Note to Semi-Finalists

Thank you very much for participating in the HUNCH Design and Prototyping. This was by far the most difficult year for deciding finalists. Part of the difficulty was the number of teams participating but the most important part was the number of high quality of prototypes for each of the 10 projects.

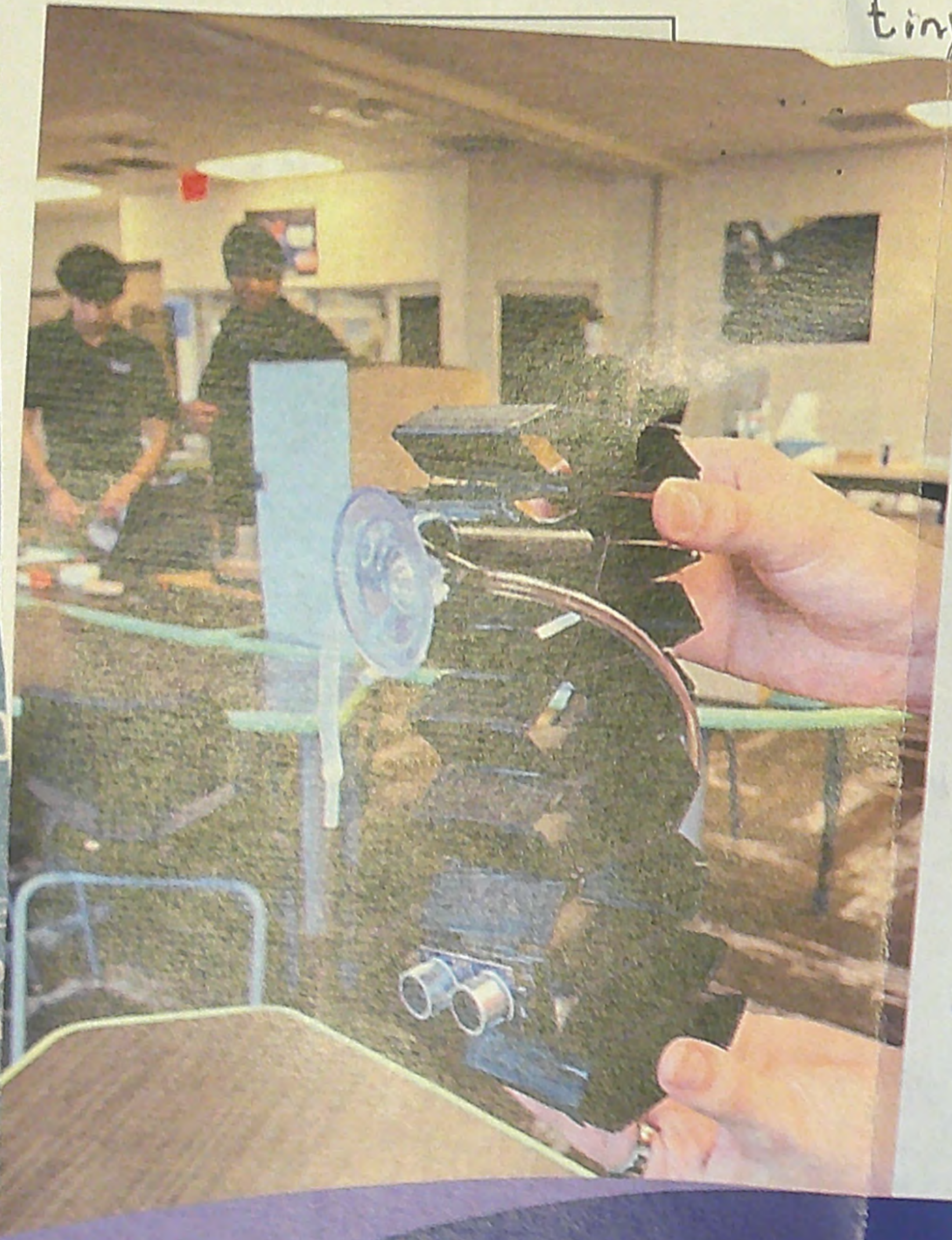
Each Mentor helped choose potential finalists for their area and were then compared with the same type of projects across the country. Teams that were selected to be finalists had very tough competition and it was very difficult to down select. Although everyone wants to be a finalist it isn't possible and decisions have to be made. Some of the decisions include the requirements but also trying to show diversity of how the problem could be solved. There was no shortage of good and diverse ideas.

Being a Semi-Finalist is a great honor because each of you put together a project and data that made the teams think, learn and be excited about space.   Your great ideas and hard work is what makes NASA HUNCH a challenge and a great experience for engineering. We hope you enjoyed the projects as much as we all enjoyed seeing your prototypes.

