

Note to Semi-Finalists

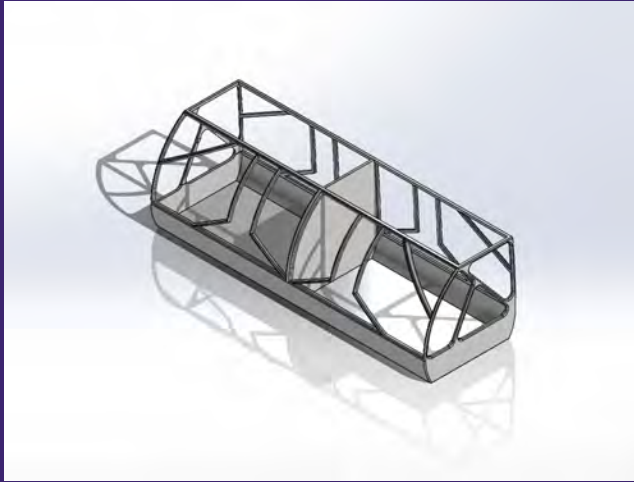
Thank you very much for participating in the HUNCH Design and Prototyping. This was by far the most difficult year for deciding finalists. Part of the difficulty was the number of teams participating but the most important part was the number of high quality of prototypes for each of the 10 projects.

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.

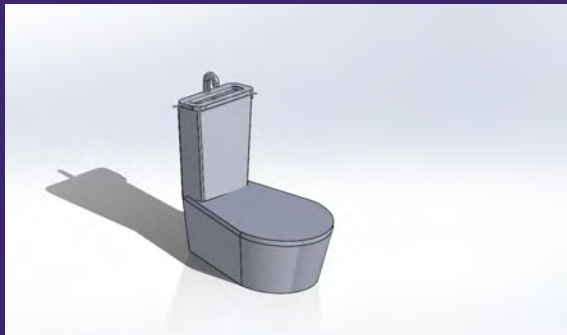
Being a Semi-Finalist is a great honor because each of you put together a project and data that made the teams think, learn and be excited about space. Your great ideas and hard work is what makes NASA HUNCH a challenge and a great experience for engineering. We hope you enjoyed the projects as much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

3D MODELS



•An advanced planter to produce resources akin to oxygen & food in the greenhouse section of the habitat.



•Toilet with sink connected to lid, inspired by Japanese Toilets.

THE FINAL DESIGN

The Habitat is a multi-unit base for astronauts to execute missions and to conduct experiments.

Quarters Module



Main Module



Greenhouse Module



VR *Lunar Habitat*

Space Coast Jr/Sr High

Teacher: Mr. Reyes

Programmer: Joseph Fiorito

Model Designers:

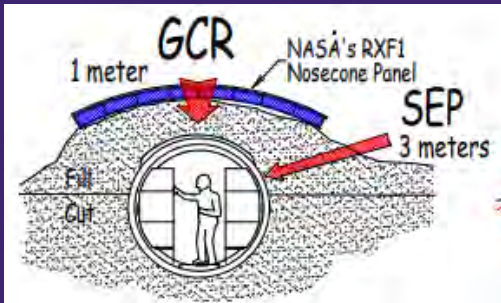
Richard Foster

Micheal Deutsch



BACKGROUND

We designed the habitat to comfortably fit 8 astronauts, allow the astronauts to exercise, conduct experiments, grow enough bamboo in the greenhouse to provide oxygen and food, sleep in privacy, and communicate with Earth. The ventilation system is contained within the elevated floor, and runs between all modules.

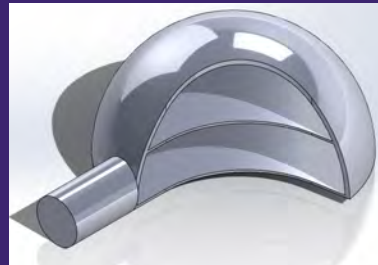


We looked into various sources of information, such as Navy Submarines, the ISS, and research studies on lunar habitats. We also looked into multiple engines to design the habitat in, and chose Roblox Studio due to its easy learning curve and familiarity.

