Lunar Supply Pod Mover

Finalist List

for

NASA HUNCH

Design and Prototyping 2021

Congratulations for being chosen as a Finalist for NASA HUNCH Design and Prototype 2021. Your design was chosen as a Finalist because your team has fulfilled all or most of the requirements for your project along with quality in design and manufacturing the prototype. Your team demonstrated good testing of your prototype and knowledge of the problems and extensive understanding of the environment for your project. There was a lot of really amazing competition for these spots and all people from the semi-finalist

By being a Finalist means that you are a winner but this does not mean your idea will fly to space. This is real engineering. Although it is possible the reviewers could see one design that is exactly what they want, it is more likely NASA may choose one or a few ideas from each team to incorporate into a different design. It is also very possible that requirements or needs have changed since the beginning of the school year and they are not interested in the idea at this time. This is the nature of engineering but it does not diminish your accomplishments.

Design to Flight

The goal of HUNCH is to keep your names attached to these ideas and to have you assist with later developments of your projects when possible. Your projects and information will be provided to Mike Bennett who runs the HUNCH Design to Flight program that will coordinate the sending of your ideas to the engineers as they request it and working with your team to give engineers assistance whenever possible. This might include updating or making new CAD drawings, assembly of prototypes, choosing flight components and/or assisting with presentations. You will receive an email through your teachers in the coming days requesting specific information about your project.

Patents

In general, NASA does not seek patents on materials that are only related to space, however, if there are other potential uses for the device or ideas related to Earth bound applications, HUNCH will ask NASA Tech Transfer to assist in working through patent process. It is our goal that students and schools are included in any patents with as much credit as possible. We do not anticipate this as an income generator but more as value to your resumes.

Presentations:

General:

- Practice your presentation.
- Look sharp and professional.
- Everyone from the team should talk.

- Briefly introduce yourselves including your name and grade and school and state.
- Reviewers will already be aware of the problem and the constraints– I'll take care of that.
- Start with a demonstration of your prototype and briefly describe the testing that has been done.
- Point out details that make your design innovative, more robust, cleanable, repairable or desirable.
- Mention one or two things that didn't work initially but you were able to make changes and move forward.
- Briefly talk about how your prototype is different from the final product would be and include the materials you think will be used on the design that would fly to space.
- Answer questions quickly and concisely but completely so you can answer more questions and receive more comments. If you don't know something, say that you will have to check on it and plan to get back with them with an answer by email.
- Relax. These people are interested in what you have to say and know what its like to be on the spot.

Specific to Supply Pod Mover

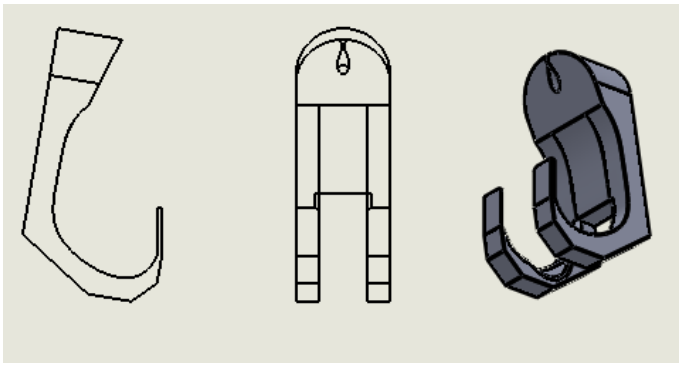
- Show how simple and robust your hardware is and how easy it can be implemented with the SEV.
- Compare your hardware to existing equipment that inspired your idea and point out the differences.
- You will be giving your talk with the other Finalists on **April 30—2:30 to 4:00 CT**
  I will be sending out invites for a Microsoft Teams meeting in the next couple of days to the teams.

Problem Statement:

On the moon, NASA will be supplying the astronauts with supplies through the use of supply pods. These pods create the need for a device capable of attaching to the rover, in order to pick up and transport said supply pods from their location of impact back to the lunar base.

Future plans

- ❏ Fully automate the hook and scoop system to function without the need for astronauts.
- ❏ Test with heavier weights and the use of a stronger motor.
- ❏ Develop a plan for collapsibility.
- ❏ Continue efforts to improve the pod scoop method of lifting (shown below).