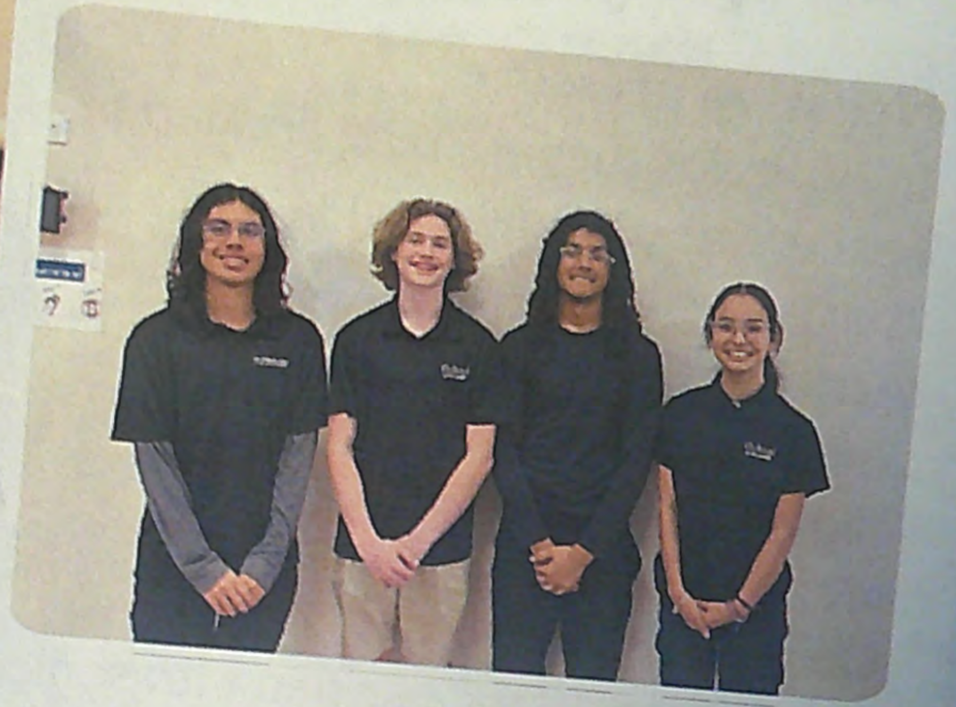
If you are a senior and moving on to college, industry, or trade schools, make sure you include your project with NASA HUNCH on your resume. You will find that your interview will center on "what did you do for NASA?" The more you tell them, the more they will want to hear. You will be receiving a letter of recommendation from NASA HUNCH describing Design and Prototype and the project you worked on. We hope that your work will translate to opening doors for your future. Thank you for being in the NASA HUNCH Design and Prototype Program.

tinyurl.com/ hunch mobility arm

#49



THE TEAM



Santiago De La Pena, Dalton James, Dooley Lance, Damarcus Turner, and Emmery Rios

VENTOSA

SECURING INNOVATION, DEFYING GRAVITY

PROBLEM STATEMENT

In space, dust and dead skin cells accumulate, posing health and equipment risks. To tackle this, we propose the Kwadropous duster robot, equipped with suction technol

