Lunar Supply Pod
Semi-Finalist List
for
NASA HUNCH
Design and Prototyping 2021

Congratulations for being chosen as a Semi-Finalist for NASA HUNCH Design and Prototype 2021. Your design was chosen as a semi-finalist because you have a prototype that shows some or all of your idea, interesting/original ideas in your design, you did some valuable testing, and/or had some CAD designs that conveyed significant contributions. Despite the difficulties and not as many schools participating this year, I believe that HUNCH has received as good of quality of projects as ever. You should be very proud of your prototypes and ideas especially because of the difficulties surrounding this school year. Some schools have been out of class all year and others have been in class all year but students were being pulled out of class for weeks at a time. Some students were only able to work and build from home. One school was only able to work together on their project for 3 weeks before their CDR. Everyone should be commended on your resilience to finish your project and the great ideas and work you have put together in front of your own eyes. Prototyping and testing are the first steps in any engineering project and all of you have learned the value of it.

It is from the Semi-Finalist list that we will narrow down our choice for Finalists. We at HUNCH are very proud of how difficult you as students and teams have made it to choose which designs should go forward. **Congratulations!!!**

This list may be updated in the next day or two if we find we are missing a few team's brochures.

We expect to have the list for the Final Design Review in the next day or so as well.

Lunar Supply Pods

Spherical Supply Pod with Struts

School: Bridgeland Highschool
Teacher: Mr. Laughlin

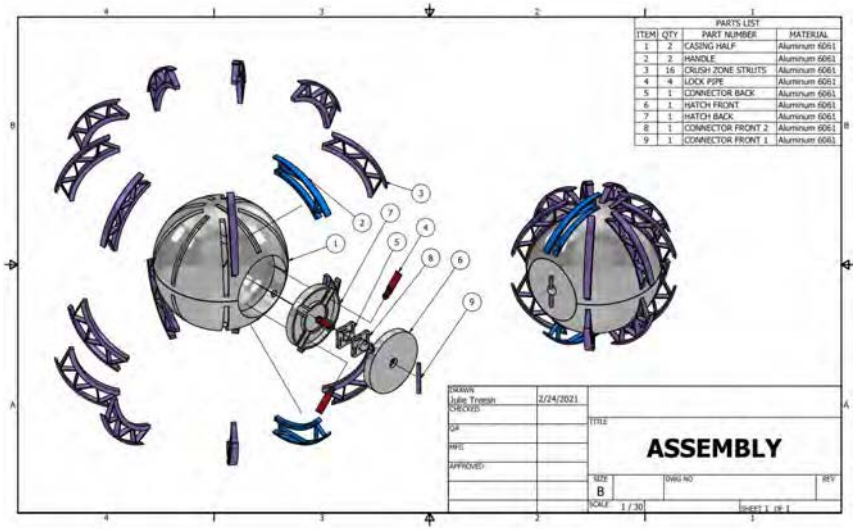
Creators:

Isaak Gonzales

An 11th grader in Mr. Laughlin's Engineering Design and Presentation class. For this project. He mostly worked on creating the original sketch, beginning parts, and trifold.

Julie Treesh

An 11th grader in Mr. Laughlin's Engineering Design and Presentation class. She worked mostly on the drawing files, fixing/changing the design, and setting up the prototype.



This Pod is used to supply water, food, and other day to day items needed while on the moon. The pods had to be inexpensive and durable so the materials they are transporting do not get damaged.

Our design includes crush zone struts to help keep the supplies intact, a hatch to keep items secure, and it is shaped so that it can roll to a stop instead of hitting the ground and stopping immediately.

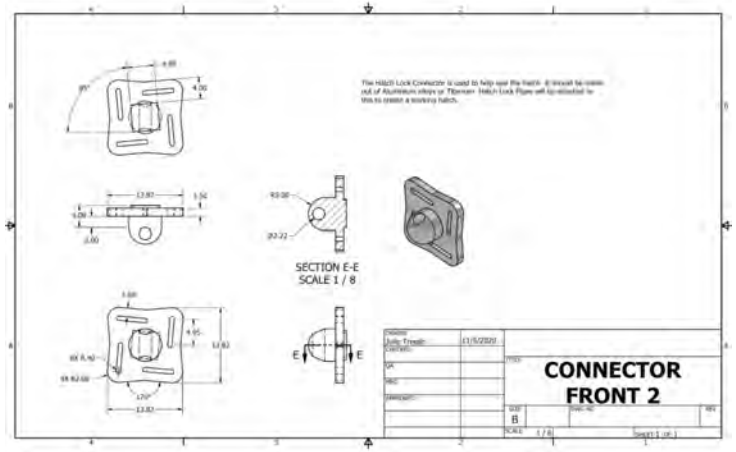
Prototype

Fully Assembled:

Connector Front 1 can be turned in order to make the Lock Pipes move.