Summary of Results:

- ❏ Capable of lifting a weight of 70lbs
- ❏ Holds pod steady, preventing swinging
- ❏ Requires minimal astronaut effort to attach to pod

L.O.M.P.
The Lunar Operational Mover of Pods

Created by: Desmond Decker, Max Howerter, and Tommy Donovan

Sponsored by Chatfield Senior High School HUNCH program

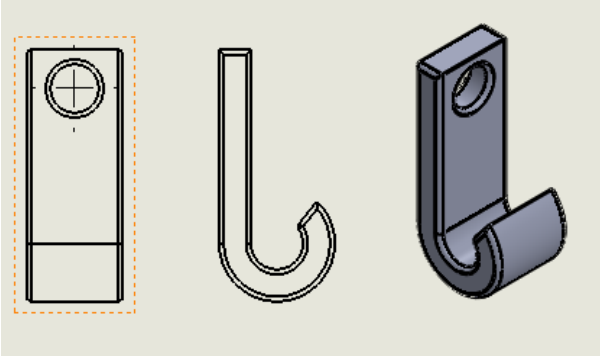
Team Members

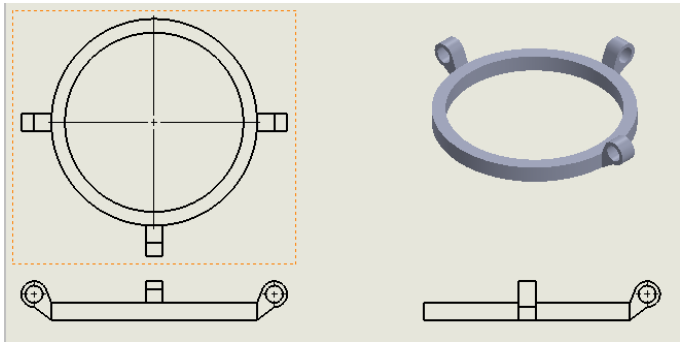
Tommy Donovan

Max Howerter

Desmond Decker

Contact: Joel Bertelsen
Email: jbertels@jeffco.k12.co.us





Interface Hook

- Made to be attached to pod by astronauts
- Hooked to cable that can be lowered by a motor to the level of the pod
- Aligns with attachment points that are built into the supply pod
- Is currently a flat, curved piece in order to prevent sway while lifting

Automated Tensioning Ring

- Allows for any size pod to be held stable while in transition
- Prevents swaying of the pod
- Rings around the upper half of the pod and is attached to cables tied into the frame of the device.
- Hook pulls pod up through the center of the ring which holds it in place
- Can function with both a sphere or cylinder design of pod

Pod Lifting Support Body

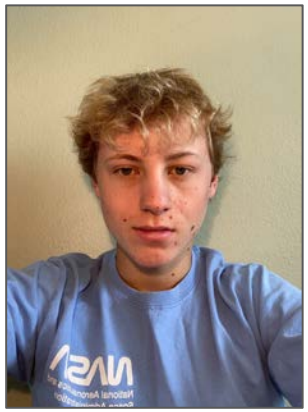
- Triangular pyramid in shape
- Distributes weight evenly to wheels and attachment point
- Support struts on the side add more structural integrity
- Positioning of the frame ensures that the pod is centered in the design.
- Is capable of supporting a 70 lbs dumbbell (¼ Scale)

Meet the Team

Kennedy Solheim

Bryce Romero

Jack Snodgrass



Kyle Roszell

Chatfield Senior High School HUNCH Program
County: Jefferson County Public Schools
Address: 7227 S. Simms St. Littleton, CO, 80127
Phone: 303-982-3670

Contact Information (Instructor):
Mr. Bertelsen
Email: jbertels@jeffcoschools.us
Phone: 303-982-3537