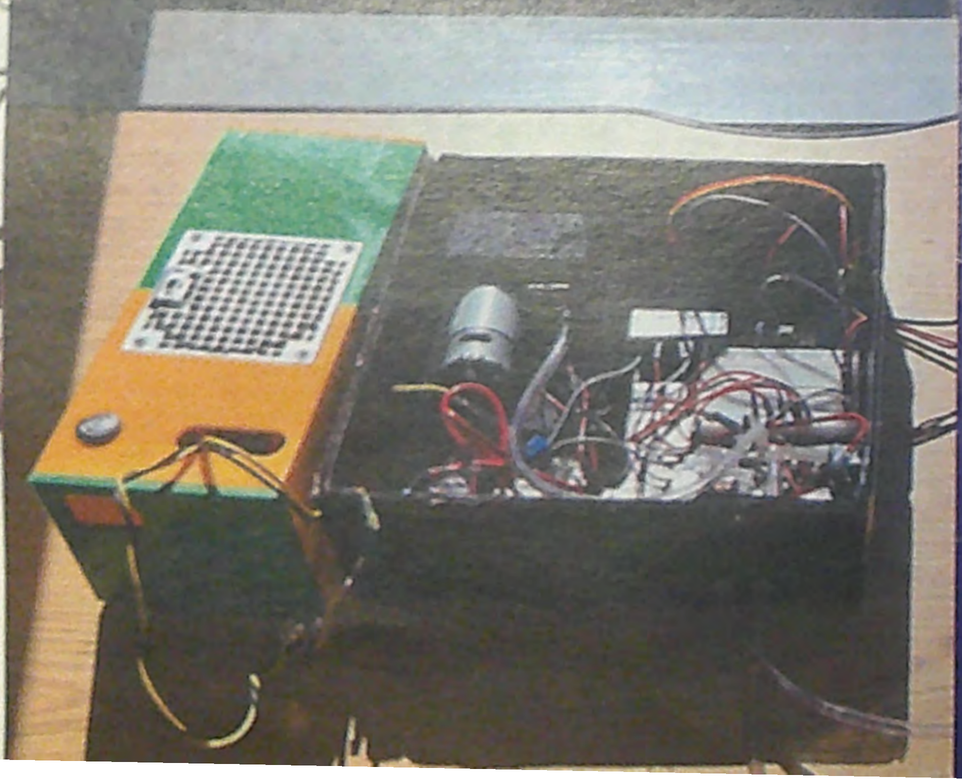
WEBSITE

KWADROPUS : SUCTION CUPS

Program: Design and prototype
School: Lewisville School of

TEST RESULTS & CONCLUSION

Our iterative testing has led to a suction cup system for space stations. While initial tests confirmed negative pressure suction feasibility, challenges with solenoid overheating persisted despite mitigation attempts. Successful duster arm integration showcases versatility, but further refinement is needed for optimal space station performance.



KEY FEATURES

Negative pressure
In order for suction to be created in space it needs negative pressure, and that is created through a pump.

Automation
The use of sensors in our project allow it to be more automated and require less human interaction.

Ultrasonic sensors
The system activates when ultrasonic sensors detect nearby objects, streamlining operation for maximum efficiency.

VALUE PROPOSITION

Effortless cleaning with automated suction. Our system adjusts suction levels using negative pressure technology and sensors, optimizing performance while conserving energy. Simplify maintenance and boost productivity with our innovative solution.

CURRENT DESIGN

→ **Description**

This automated system integrates advanced ultrasonic sensors alongside a precision pneumatic actuator to ensure surface connection.

