Element B:
Analysis of Prev. Soluti
Element E:
STEM Principle Applic.
TEXAS S

Environmental Science and Technology
LUNAR ADDITIVE MANUFACTURING
MANUFACTURING
PROBLEMS
PROBLEM STATEMENT:
MULTIPURPOSE TOOL: LED's
PROTOTYPE STAKE 6:
PROTOTYPE STAKE 6 OBSERVATIONS:
CONCEPTUAL SKETCHES
DESIGN FEATURES
EXTRA IDEAS
OBSERVATIONS:
FIRST ATTEMPTS: STAKE 1, 2 AND 3
STAKE 1
STAKE 2
STAKE 3
DEMONSTRATION VIDEOS
ORIGINAL DESIGN OBSERVATIONS:

REFERENCES
LUNAR
CAMPER
Clear Falls HS
Mentor: Trevor Curtis
Devs: Amy Tran & Sofia
Materials
Problem Statement

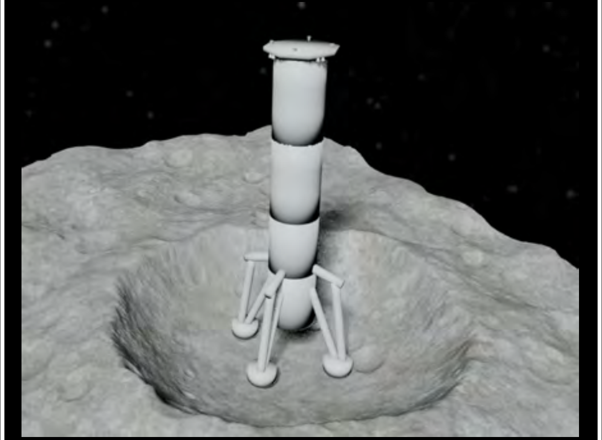

Physics
Transportation
Cypress Springs
High School


Biology
MANVEL HIGH SCHOOL
HUNCH
NASA
HUNCH

Payload Deployment

Leg Adjustment

Drop Test

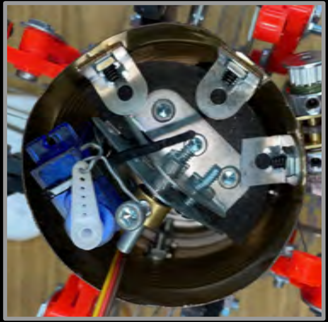


lunar legs

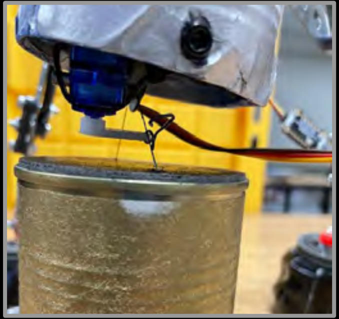
by STAR AURELIAN

Caleb Smith & Kapono Corpus
Teacher: Frederick Herrmann
Makua Lani Christian Academy

Drop System



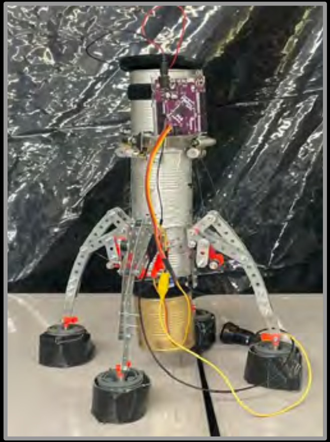
- Pin secures payload.
- Pin prevents pressure on servo.
- Pin removal provides instant deployment.



Leg Adjustment

- Lasers provide distance data.
- Motors pull legs up or down to adjust legs to lunar surface.

Feet Design



- Spring shocks on each landing foot.
- Wide feet distribute landing pressure.
- Double-layer air shock toruses on each landing foot.
- Feet angle to surface contour.