Different Parts of the Design:

PARTS LIST			
ITEM	QTY	PART NUMBER	MATERIAL
1	2	CASING HALF	Aluminum 6061
2	2	HANDLE	Aluminum 6061
3	16	CRUSH ZONE STRUTS	Aluminum 6061
4	4	LOCK PIPE	Aluminum 6061
5	1	CONNECTOR BACK	Aluminum 6061
6	1	HATCH FRONT	Aluminum 6061
7	1	HATCH BACK	Aluminum 6061
8	1	CONNECTOR FRONT 2	Aluminum 6061
9	1	CONNECTOR FRONT 1	Aluminum 6061



Critical Design Review

Project: **Lunar Supply Pods**

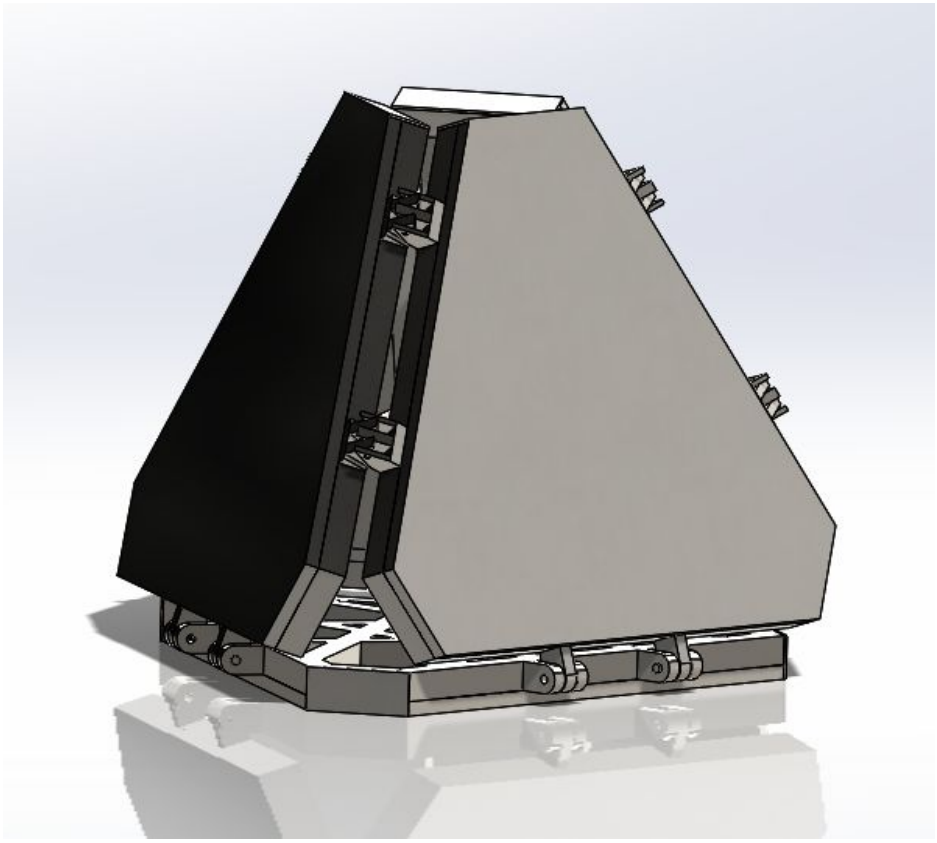
School name: **Space Coast Jr/Sr High School**