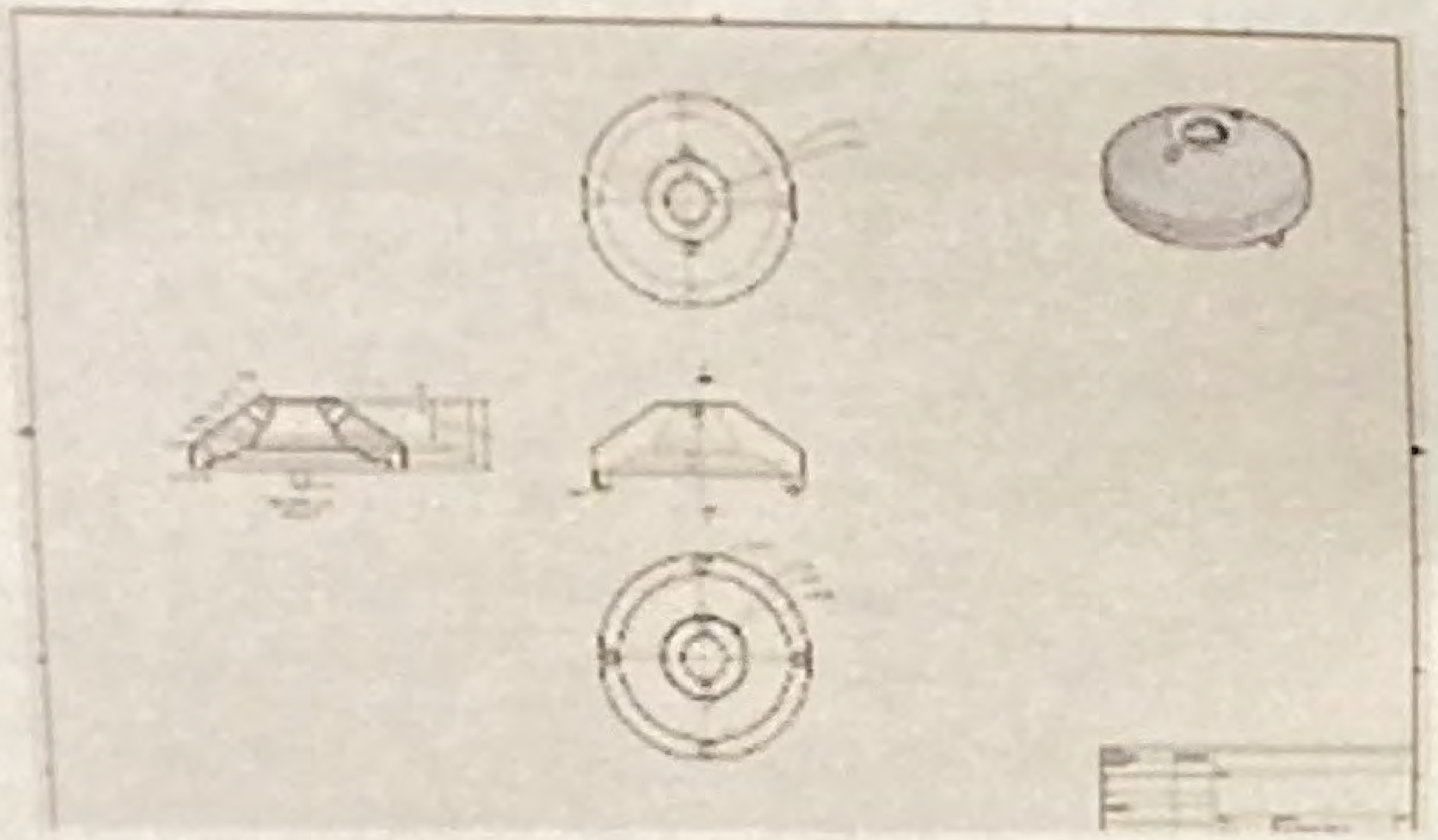
FUTURE PLANS

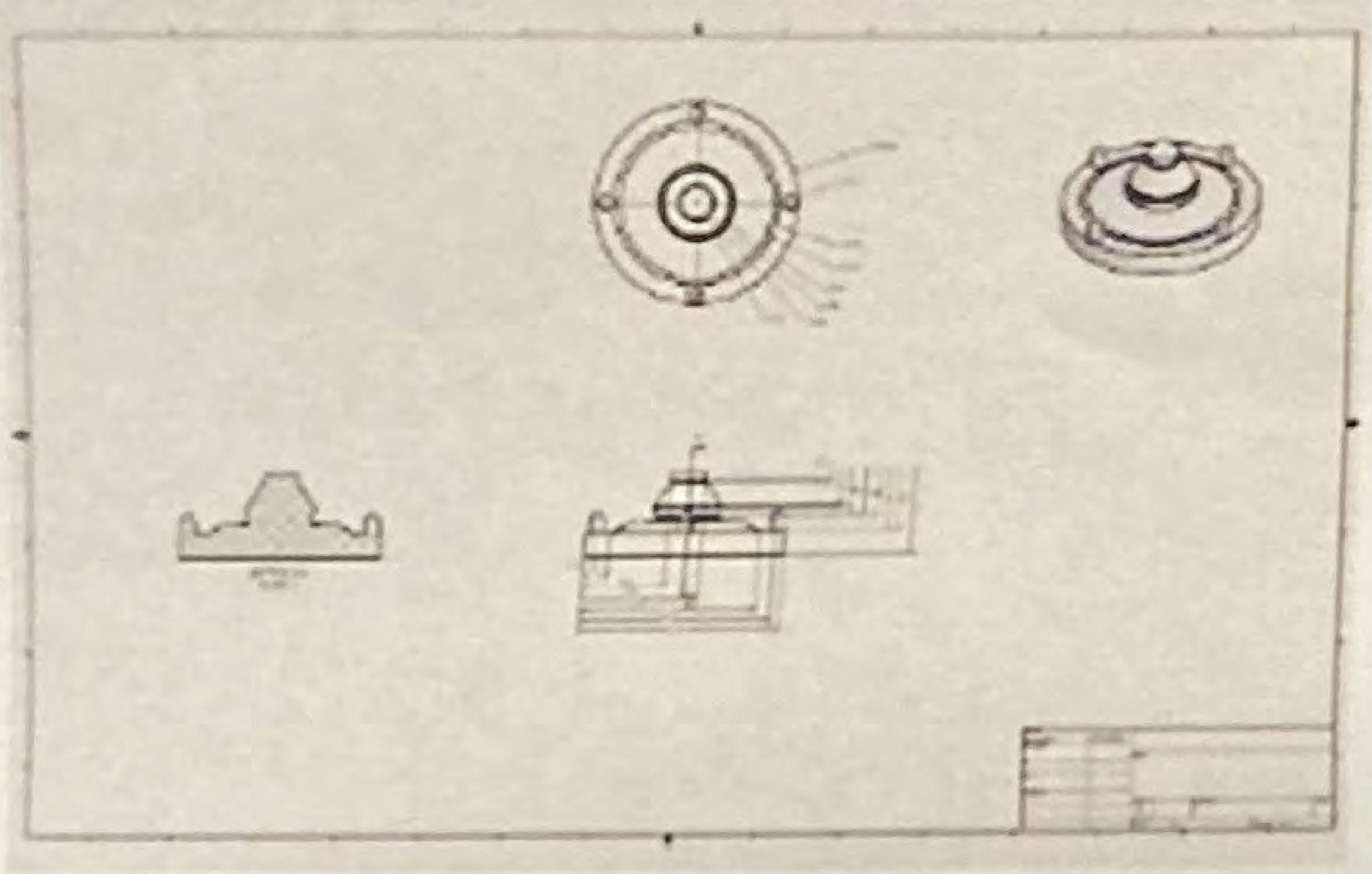
→ **Return of Positive Pressure:** When the suction cups adhere, positive pressure breaks the seal for easy detachment.