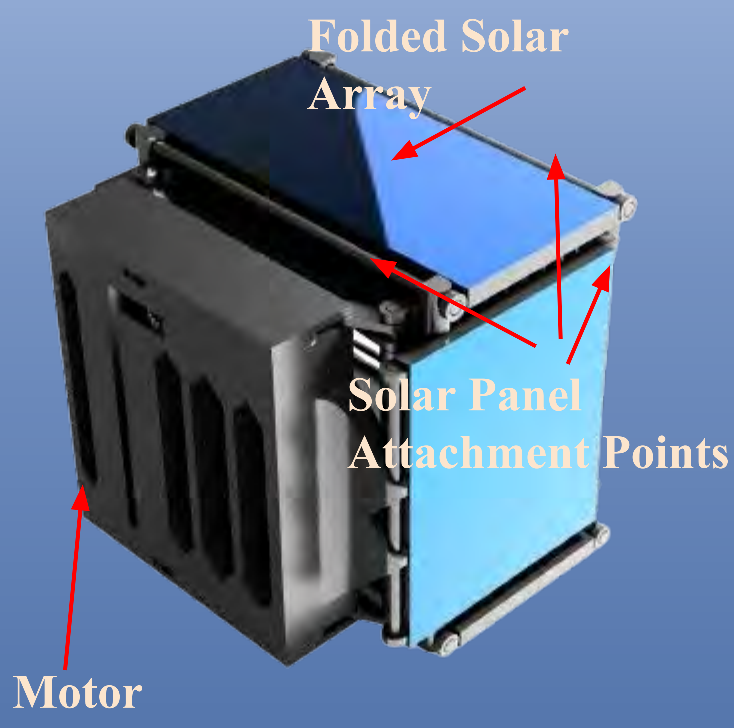
CubeSat Solar Panel Deployer Design

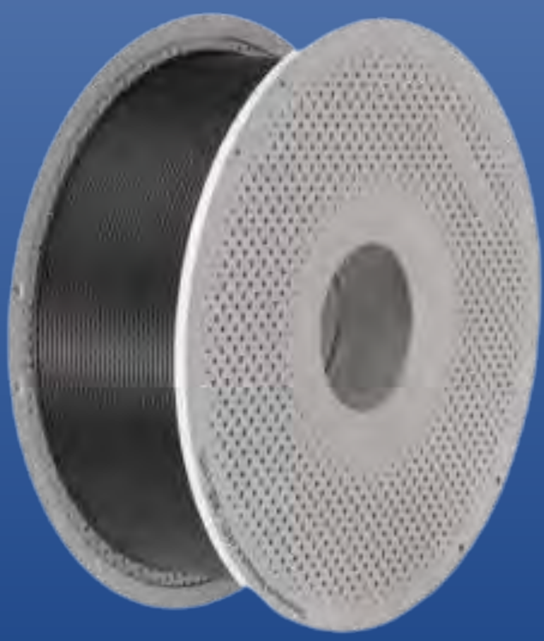
Deployment Method - Motor-Assisted Deployment

After multiple iterations of the deployer, it was concluded that the only way to conduct the deployment at a speed safe without the use of a complicated mechanical system was by utilizing a motor. It has been determined that the motor, operating at 21 rpm at 12 volts, will operate for a burst of 7.14 seconds which will fully deploy the solar panel array.

Power Generation

With our design, we expect to provide close to 2160cm^2 of solar panel area, which, assuming that all solar panels are in direct sunlight constantly would generate 58 watt hours every hour. With NASA hunch guidelines telling us to assume that the solar panel array will be in the sunlight 30% of the time, it can be assumed that the time that solar panels will be in sunlight every 24 hour period will be 7 hours. During this 7 hours, the solar panels would therefore be expected to generate close to 406 watt hours daily.