Additional Information QR Codes

3D Printed SUPOR Video Test

Mock Robot Design SUPOR Video Test

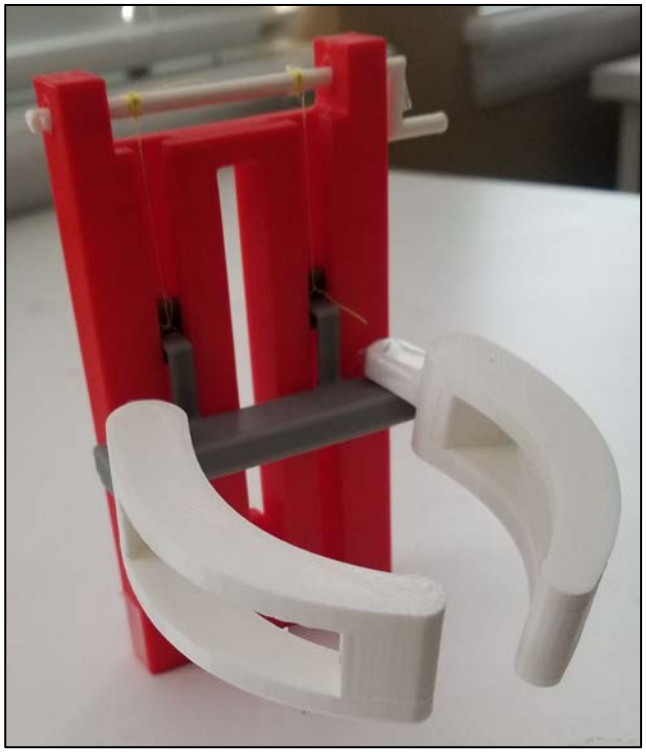
SUPOR Engineering HUNCH Portfolio

CAD Drawings

SUPOR – SUpply POd Retriever

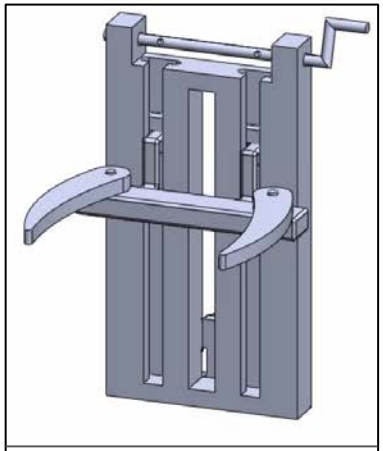
Lunar Supply Pod Mover Project

By: Kennedy Solheim, Jack Snodgrass, Bryce Romero, Kyle Roszell

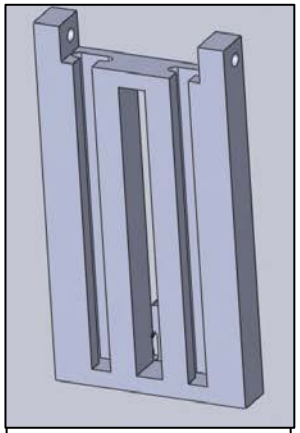


SUPOR is a supply pod mover that will efficiently, effectively, and safely retrieve a supply pod when it lands far away from the lunar base or weighs too much to transport by hand.

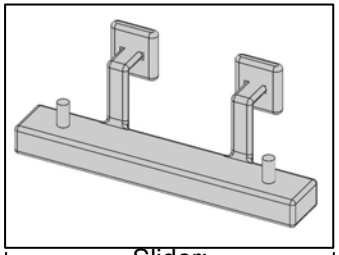
CAD Structures



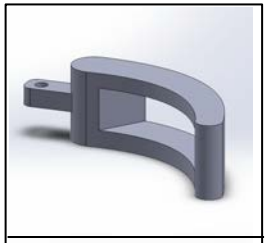
CAD Assembly



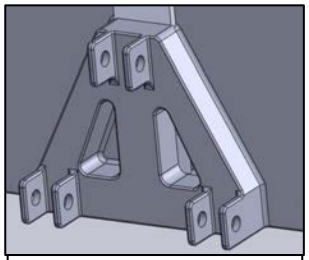
Main Support:
The main support has:
- a track system for moving the supply pod up/down
- holes at the top where the Winch Rod inserts



Slider:
- inserts into track system
- supports claws
- allows movement of supply pod up/down
- ensures disassembly



Claws:
- claws are angled slightly upwards to support the pod from the bottom and sides.
- Servos control the claws