→ **More Capable Actuator:** The pneumatic actuator extends the suction cup independently. Positive pressure extends, negative pressure retracts for closer reach

→ **Pressure Sensor:** It is a sensor that can tell the robot when it creates a suction or if it loses a suction

Suction Cup Mold IDW





Our team

adn6uyen@gmail.com

100045296@ccisd.net

Problem Statement

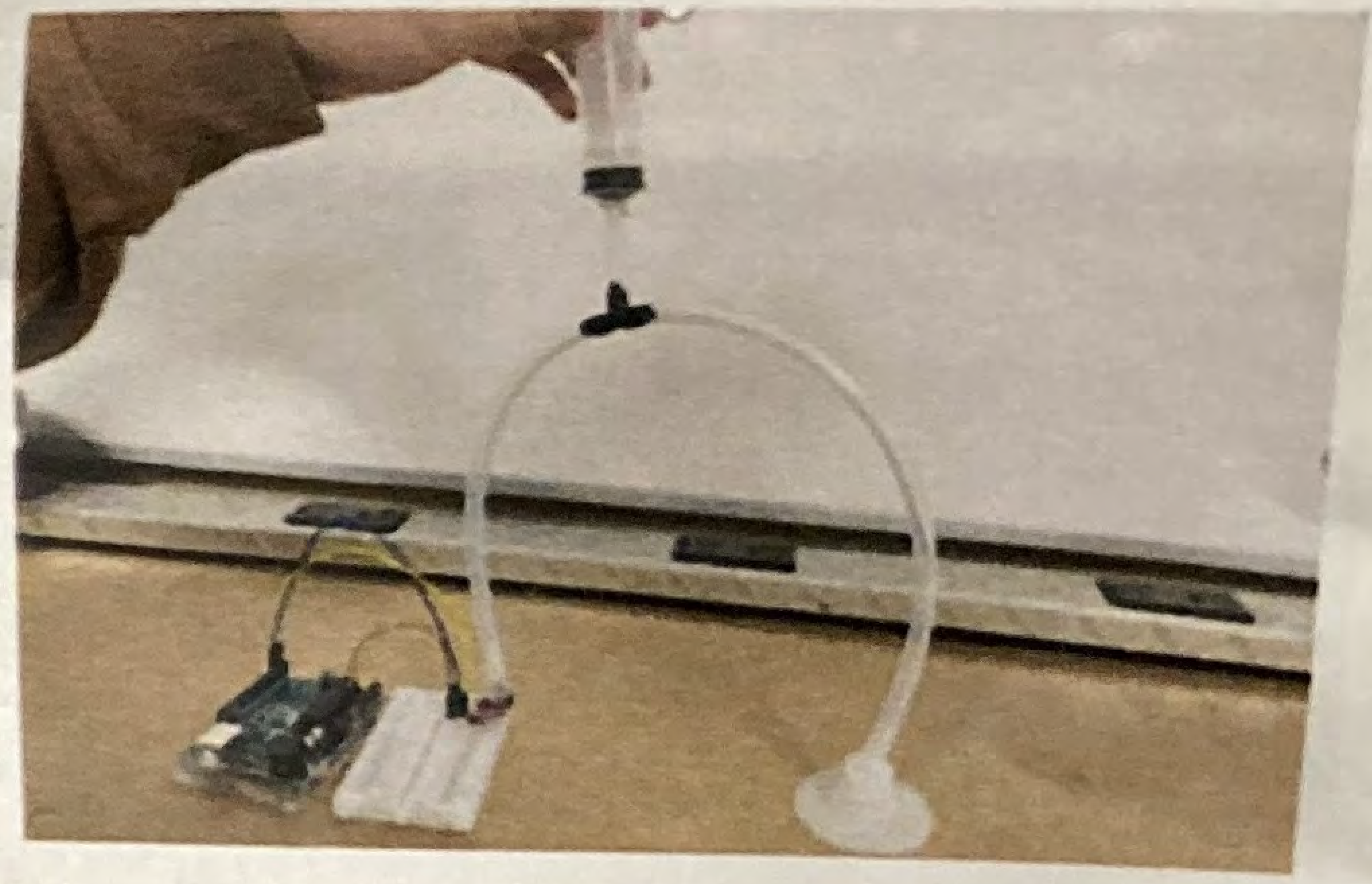
Develop a suction cup that can conform itself to a smooth but rounded surface and suction onto it. Each Suction cup needs to be able to act independently. These Suction Cups will need to be able to attach and detach from the surfaces without pushing the robot away from the wall in the microgravity.