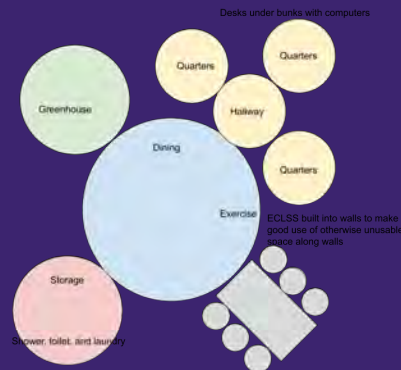
BRAINSTORMED

IDEAS

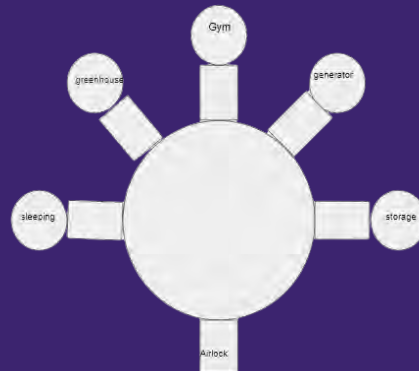
Multi-Floored Single Module



Multi-Module Single Floor



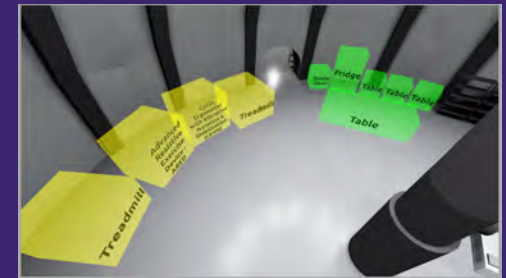
Hub and Spoke Multi-Module



OUR PROTOTYPE

Our initial design was similar to our final prototype. It had placeholders instead of actual furniture and was laid out differently than our prototype.

Initial design of the Main Module

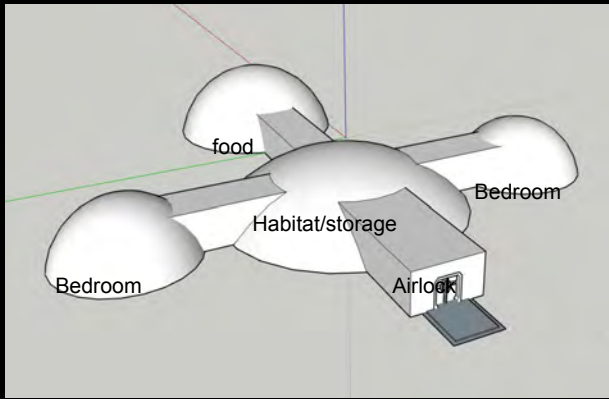


Current design of the Main Module



Video of the Prototype





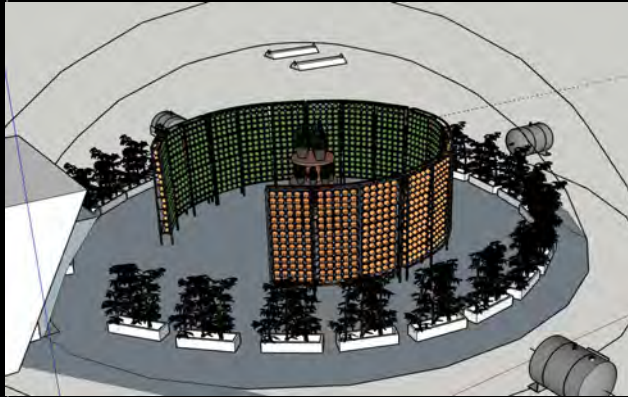
Criteria:

- Airlock
- Habitat
- Storage
- Food & bamboo
- Sleeping quarters

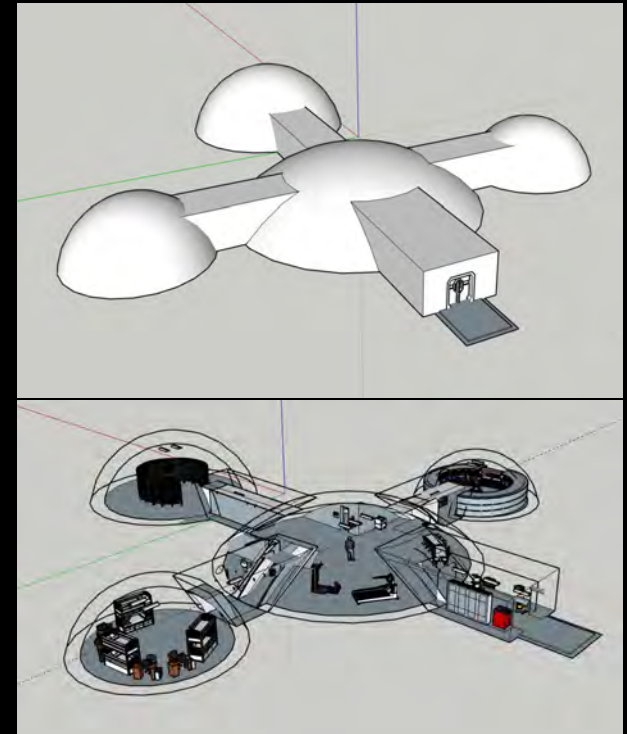
Constraints:

- Dome Limits Space

The astronauts will use this Lunar Habitat as a “home base”. Astronauts will spend majority of their time in this habitat because it has all the requirements to sustain human life. In the Lunar Habitat they will have space to sleep, eat, work, communicate, and store their findings.



VR Lunar Habitat

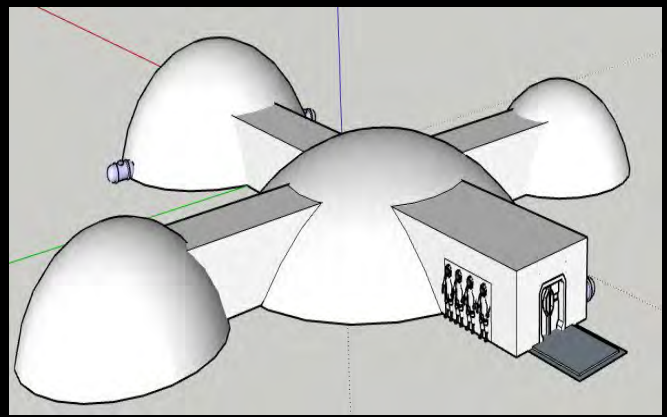
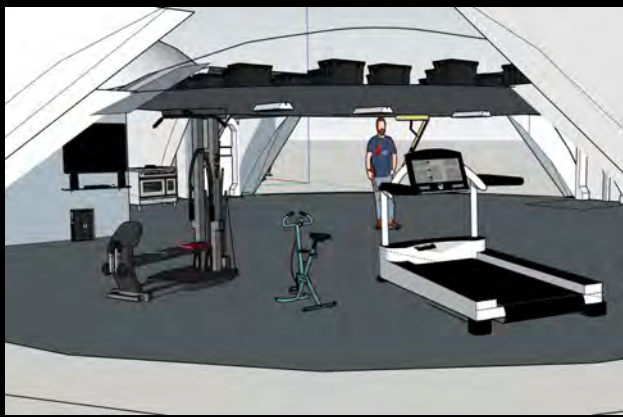
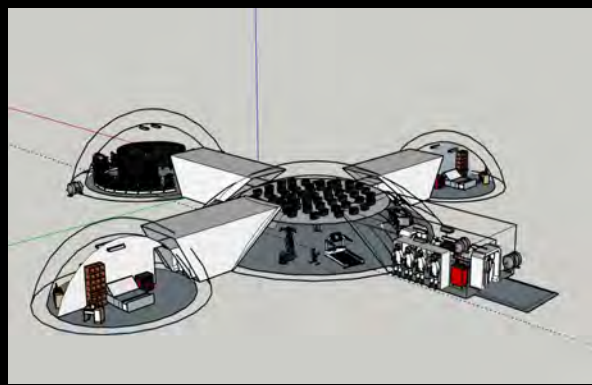
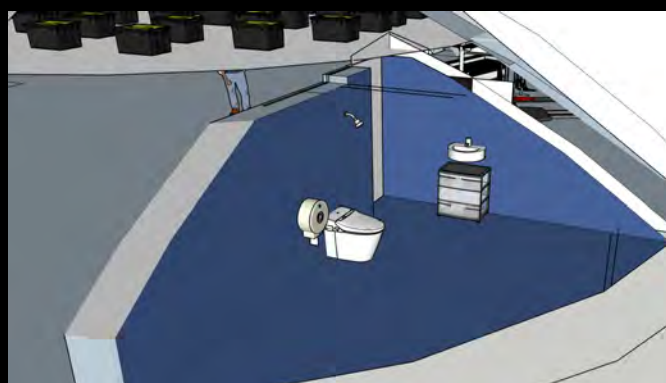
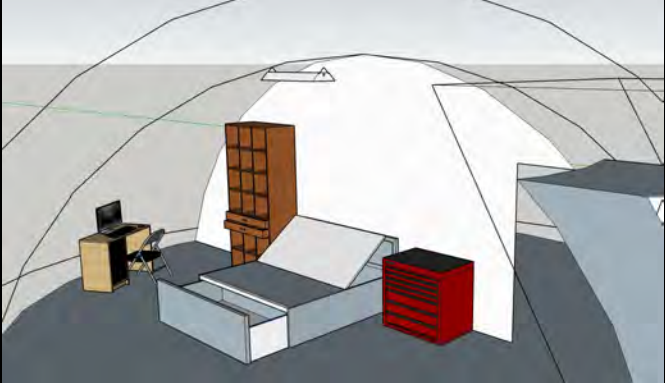