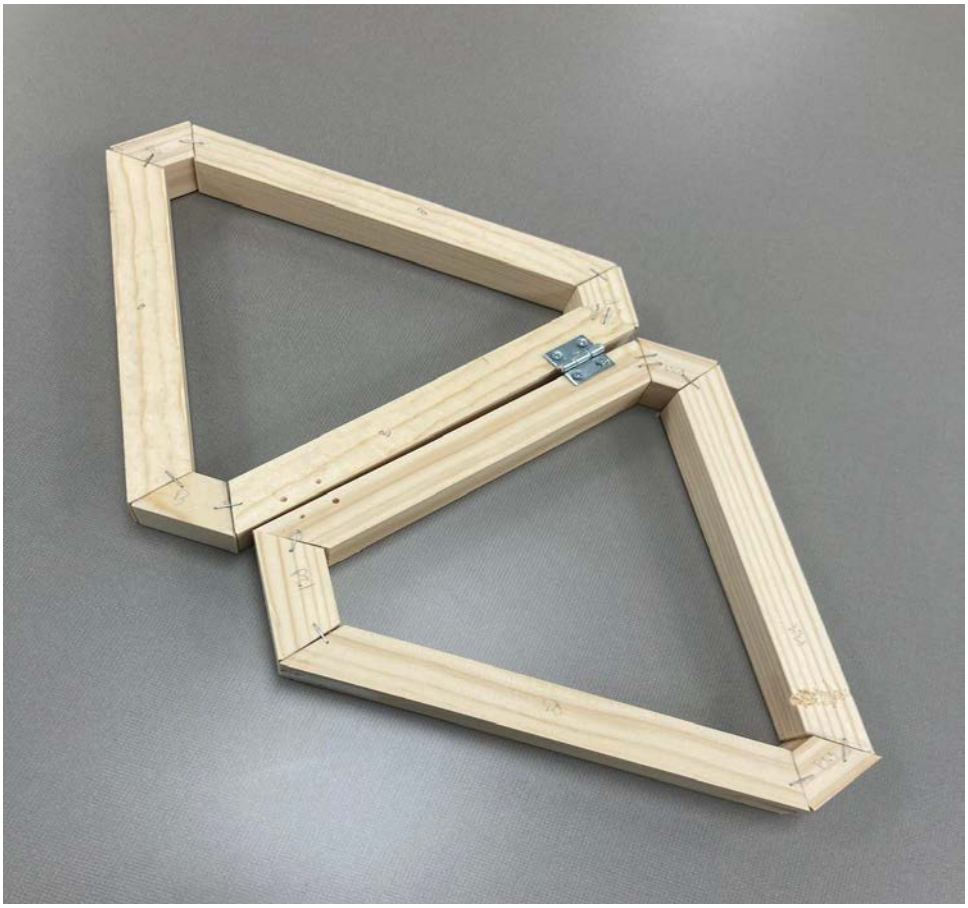
Teacher: **Mr. Luis Reyes**

Team Members: **Sean Tomlinson Zachary Bramelett**

Description:

Our prototype shows the basic functionality of our design of the lunar supply pod. It demonstrates how it opens and we will explain how it will lock. Our prototype does satisfy the constraints, it shows how the basic parts will work and we can explain how the lunar supply pod can land on the surface of the moon. We understand the microgravity on the moon and how our design could fail depending on the circumstances. The gravity on the moon is about 1/6th of the gravity on earth so us using that we considered different scenarios on how the lunar supply pod would be launched off a vehicle. We have the solidworks file showing the design that can be replicated including what material we chose which was stainless steel. Since we do not have a software that can prove that our design works we have to explain more clearly on how the functionality of the design is gonna work. Since our design is a reversed engineered design of the opportunity lander that delivered the rover to mars, it was already done and proven it works so it is easier to produce.





With permanent human presence, development, and colonization on the moon rapidly approaching, we need to solve key issues regarding resource deliveries. We've developed the Interactive Resource Impact Simulation, a computer model and tool able to simulate a practical method of delivering supplies to such inhabitants. It is the most comprehensive and accurate simulation available that can investigate the possibility of lunar supply pod deliveries to the moon (or other celestial bodies), saving time and money by accurately displaying the exact way the pod would land, the amount of damage entailed, and a quantified likelihood of survivability of the pod and its contents, possibly revolutionizing how we transport goods throughout the solar system. Our product provides a key platform for furthering the research and development possible on the moon in a practical and inexpensive manner for years to come.