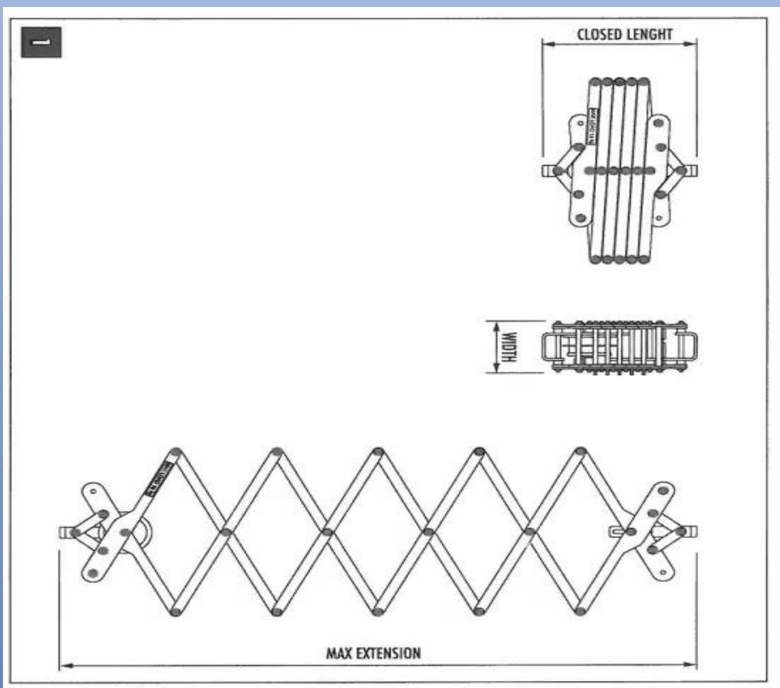


Material Used - PAHT-CF

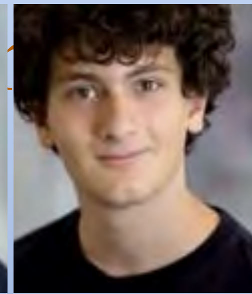
The material used to print the deployer mechanism is PAHT-CF filament from the manufacturer, Bambu Labs. This material is well suited for the environment of space as it has a heat deflection temperature of 194ºC (381.2ºF), well above the 120ºC that a complete blackbody is expected to reach under direct sunlight exposure. Furthermore, the material is reinforced with carbon fiber microtubules, allowing it to maintain shape after long periods of thermal cycling between the hot and cold temperatures of space.

The Mechanism of Deployment

The mechanism by which the solar panels are to be extended from the main body of the CubeSat satellite will be by what is known pantograph mechanism, a system of interlocking parts which have the ability to expand and contract mechanically.



Meet the



Attending Pacific Ridge School, our three members are all in 10th grade. On the left is Jackson Bush, a talented artist and creative student who helped design multiple models before arriving at our final iteration. Featured in the middle is Jacob Spector, our mechanical specialist ensuring that the team stuck to the requirements and limitations of the project. Seen on the right is Evan Rice, helping with many aspects of design and brainstorming, utilizing the 3D CAD program onshape was able to model the dimensions of multiple prototypes.

Our Design Process

With nearly 15 printed prototypes and over 20 individual CAD models our team has gone through many iterations before reaching our final version. We originally experimented with utilized a gas filled container to expand a tube connected to the solar panels. However, it was realized that it was needed to simulate a complete vacuum for this idea to be feasible, something that we did not have the resources to do. Another idea which we had was to not utilize a motor in the deployment of our mechanism. This idea was found unusable after the difficulty in utilizing a mechanical mechanism while still deploying at a safe speed. 3D printed prototypes were fabricated through the use of a Bambu Lab X1C printer and associated software.