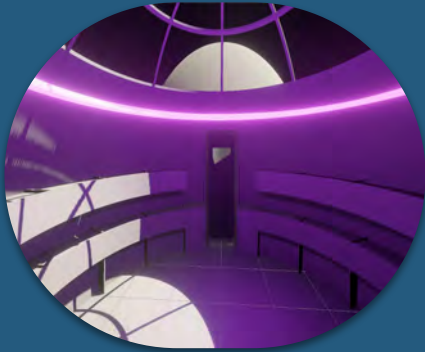
The VR Lunar Habitat to make the moon habitable



Short Vid of Lunar Habitat

[Link](#)





Our Priority: Comfort

While NASA is perfectly capable of designing optimal, utilitarian habitat spaces (think the ISS or Apollo capsules), it is our goal to incorporate comfort elements within NASA's vision. To accomplish this, we limited two beds to each sleeping quarters, added a window within the bamboo garden, and we even built a mock test space (pictured below).



Any questions? Contact us!

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Garrett Worthen
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+1 (406) 209-3124

Mr. Carl Poeschl
carl.poeschl@bsd7.org

VR Lunar Habitat
Bozeman High School
Team #1



VR Lunar Habitat

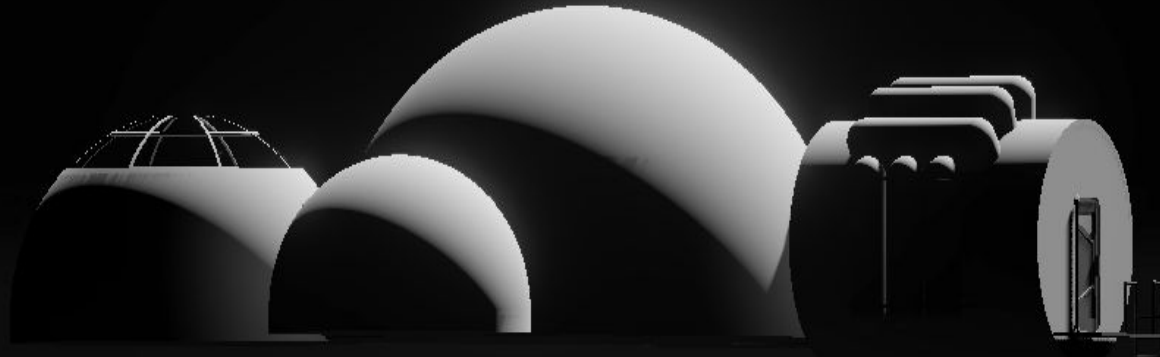
Cameron Taylor,
Garrett Worthen,
Mr. Carl Poeschl



NASA
HUNCH
High school students United with NASA to Create Hardware



BOZEMAN
HIGH SCHOOL



Key Elements:

The main 'Hab' features: Exercise equipment, integrated storage, bathroom connected to ECLSS, dedicated "attic" space, soft comforting lighting.