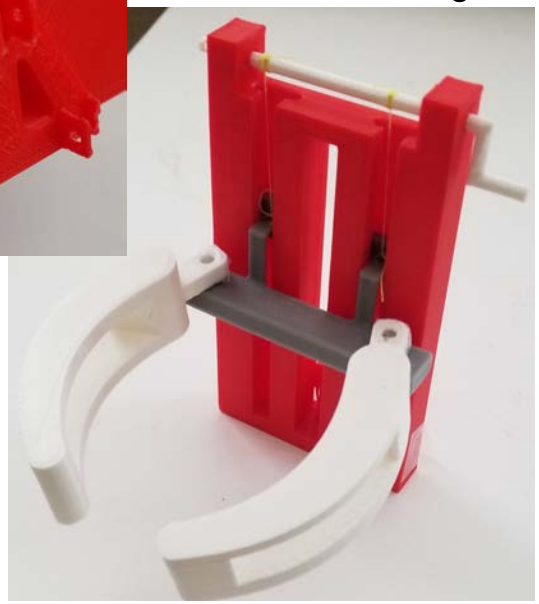
3 Point Hitch:
- triangular structure optimizes strength
- located on the back of the main support structure.

Winch Rod:
The winch Rod:
- acts as electric winch
- has holes for threading with string to represent the winch abilities

Testing and Mock Designs

3 Point Hitch on the back of the 3D printed Main Support

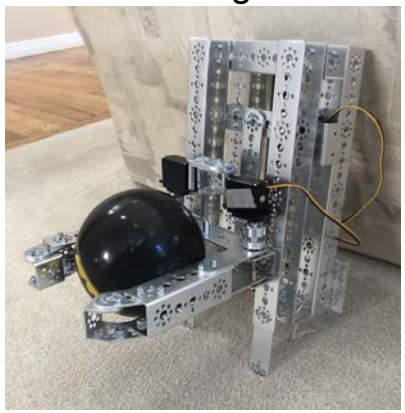
3D Printed Design



Within our 3D printed design, the grey slider piece presents a smooth transition up and down with relation to the cranking winch rod. The white claws would need to be scaled down a little bit to reduce the weight in the front of the design and accommodate for a wider grasping hold. The slider arms having height to them allowed for SUPOR to accommodate for the distance that would be between the ground and the SEV.

Robotic/Mechanical Design

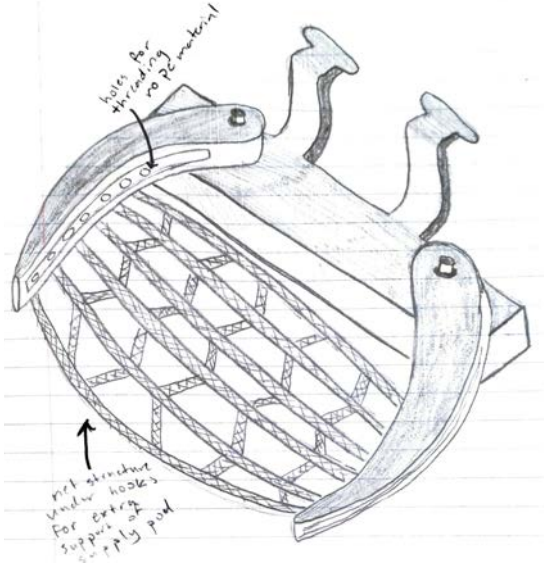
The mechanical mock design of SUPOR presents the servos' abilities to control the grasping mechanism of the claws while a track system and gear controls the up and down movement of the claws carrying the supply pod.



Videos of the working designs can be accessed in the "Additional Information QR Codes" section.

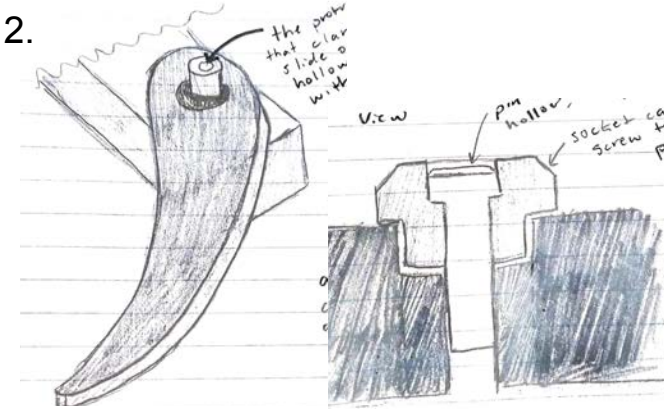
Next Steps

1.