IRIS

INTERACTIVE RESOURCE IMPACT SIMULATION

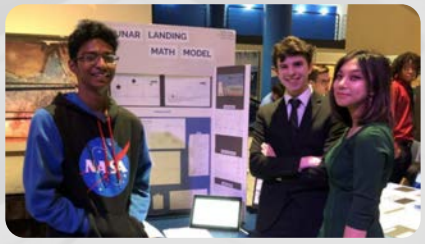
NASA HUNCH

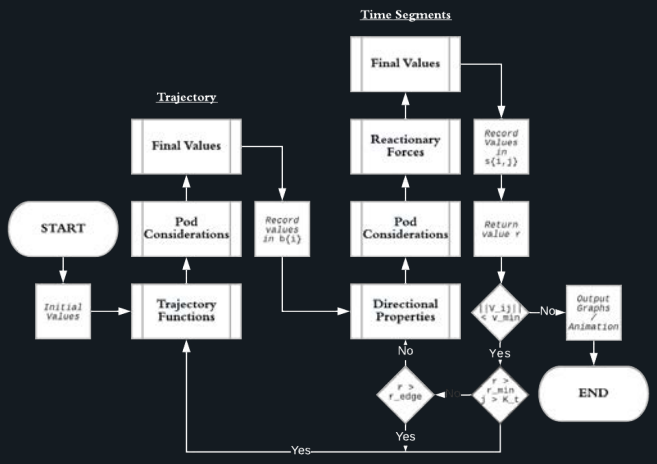
CONTACT US

Joshua Ange, *Project Manager*

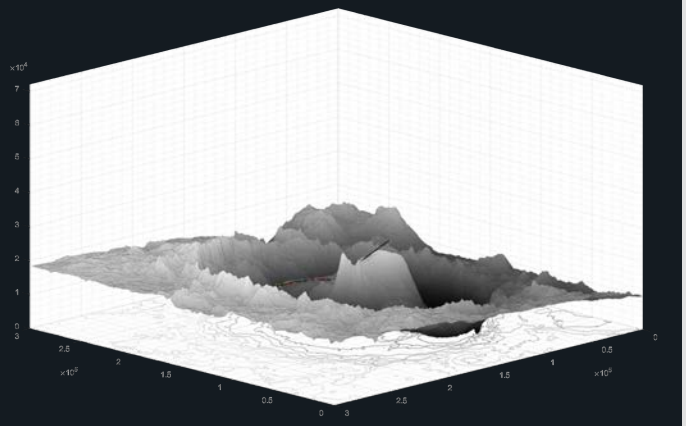
Amber Glory

Jonathan Andrews



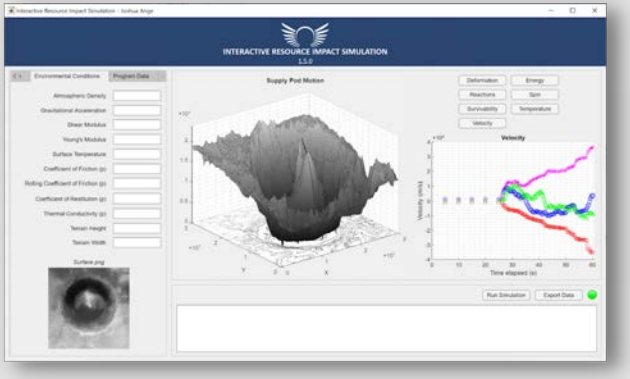


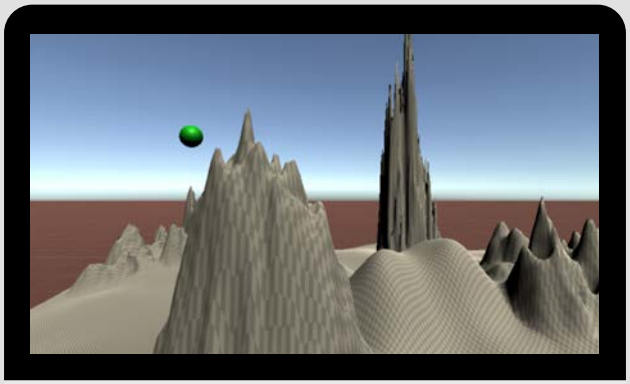
By utilizing nested iterative calculations, the Interactive Resource Impact Simulation is able to successfully predict the trajectory of launched supply pods above and across the surface as well as their spin, temperature, deformation, kinetic energy, and other physical reactions.



SIMULATION

GRAPHIC USER INTERFACE





In employing a layered approach with a strategic internal organization system to allow for maximum control, the suggested pod design efficiently highlights the individual strengths of materials such as Grade 5 titanium, ceramic matrices, and carbon fiber.

POD DESIGN

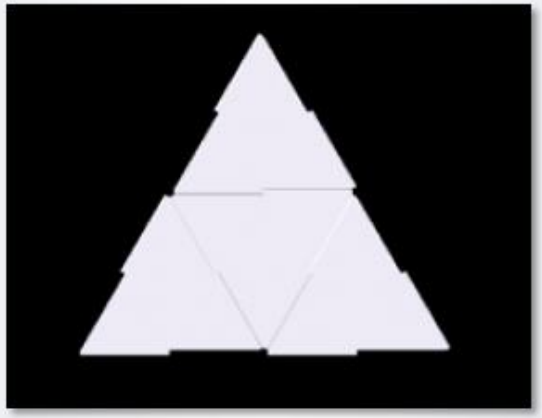
The Premise:

A contained Breakup of mechanically attached pods on impact, In order to disperse force evenly, is the central idea behind Our design.

Currently we plan on using 20 individual pods, attached using a type of Velcro, in the shape of a Geodesic Spere (approximation of a sphere using equilateral triangles) and contained within a Kevlar based wrap to safely land supplies on the lunar surface.

The wrapped set of pods will impact the lunar surface at a low angle and with a positive spin in order to reduce the force of initial impact as much as possible.

The non-ridged design will also discourage the supply drop from rolling too far along the lunar surface, further containing the landing.



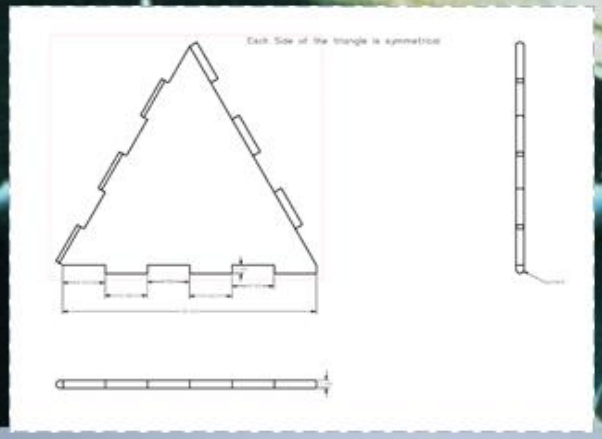
Lunar Supply Pod

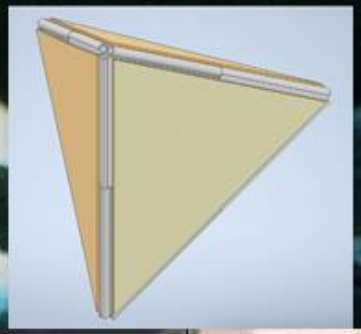
By
Grant Griffin, Dylan McGuire, and Wilber Garcia
For
Mr. Merritt's
Arch and Civil Engineering

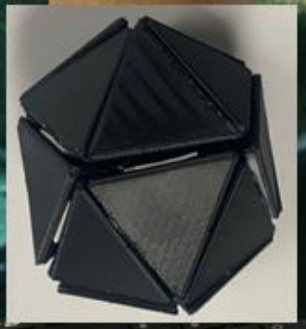
The Starting point for the supply pod assembly is the single aluminum panel, 4 of these will attach together using metal rods through the hinges attach the edge of each panel. They fold in to a triangular pyramid and are locked into place with a wire lock to each corner to form the individual pods that will be directly containing the supply drops.