Where are the space suits?

The lunar space suits are actually attached to the exterior and accessed from inside.



Design Process:

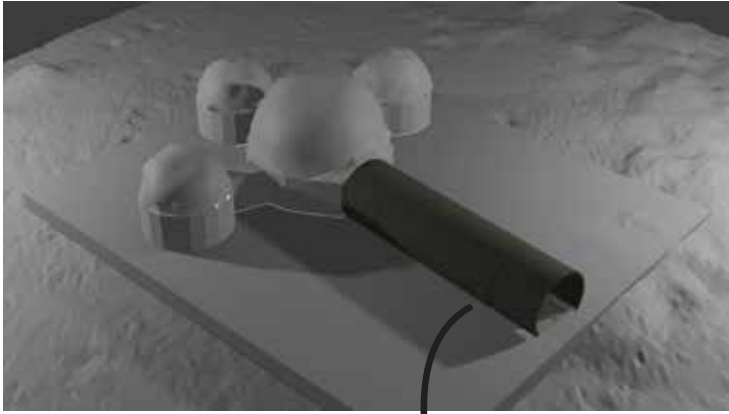
Thanks to our VR experience with HUNCH last year, we were able to streamline our software development. We hit the ground running and got the VR aspect of the project done in less than two weeks. We used the empty virtual stage as our springboard for adding all the models that represent the VR habitat. Each object was modeled (Or virtually 'sculpted') by hand, then important into UNITY where Cameron programmed the physics interactions between each object.

Future Steps:

Ideally, the bland colors are replaced with realistic textures. As it stands the grey colored objects represent 'static' (unmoving) assets and the blue objects are interactable and dynamic.

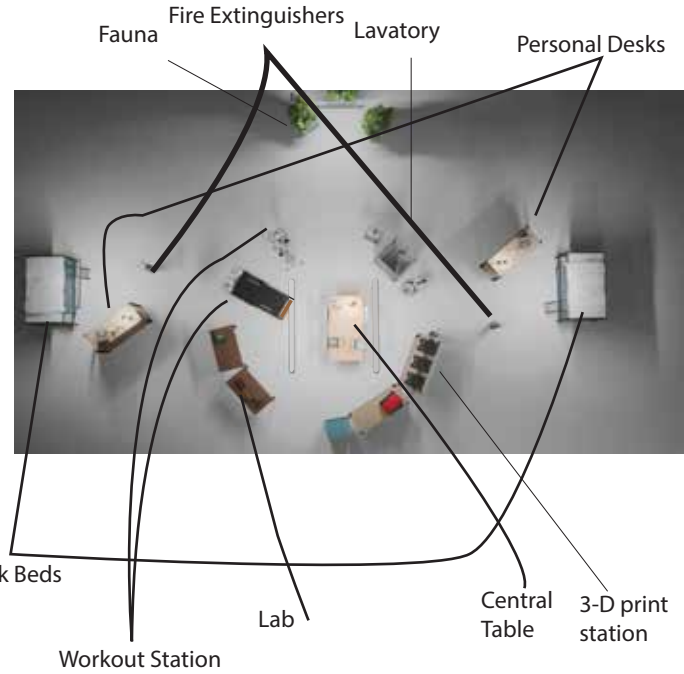
The second major step is post-processing--or making it look good. Anti-Aliasing represents the biggest obstacle to a good user-experience. Beyond that simply filling out the space with detail, interactable objects and other features that complete the space.

VR Lunar Habitat
Mark Goldstien
Henry Winchester, Charlie Clark
The Harley School - Rochester NY



Airlock

The lunar habitat is fully equipped with all the necessary items to support an astronaut on the moon. The habitat has the perfect number of elements to accommodate space concerns and still have all required materials. The components used in our model are all realistic and structurally sound. This gives it the ability to be brought out of the computer and into space. The habitat while important to have all the necessary components should not feel like a prison which is why we placed an emphasis on not just the components but on the atmosphere. Our model provides the astronauts with a decent size to live in and move about.



All of these factors are imperative for living on the moon. The 3-D print station allows for any small repairs to be done locally. The lab allows the scientists to do their research. The beds are for the astronauts to sleep in. The workout station is necessary so the astronaut's muscles don't decay in the reduced gravity. The fire safety measures are extremely important because if a fire breaks out the whole habitat would be destroyed. In addition it was critical for there to be space to easily traverse across the station.