We plan to implement a flexible yet sturdy netting structure that threads into the bottom of the claws to allow for additional support beneath the pod during transportation. They retract like curtains to move under the pod before grabbing it.

2.

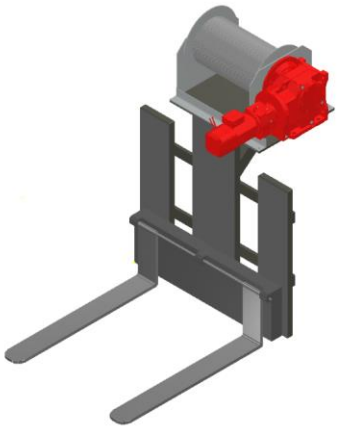


In order to secure the claws onto the slider and keep the claws from sliding off the cylindrical protrusions of the slider, we will create a pin structure in the cylindrical protrusions that hold the claws, meaning we would hollow the protrusions, line the inside with a helicoil structure to then thread a pin inside and place a cap on top in order to secure the claws in place.

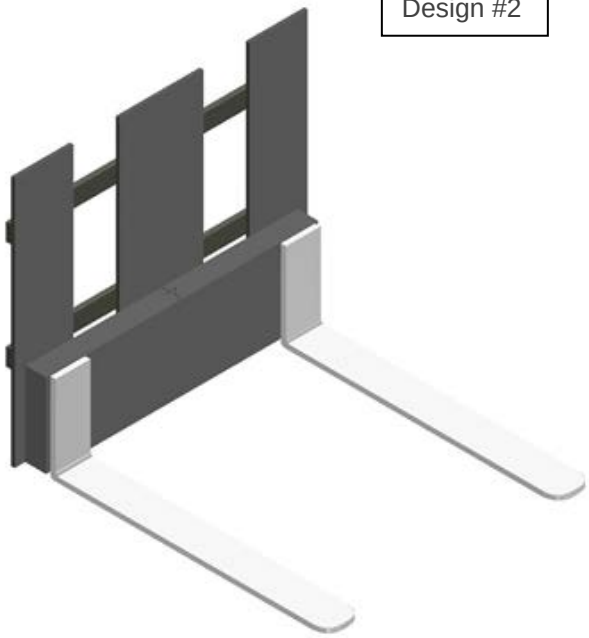
A Versatile Design: Optional Overlapping Methods of Transportation and Support

The versatility of the design is necessary for ease of use and accessibility into compromised positions of Supply Pods.

This design, with its multiple components, allows astronauts several means of use in order to retrieve the supply pod itself, making mission ease and success much more of a possibility.



Design #2



NASA HUNCH

NASA Supply Pod Transport

Team: Farrah Westfall, Ethan Heffernan, Chaz Cheramie, Connor Clark

Instructor: Mr. Merritt

Clear Creek High School
Clear Creek ISD
2305 E. Main St.
League City, TX, 77573

How these parts are supposed to look.

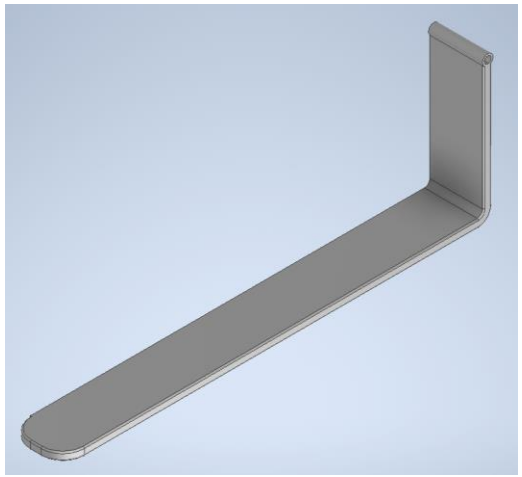


Figure 1: The forks are the main mode of transportation and support, allows a stable surface for a supply pod to be transported to the base.