Grading Link

Kwadropus Suction Cups

School Clear Creek high school Team # 1

NASA HUNCH



Kwadropus Suction Cup

By: Cara Anderson & Andrew Nguyen

For

Instructor Mr. Merritt

Architectural Civil Engineering

Clear Creek High School

Clear Creek ISD

League City, TX 77573

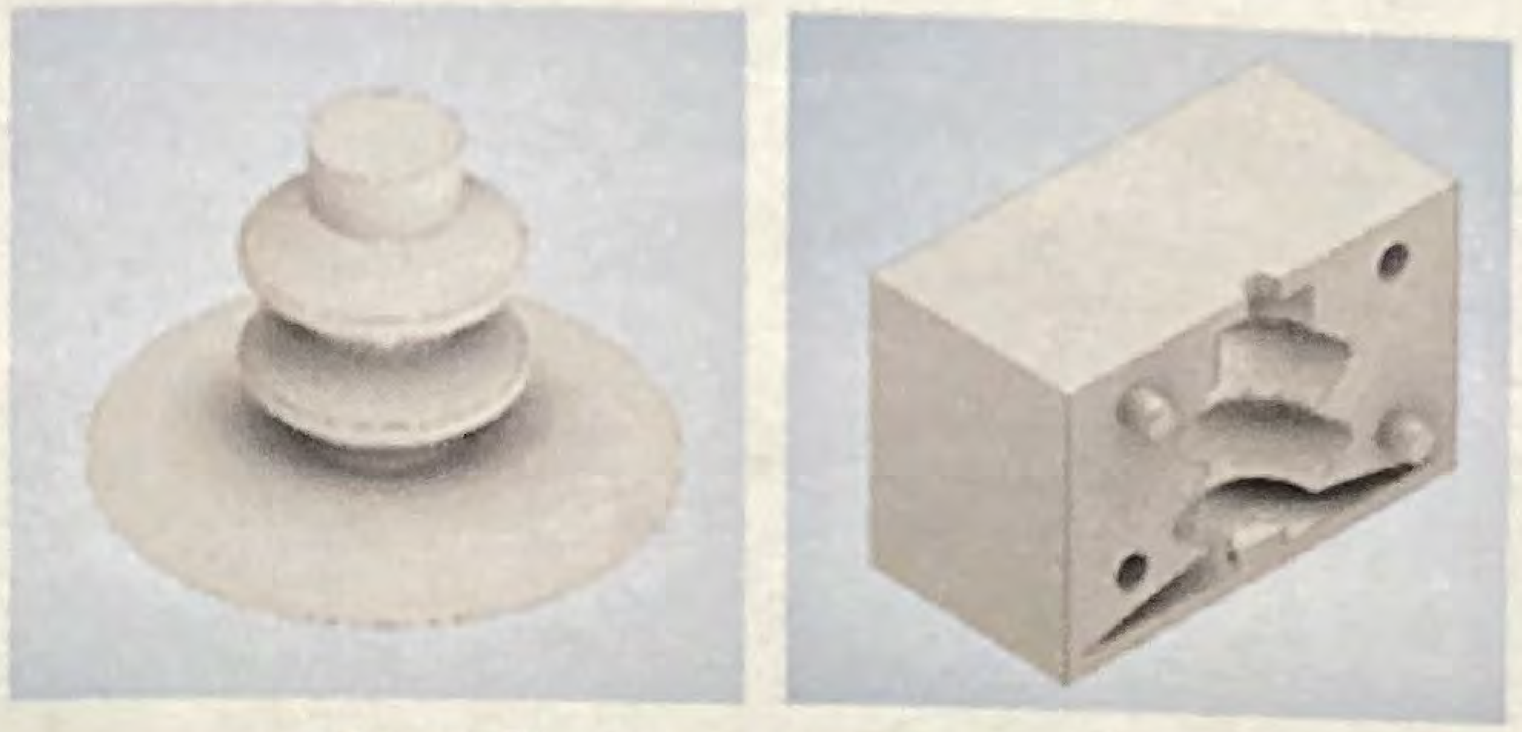
Our Process

We began by researching how suction cups work, the different types of ways suction cups suction, materials for suction cups, and suction cup designs. We decided to create a design that included pneumatic activation, silicon, bellows, and a round base with lips. The pneumatic activation will be executed through the use of a