Our Website

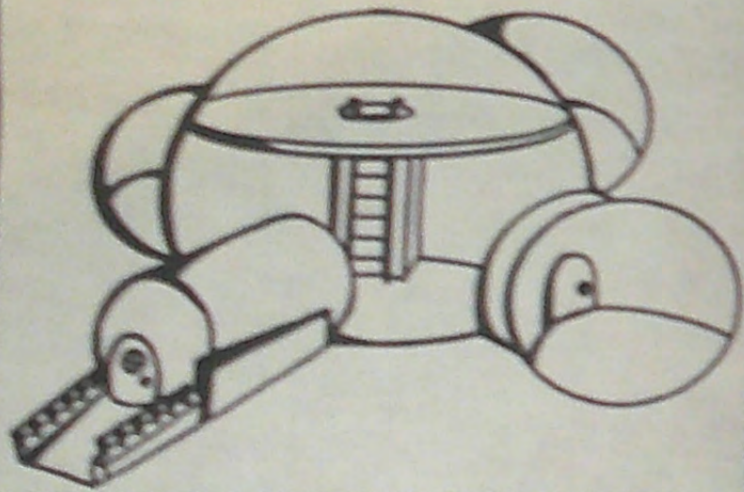


Password for folder containing files: `Imply1-Prankish5-Serrated3`

Main Features:

Our project utilizes the uniquely round shape of an inflatable habitat by incorporating a second floor in the main section of the base. This allows an increase in usable area, and more room for helpful equipment and storage as a result.

Isometric view of layout



As a result of this main feature, we have decided to dedicate a majority of the upstairs space to the technology involved in a communication center. Additionally, we will have some space reserved in the upstairs area for a laboratory like set up for astronauts to work on projects.

Scan



Here



Project
VR Lunar Habitat
School: ~
Lewisville School of
Science and Technology
Location:
Lewisville, TX

DLC:

Lunar Habitat



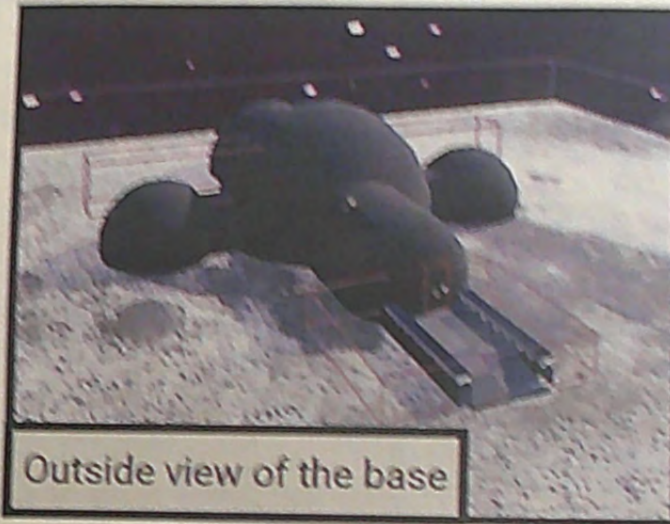
Domanique Turner, Lee Head, Connor Wood

Research

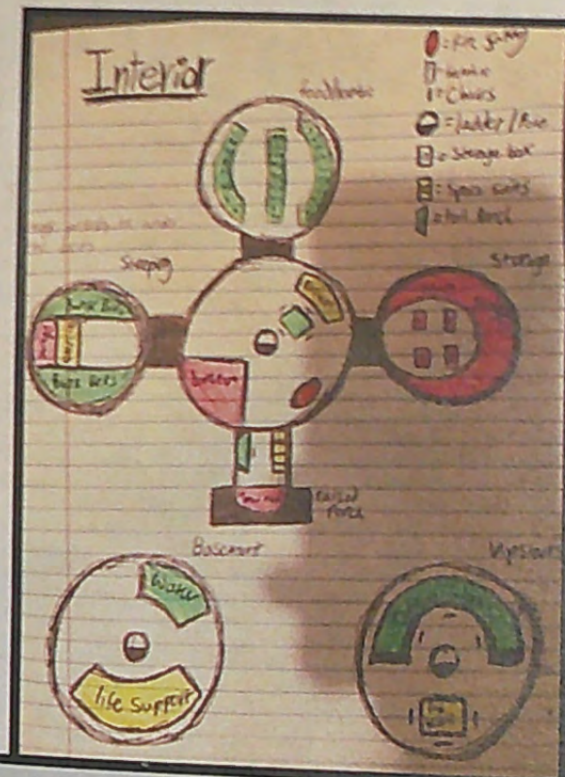
Research is one of the most crucial aspects of this project. As a result, we have dedicated a significant amount of time to researching everything. One of these main things is the nuclear fission power source that we found would be the most effective for power generation on the moon.