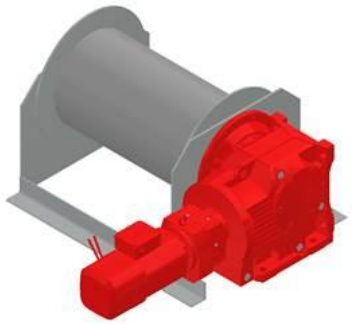
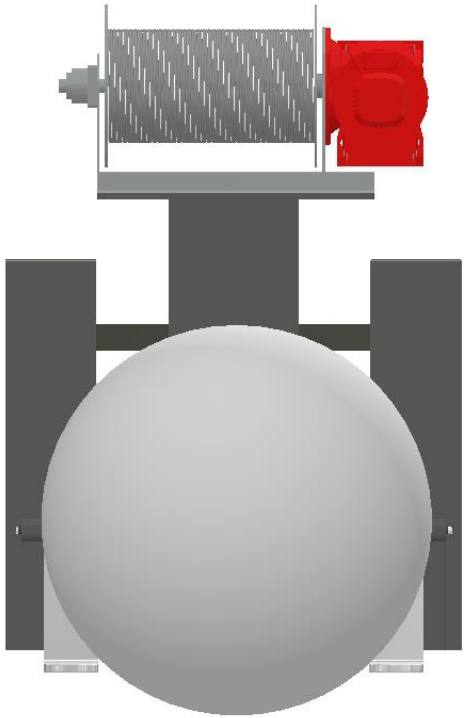


Figure 2: The Winch allows transportation of the supply pod from compromised positions, such as craters or ravines.

What is the purpose of this design?

The purpose of this design is to allow astronauts on lunar missions to easily retrieve the supply pods using a variety of methods for transportation.

Combining forklift components for the lifting and transportation with the use of an electric winch to retrieve and stabilize compromised supply pods.



Extra Important Information for the Design.

The design will be connected directly to the SEV via a winch. Electric components such as the winch will draw on the power supply of the SEV, making the need for separate supply sources unnecessary.

The forks are supposed to be connected to a back plate, which can be lifted or lowered via connected gears just enough to keep ground clearance on the surface.

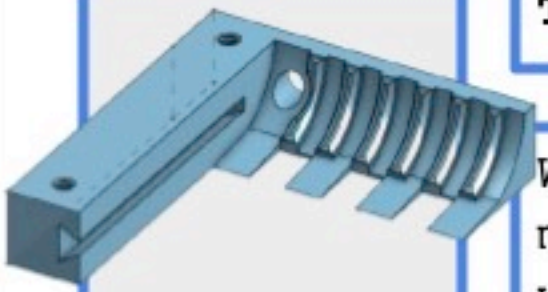
Advantages:

- Versatility
- Ease of use
- Low maintenance
- Optional use of components

Supply Pod mover

School: Council Rock South

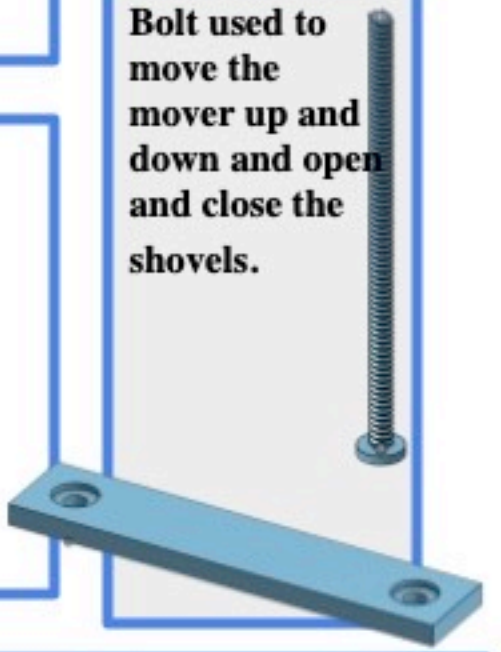
Teacher: Mr. Bauer

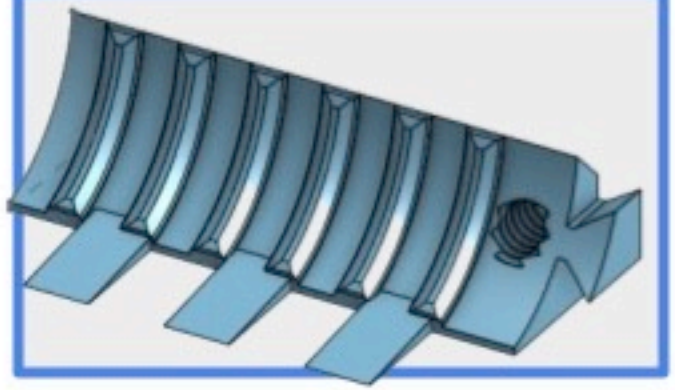


Bumps and the inclined base piece allows for lunar regulate to escape.