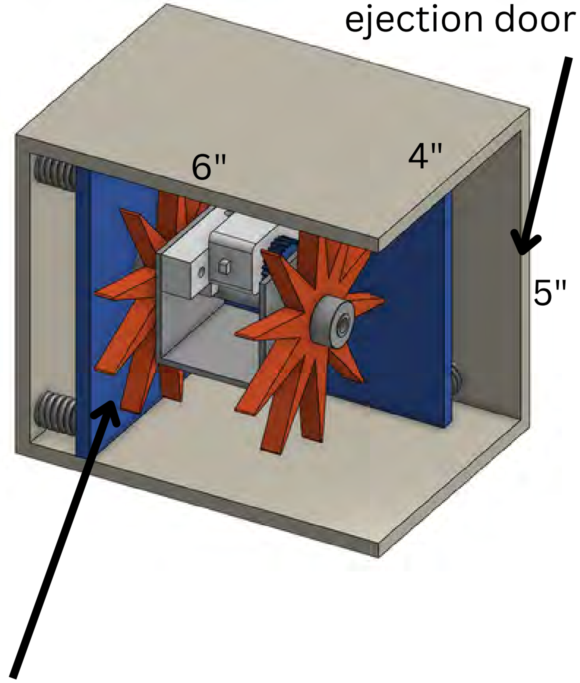
Lunar Ejecting Robot

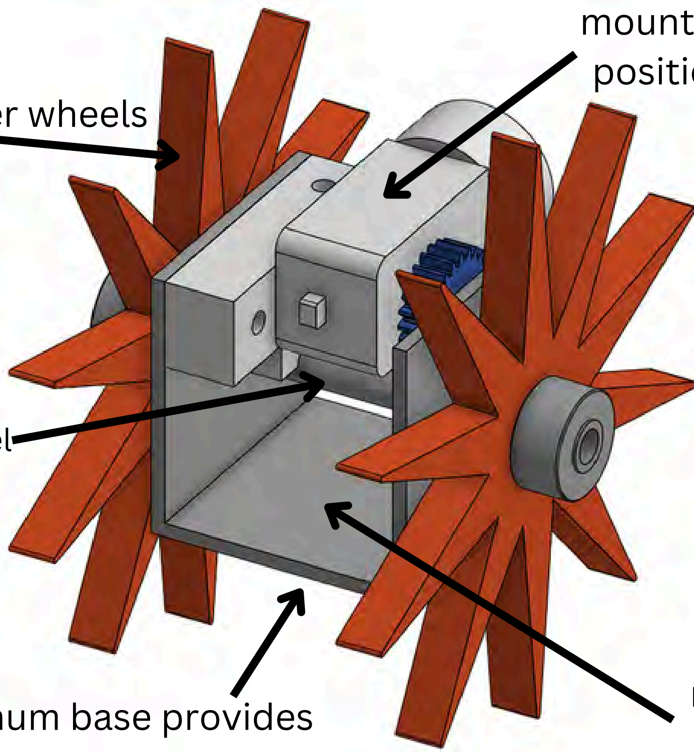
Pacific Ridge School

Harlan Schillig

Andreas Karanikkis

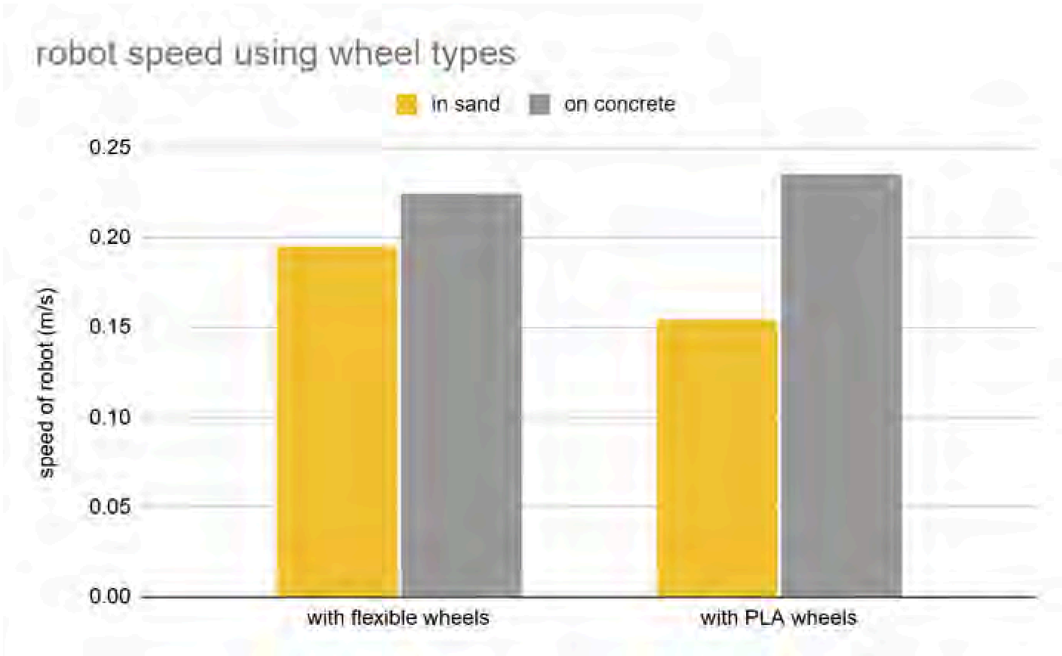
The flexible wheel design of our mini robot allows for us to place the robot in the box with minimal risk of critical components vibrating or impacting with the side walls