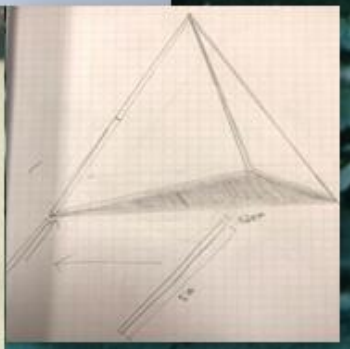
After the panels are assembled into the pods, the adhesive/Velcro padding on each face (save for the outside face) will be assembled into a single 20-pod large ball. This shape is called a Geodesic Spere, or icosahedron in this case. Which will act as the assembly during transportation and landing (crashing) process

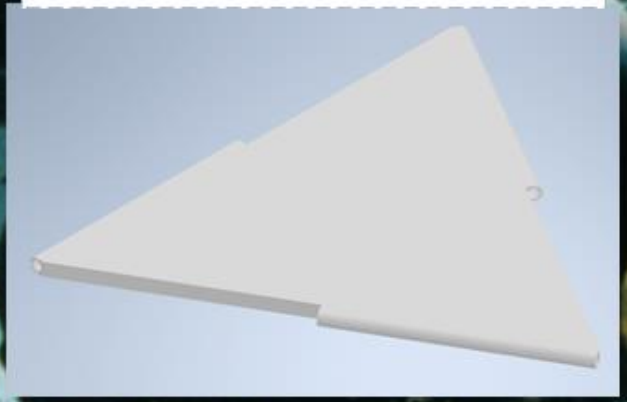
As the pods are fully assembled, the assembly will be placed inside a loosely fitting Kevlar net. The net fits with a few feet of difference between their diameters so that the pods will have enough room to properly disperse upon impact with the lunar surface.











Stages of Assembly


HURLEY
1-A

NASA HUNCH

Critical Design Review

Project name: **Lunar Supply Pod**

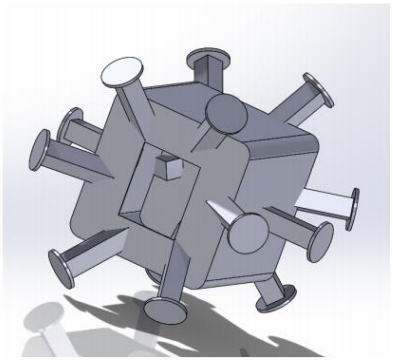
School name: **Space Coast Jr/Sr High School**

Teacher: **Mr. Luis Reyes**

Students: **Nicholas Scuderi, Kevin Taylor**

Description:

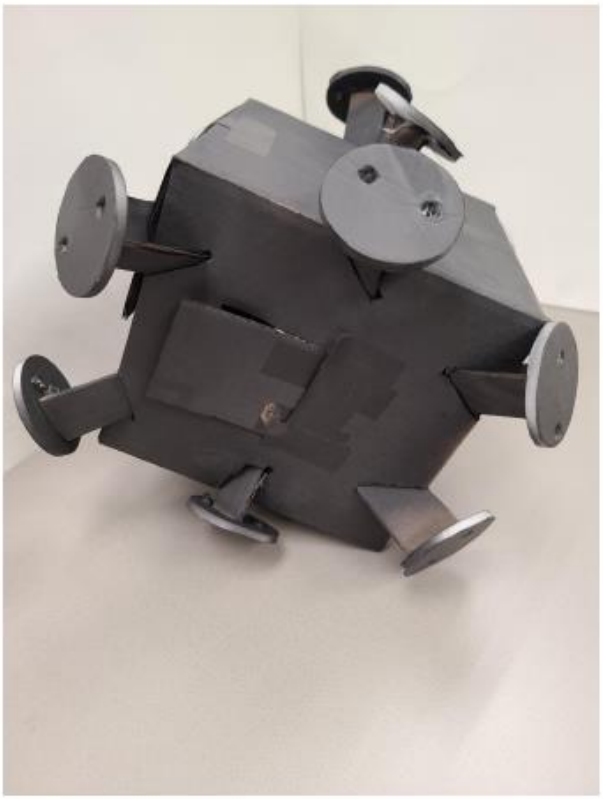
Our project satisfies the requirements and the constraints. We made the pod to have a design to be able to crash land on the moon. Our prototype has a small 3D model that demonstrates how it will be used. The legs will work as a cushion to absorb the impact of the crash. The tests showed that our design works and can be a good way to deliver supplies on the moon. The lags can be reused because once they break or bend, they can be taken off to then reuse on a different pod. With there being no gravity, we designed the pod with legs all around it knowing that it would be crash landing on the moon. Since we don't know what face, it is going to hit first the legs are meant to help with that. While our design doesn't look like something like anything you can get it is a very simple design.



This is the solid works drawing and this shows on how it is a little bit different from the CDR prototype and shows how the legs were put in and how the door was changed.