We have motorized movement on the supply pod mover which utilizes an arduino kit and student written code. We have a 3D printed model of the SEV, as well as the supply pod mover, and a great way of holding the supply pod in place and sifting out unwanted debris.

Bolt used to move the mover up and down and open and close the shovels.





Module wheels to attach to Supply Pod Mover.

Slingshot pouch that inspired the idea.

Cypress Springs High School

Industrial Technology

Engineering and Design II

Cypress Fairbanks ISD

Cypress, Texas

NASA HUNCH Program

Team Name:

Solo Moon Mover

Team Members:

1. Abel Rodriguez

Student Email:

Abel.a.rodriguez2003@gmail.com

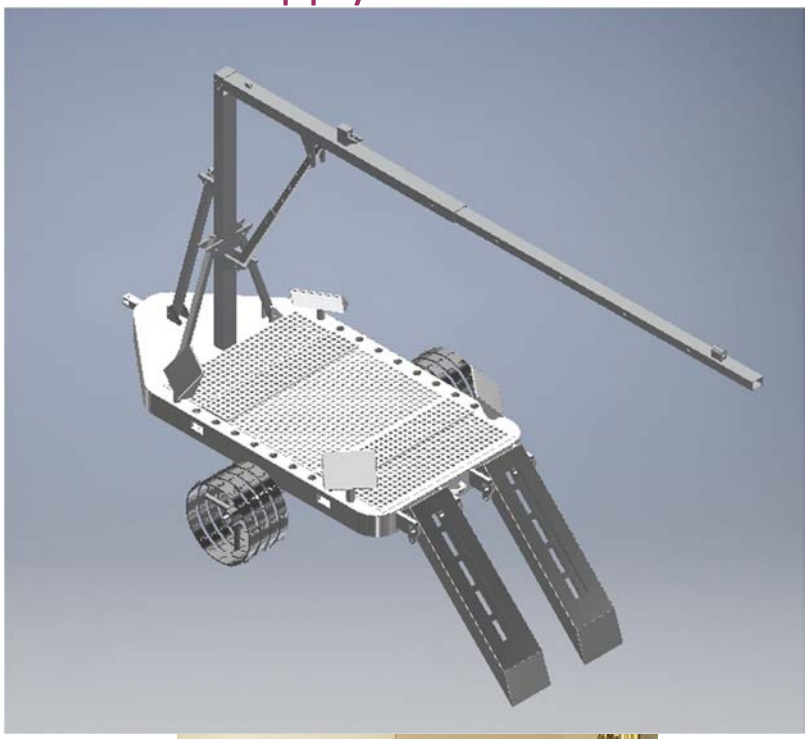
Instructor:

Steven Marcus

HUNCH Advisor/Mentor:

Glen Johnson

Supply Pod Mover



General Information: The moon has 1/6th of the gravity of earth. Additionally, the method to lift and carry the pod must be lightweight to cost NASA less money to send it. On top of that, the design must use a heat-resistant material to survive the condition the moon brings.

Objectives: The objective is to develop a supply pod mover for the moon to lift and carry a pod with a 3 tons mass on the earth. Also, the mover must be lightweight and be very simple to use