vacuum motor or syringe to minimize pressure upon impact with the surface. Bellows will allow for the ability to attach to irregular surfaces. The silicon material allows for flexibility which aids in attaching to curved surfaces.

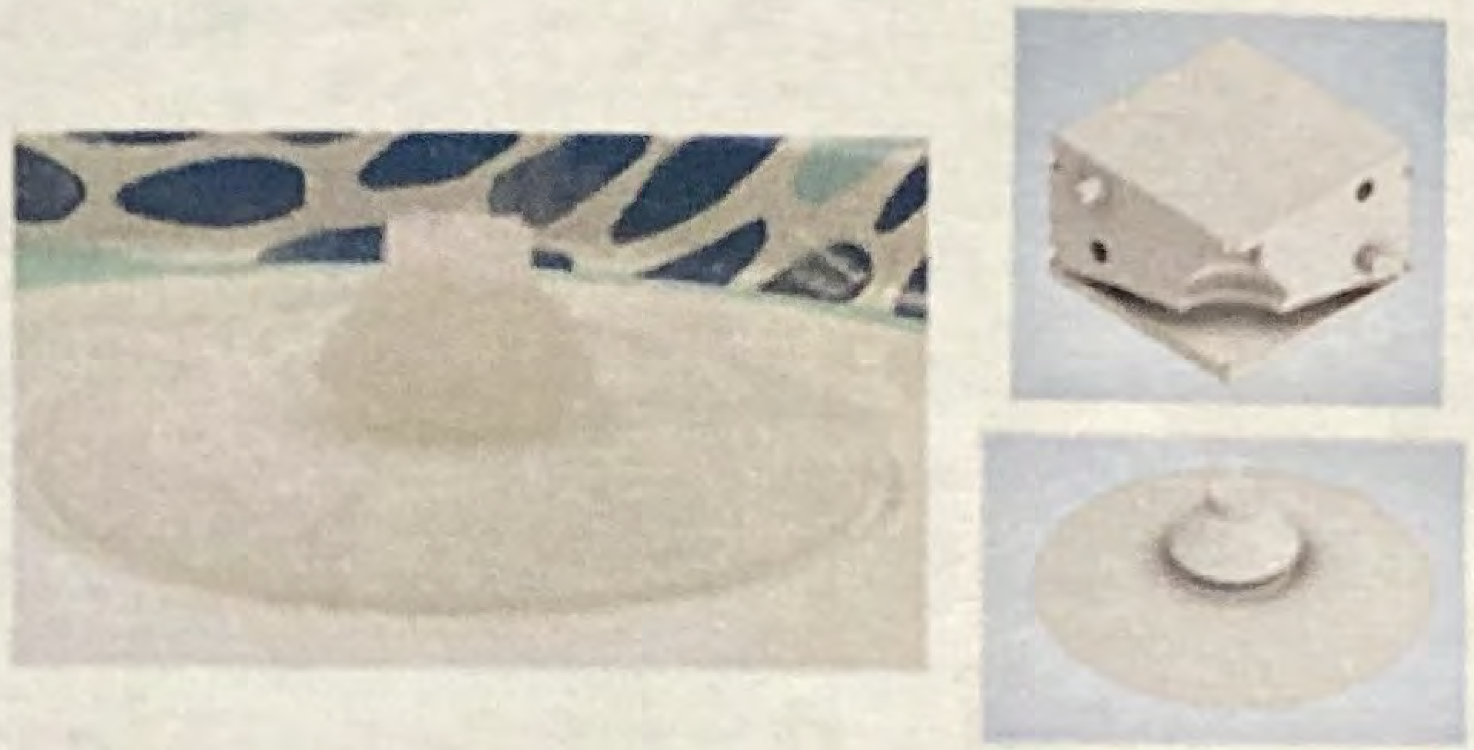
Early designs

With our first suction cup design we created a mold for a suction cup with two bellows and a flat circular base. We later changed the mold in the 2nd cup design to have only one bellow because it minimized spaced inside the suction cup. In the 3rd cup design we made the bottom of the suction cup thicker so the silicon would be more durable and be ess likely to tear.