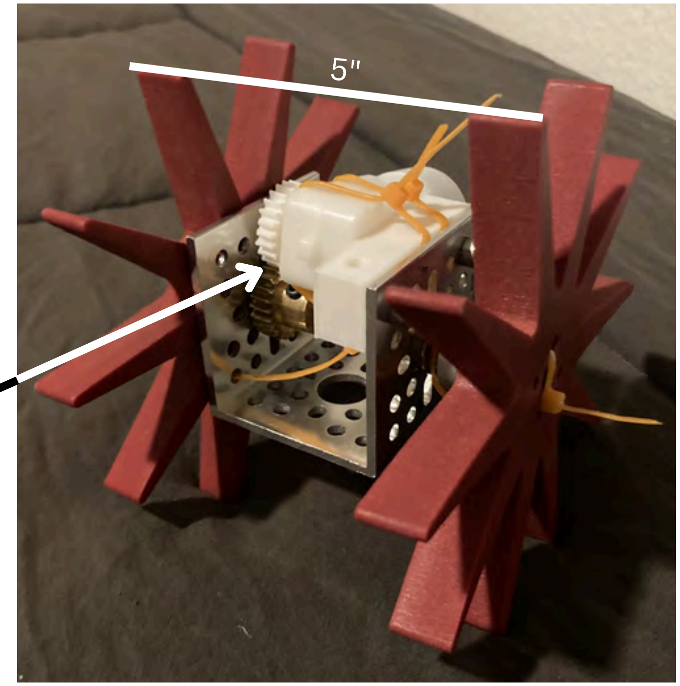




A big focus of our robot was durability. To achieve this the main body is made out of aluminum and weighs in at 13oz with all components including the camera attached