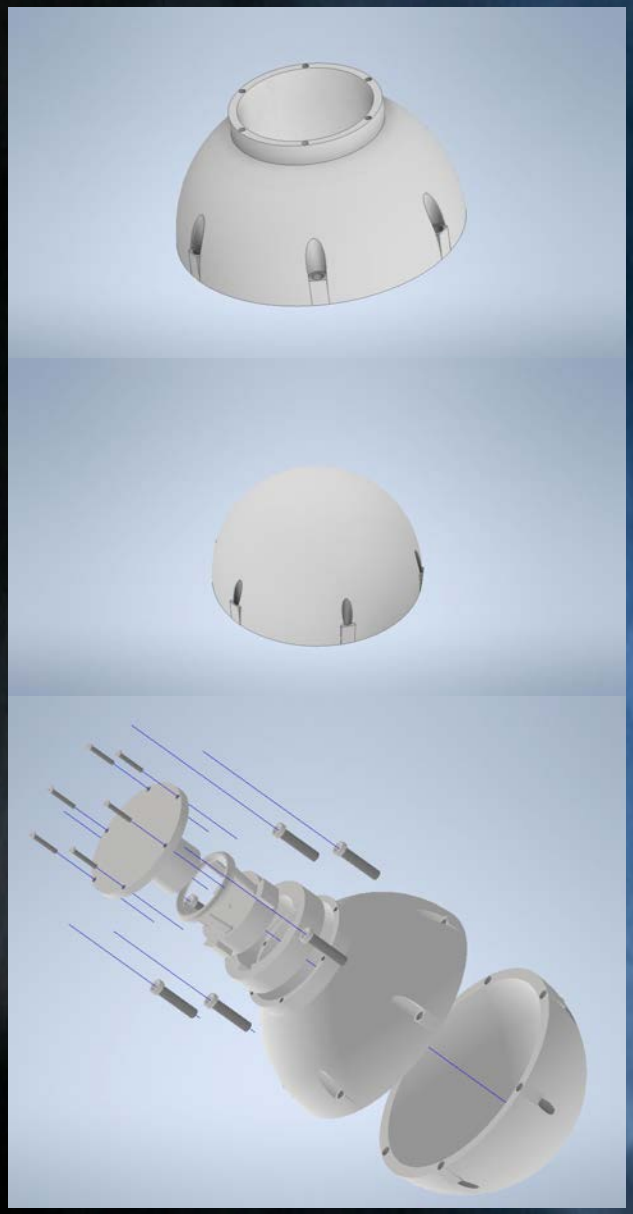
This is the end of the leg which shows that it has holes for the mover.

This is a look at the legs can work by crashing on the moon.



This is a look at the door and where people will be go in and out.

Supply Pod–Halves/IPN



Limitations

1. Weight of supply pod
2. Size of supply pod
3. Velocity at touchdown
4. Strength of supply pod
5. Spinning of pod In air and on the impact of the ground
6. Angle of contact with surface
7. The amount of fuel to slow down the pod
8. Undulating of the moon's surface
9. Surface particle sizes
10. Internal and external dampening of container's effects on the pod