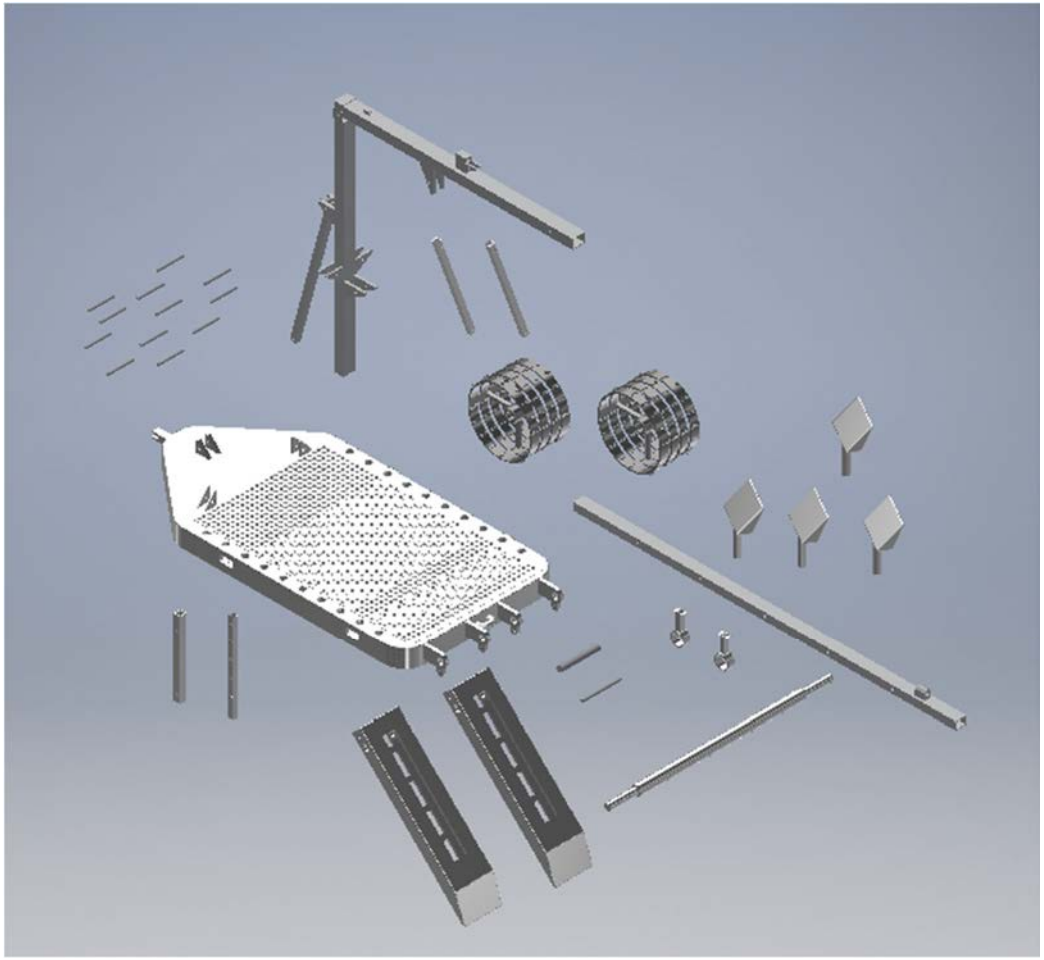
.

Material: Steel and Aluminum.

Issues: During this project, I had issues determining the right proportions for the design. Along with making the crane a simple design that astronauts could easily. Another issue I came across was making it lightweight as possible without damaging the structure of the trailer.

Problem: The problem to solve was to lift a 1000 pound pod on the moon, and keep the pod from swinging back and forth along with transporting it back to the lunar base.

BLOW UP VIEW:



Solutions: One resolution was to create pegs that the pod would sit on to act as a ball holder for sports balls. Also, to prevent bending of metal, I put in support beams since my instructor gave me that idea. Moreover, I put in two ramps to allow the pod to get loaded into the trailer. Furthermore, to prevent any movement, I chose to have an area where straps would be present to secure the pod down. Finally, the crane can move up and down to allow astronauts to lower the winch down attached to the end of the crane.

Challenges: One challenge I stumped upon was to develop a trailer and crane system that an average astronaut could use without using a ladder or other exterior object to use it. Furthermore, I need to make sure that the crane was stable and wouldn't bend under pressure. Finally, I needed to figure how I would accommodate cargo and how the pod would get loaded onto the trailer.

Techniques: I used a pencil and paper to stretch out multiple designs until I stretched out a practical and simple design. In addition to this, I used computer modeling (inventor) to design my project in a real-life shape, so I can see how my design works with the different parts attracted to it.