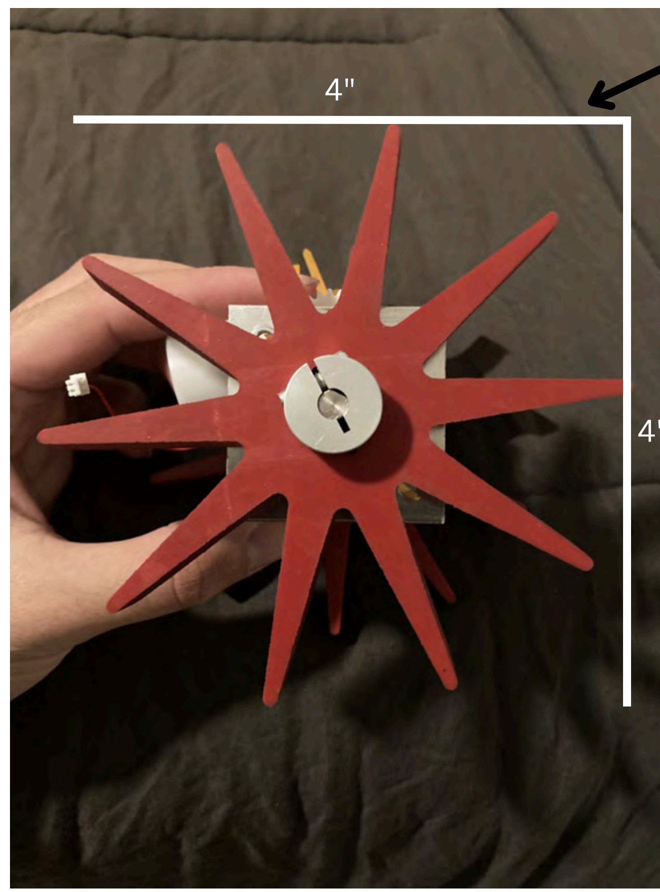
Teacher: Mr. Simon





geared connection for added strength

The main variable we adjusted throughout the improvement of the mini robot was the material of the wheels. We found using the flexible wheels on our robot improved our speed and power efficiency



4" x 4" profile leaves room for support in the box to keep robot safe from vibration

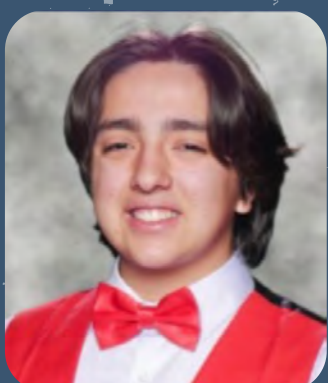
NASA HUNCH

High school students United with NASA to Create Hardware

LANDING LEGS AND CARGO RELEASE SYSTEM

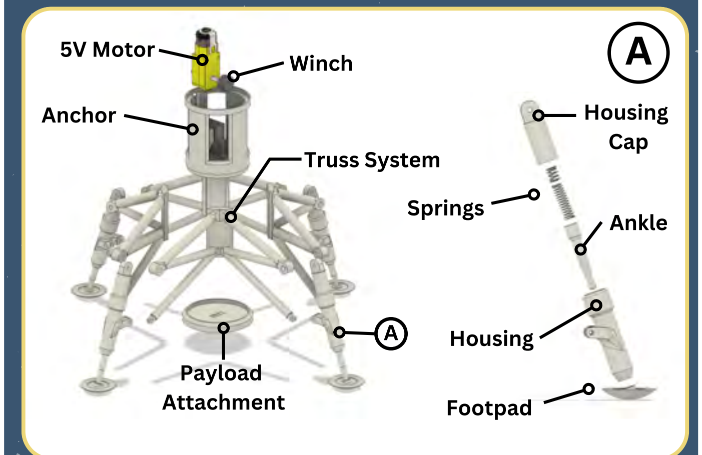
Ethan Irvin
Lead Researcher

Sahid Cuevas
Lead Designer



DESIGN OVERVIEW

The main features of our rocket design are its landing legs and cargo release system that have gone through multiple iterations and testing. We have ultimately arrived at this design

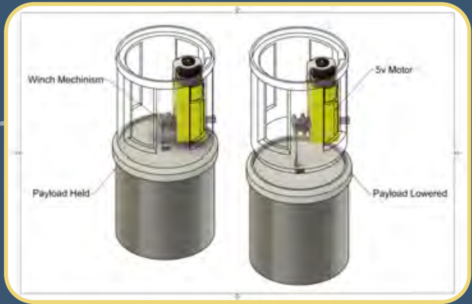


LANDING LEGS

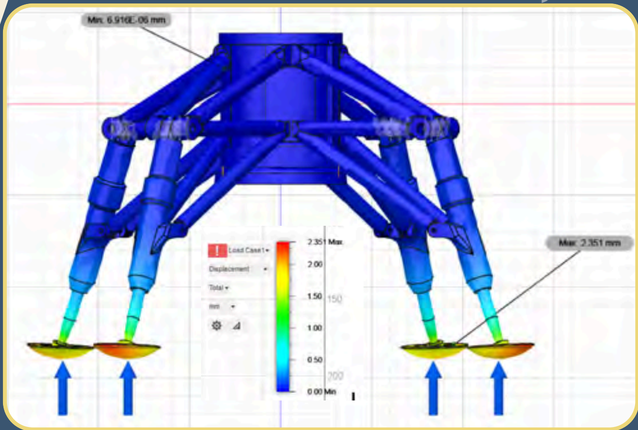
The wide structure of the rocket legs ensures stability. While our tested shocks work to effectively absorb any impact of dropping.