Nasa Hunch Project

Supply Pod

By

Thomas Creedon, Ethan Bauer, Mateo Tovar, and Miguel Munoz

For

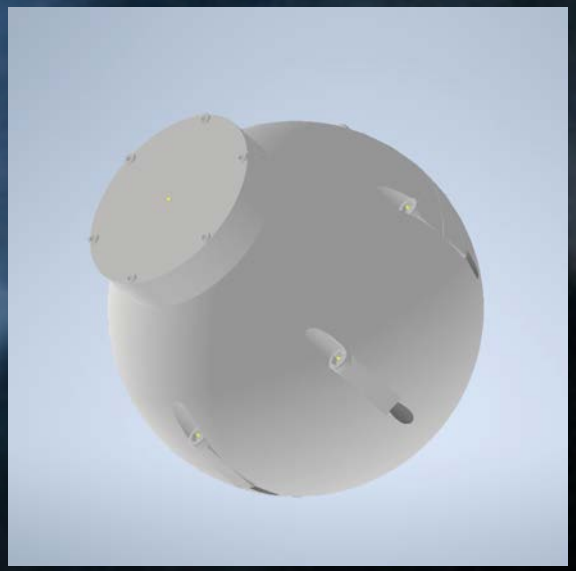
Instructor Mr. Merritt

Architectural/ Civil Engineering

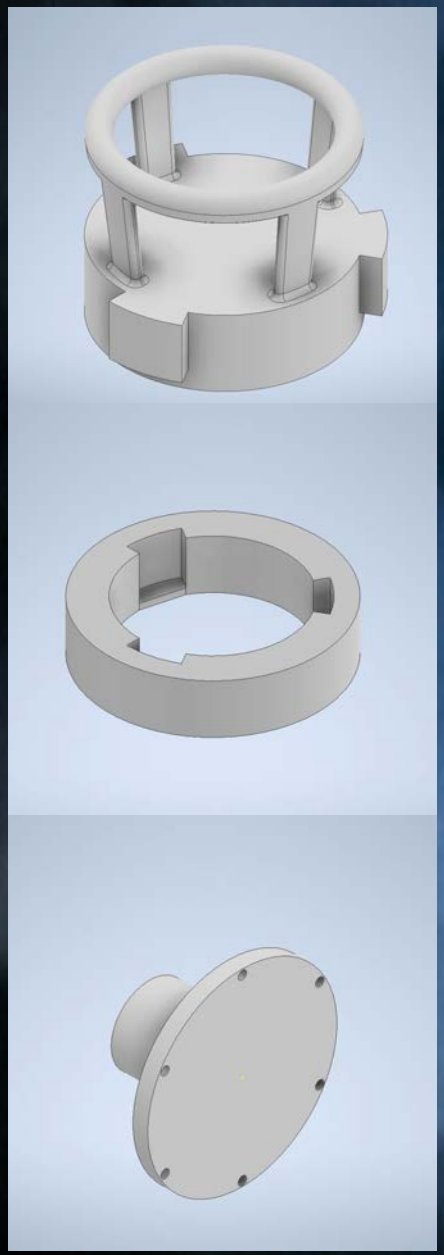
Clear Creek High School

Clear Creek ISD

League City, TX



Inner Parts



Problem Statement

Design and create a Supply Pod that can hold supplies that can with stand a high velocity impact. The Pod must also be able to make putting supplies on the moon at a cost-efficient rate.

3D Printed Parts


CLEAR CREEK
WILDCATS
2020
March 18, 1937
Budded on Earth
to bloom in Heaven

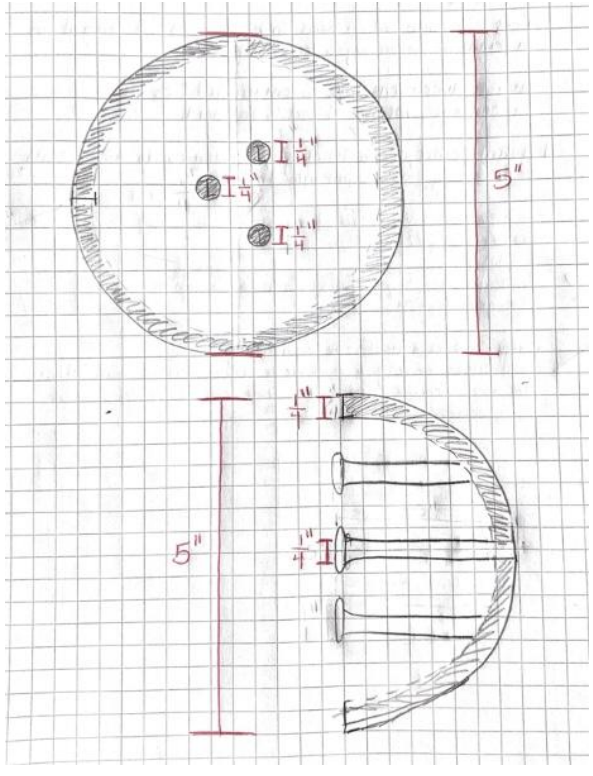
-Our 3D printed prototype-

Note: the supports in the structure were for printing purposes only

With the spherical design there are no weak points that are at the threat of cracking upon impact.

The sphere also provides a larger surface area which leads to an increase of friction with the surface (leading to a faster stopping time)

NASA HUNCH- Fairport High School, Fairport, NY.
Vincenzo Stornello, Donna Himmelberg
Lunar Supply Pod
Kayla Maxwell and John DeWaters



Print is 5” in diameter, outer shell is ¼” thick. Outer texturing would lay over top of this shell.

Things you asked us to model

- Mass of the container: 5,000kg
- Mass of contents: Currently unknown
- Velocity at touchdown: 447 m/s
- Angle of contact with the surface: 24.3 degrees
- Surface particle size: N/A KSP doesn't model the physical sand on the moon
- Undulation of the surface: Lots of highlands along with some valleys
- Coefficient of restitution: 0.84
- Spin of the pod: Steady to fast forward spin
- Internal or external dampening of the pod: Custom textured surface outside of the pod
- Advantage to pod being smaller: None, a smaller pod caused more airtime and longer distances traveled by the pod

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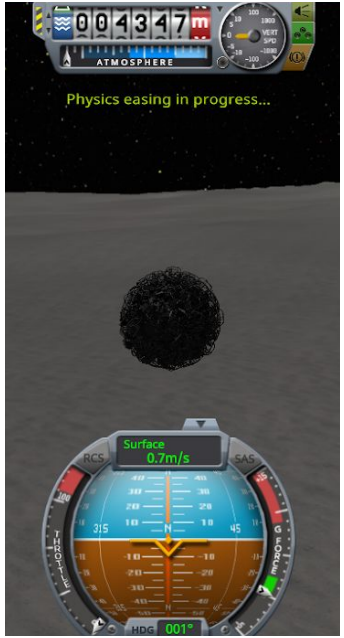


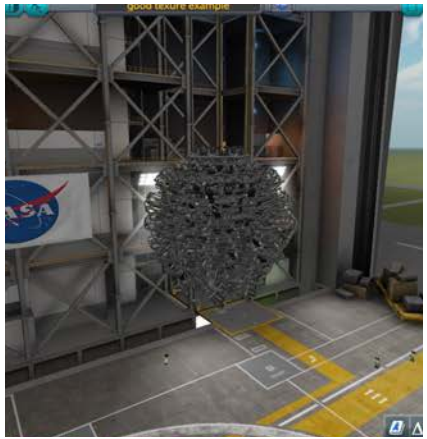
-Sizing/texture-

- woven wicker basket design (wicker basket weave provides stability in the give of the metal)

(The twisted texture shown below adds to friction as well)

With the texture pictured to the right in conjunction with the large amount of friction on the surface of the moon our calculations lead us to believe that the coefficient of friction is approximately 6.4

We created this texture in the virtual simulation in an attempt to replicate the actual texture we had planned



About The Project

The project is called the Lunar Supply Pod Module, and its purpose is to transfer vital materials to landing crews on the lunar surface.