First Cup Design



2nd Cup Design

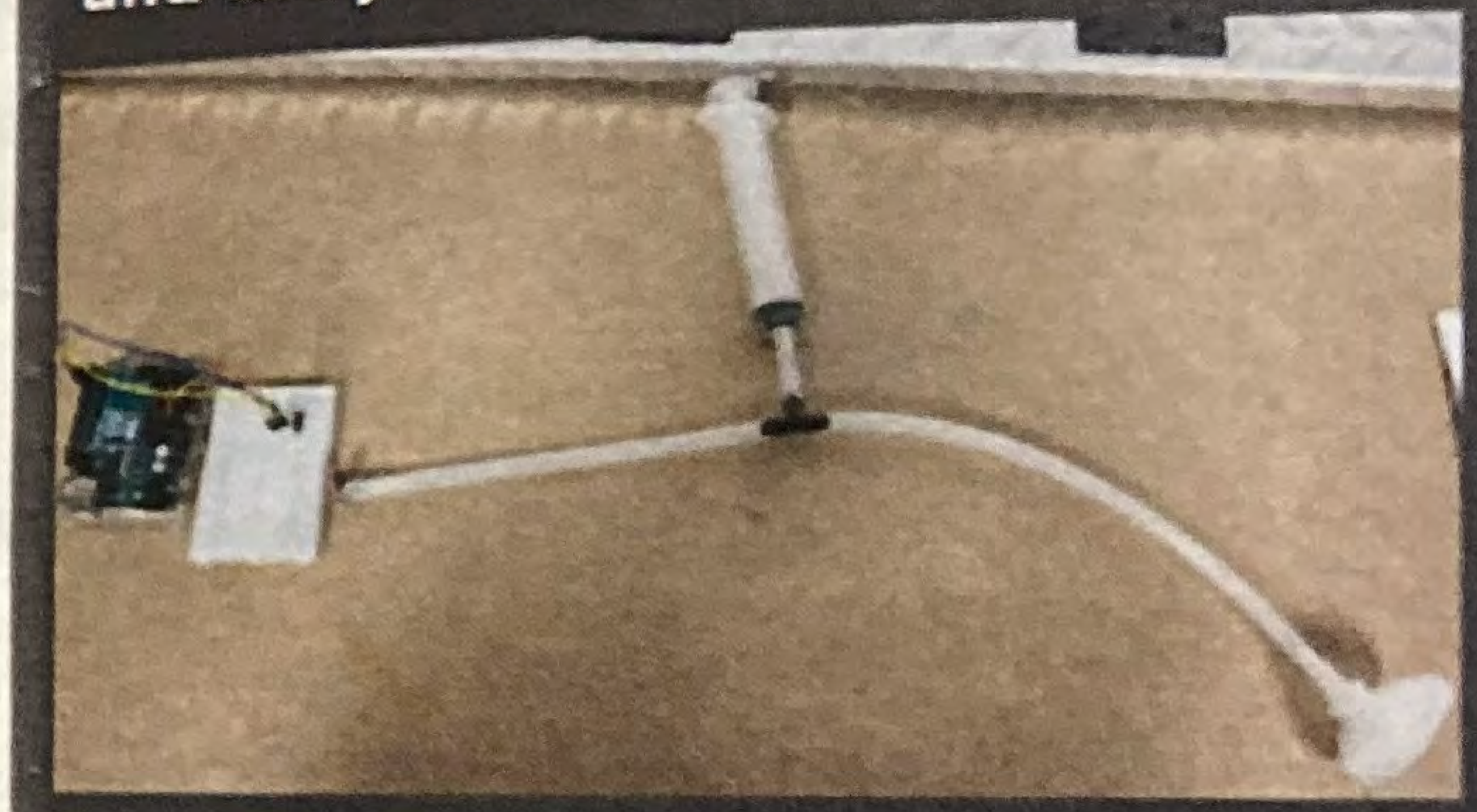


3rd Cup Design

Final Cup Design

Final product

We concluded to have a smaller suction cup so it would attach to curved surfaces easier, added a lip on the base of the bellow along with the lip on the suction cup base, and added tubing to connect the suction cup to the syringe and the pressure sensor.



How it works

Our suction cups work through pneumatic activation. By laying the suction cup atop a flat surface the lips (outermost layer of the base of the suction cup) attach to the surface. Next the syringe will suck any remaining air out and flatten the suction cup to the surface, creating a difference in air pressure and suctioning it to the surface. To detach the suction cup you add the air you took out of the suction cup back in and it releases the suction. The difference in air pressure is measured with an arduino and a code is used to verify that the suction is attached and lights up a light on the side of the suction cup.