CARGO RELEASE SYSTEM

Our rocket utilizes a winch and cable mechanism in our design in a similar manner to how a crane works to hold a payload. Running on a 5v motor our design is able to easily pick up and release our payload gently on the ground after landing.

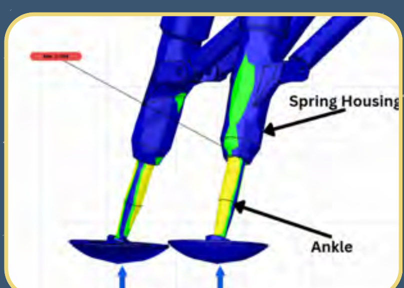


Drop Test



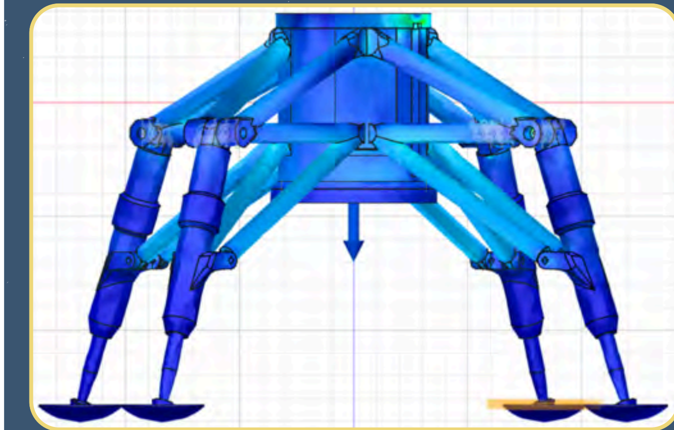
- Purpose of the study: Examine the effects of dropping the rocket from 2 meters onto a dry mortar mix (Lunar Regolith Simulant).
- Focus: Evaluate the impact on the landing legs design.
- Considered factors: Included the full weight of the rocket.
- Included components: Accounted for both cans stacked on top of the rocket.

Results



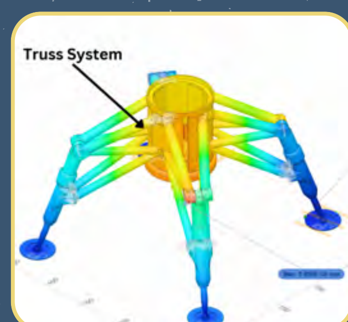
This study revealed that the dynamic force of impact on our legs placed stress on our legs ankles and less stress in the spring housing. This simulation underlined a key area to buff up before more testing can proceed.

Weight Test



- Purpose of the study: Visualize the rocket legs' performance while carrying a 238g payload on the ground.
- Method: Simulation of the rocket in a static position.
- Force applied: Static force from the payload attachment.
- Force value: 8.3952 ounces (238g converted to ounces).

Results



This study revealed that the static force of the payload acting on the anchor places stress on the truss system. Our safety factor was within an acceptable range, meaning our design is capable of holding up the payload.

Physical Drop Test

- Purpose of the test: To see how our rocket withstands the test layed out in the HUNCH challenge document.
- Method: Dropping the rocket from 200mm(20 cm) onto a six degree sloped lunar surface simulant.
- Force applied: Dynamic force of the legs impacting the lunar surface.

Results

Physical testing showed that our legs were able to withstand the force of impact without buckling or showing any damage. However this testing highlighted a slight flaw in our payload clearance that will be addressed swiftly. Otherwise our design functioned as intended and further testing will proceed.