The pod is designed to be able to carry any non-fragile objects that the astronauts might need. To ensure that they never run dangerously low on supplies, the pod can include

- Clothing
- Water
- Food
- Oxygen Tanks
- Etc.

Team Members

Klayton Caballero

Joe Shephard

Cynthia Juarez

Additional Information

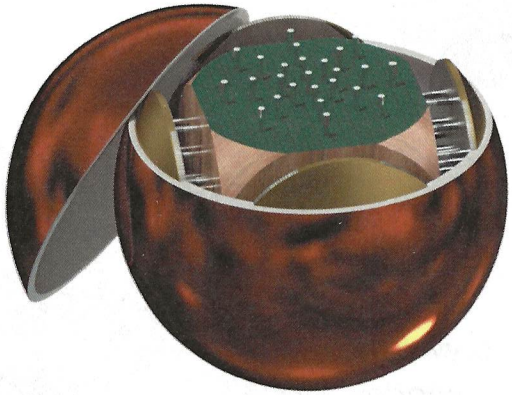
Cypress Woods High School

13550 Woods-Spillane Blvd,
Cypress, TX 77429

NASA HUNCH Program

Lunar Supply Pod

An efficient way to transfer vital materials to the lunar surface

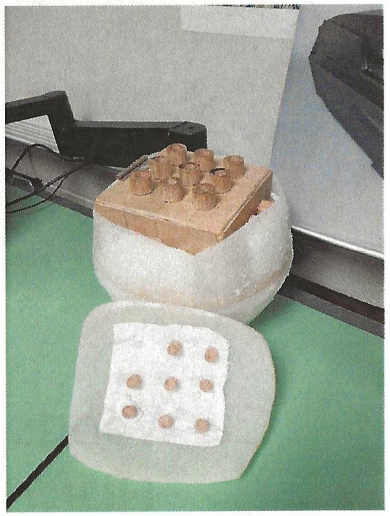


Cy-Woods NASA HUNCH

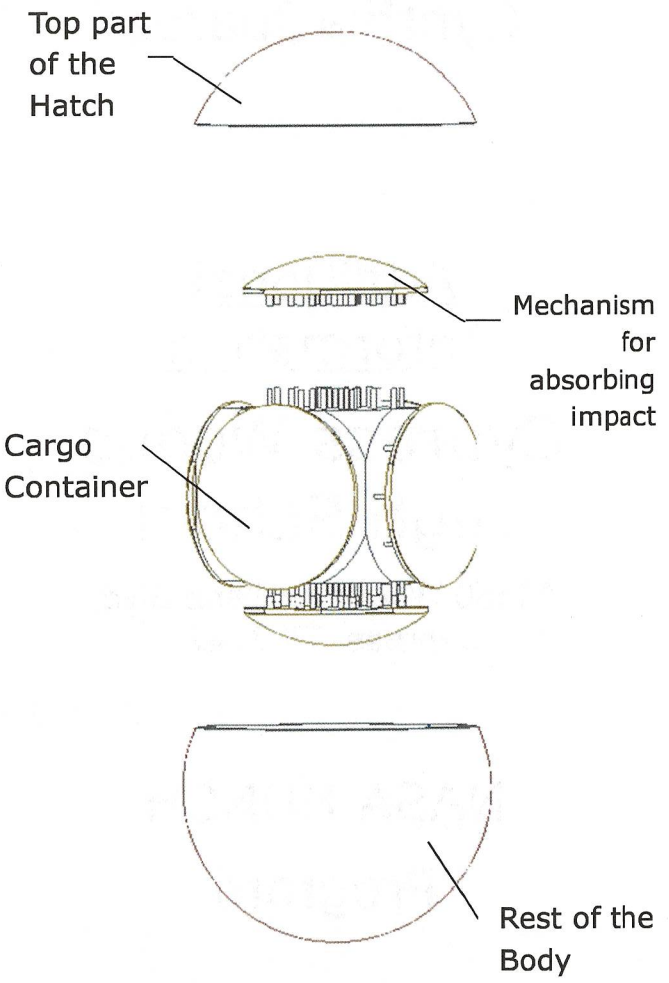
Prototypes

The first prototype constructed from paper and thick poster board

The final prototype created from plywood, wooden dowels, and casted silicone



Project Anatomy



Innovation in the Pod

In the design process of the Supply Pod, we brainstormed many innovative ideas concerning the construction to maximize simplicity.

For the inner cargo container, we have it floating (not explicitly connected to anything) in the middle of the sphere to allow for an easier way of absorbing the impact.

For the hatch system, we offset the opening from the center to maintain structural integrity, and to lock it in place, we made nested metal rods that screw into the outer sphere.