Always at
100%

Design



Outside view of the base



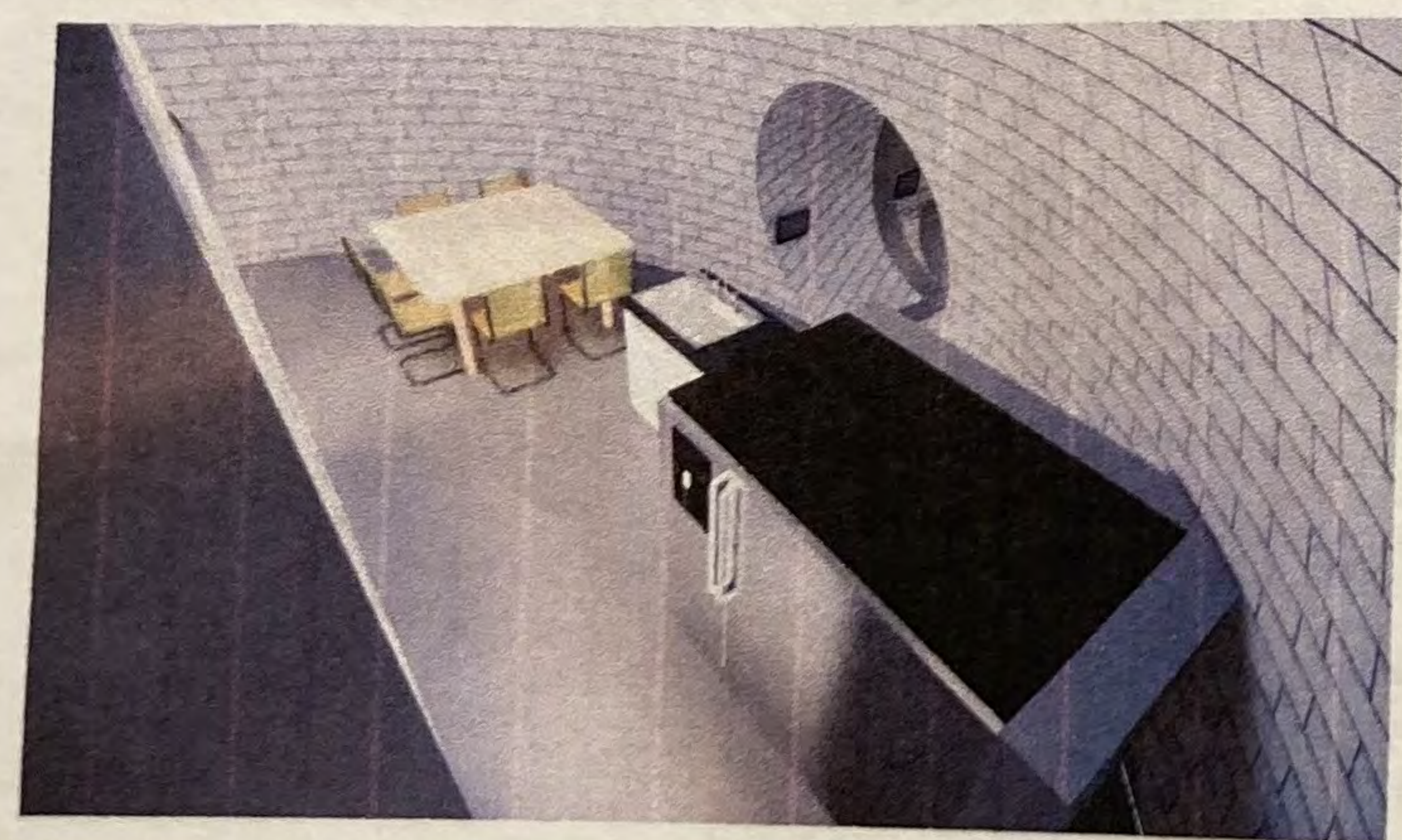
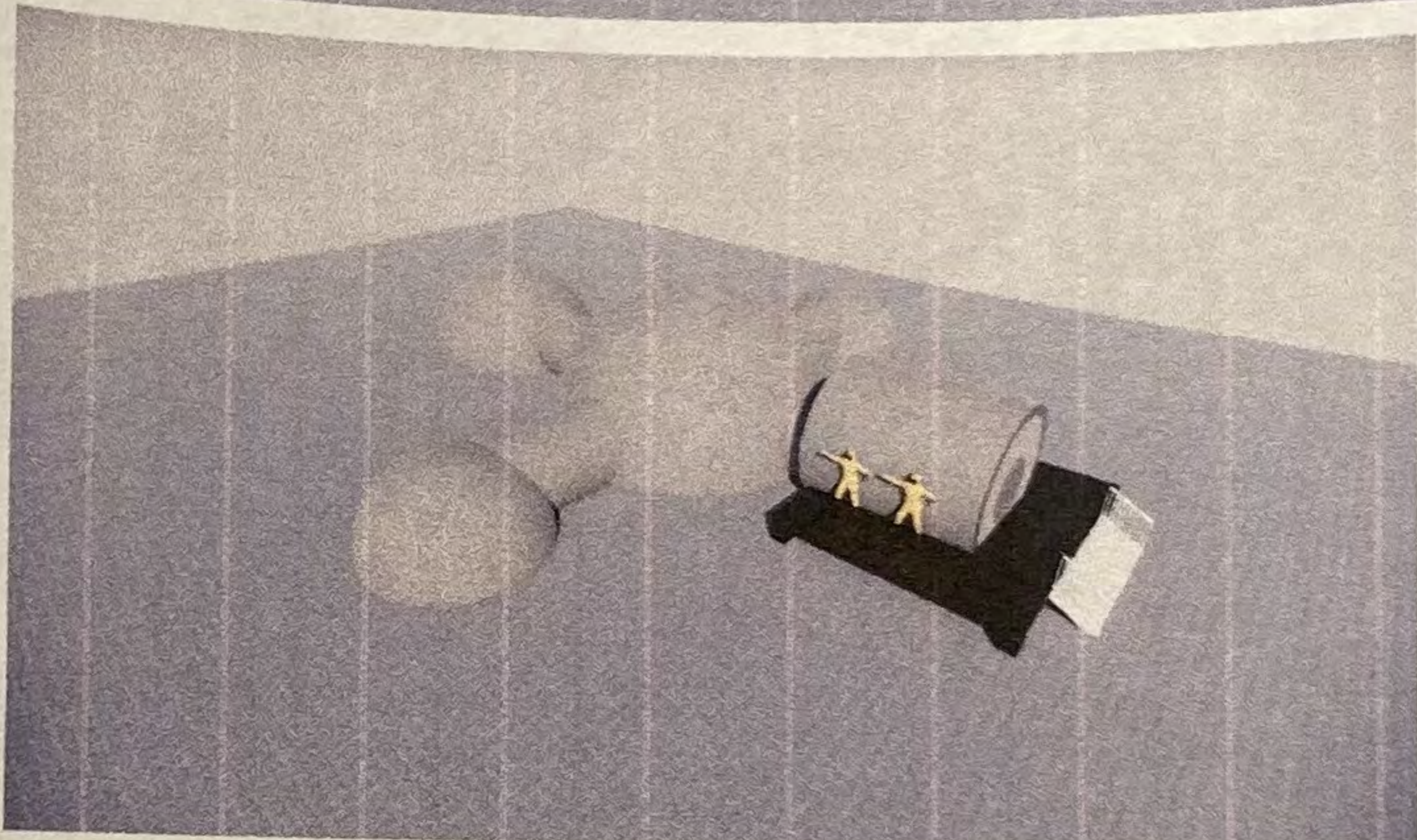
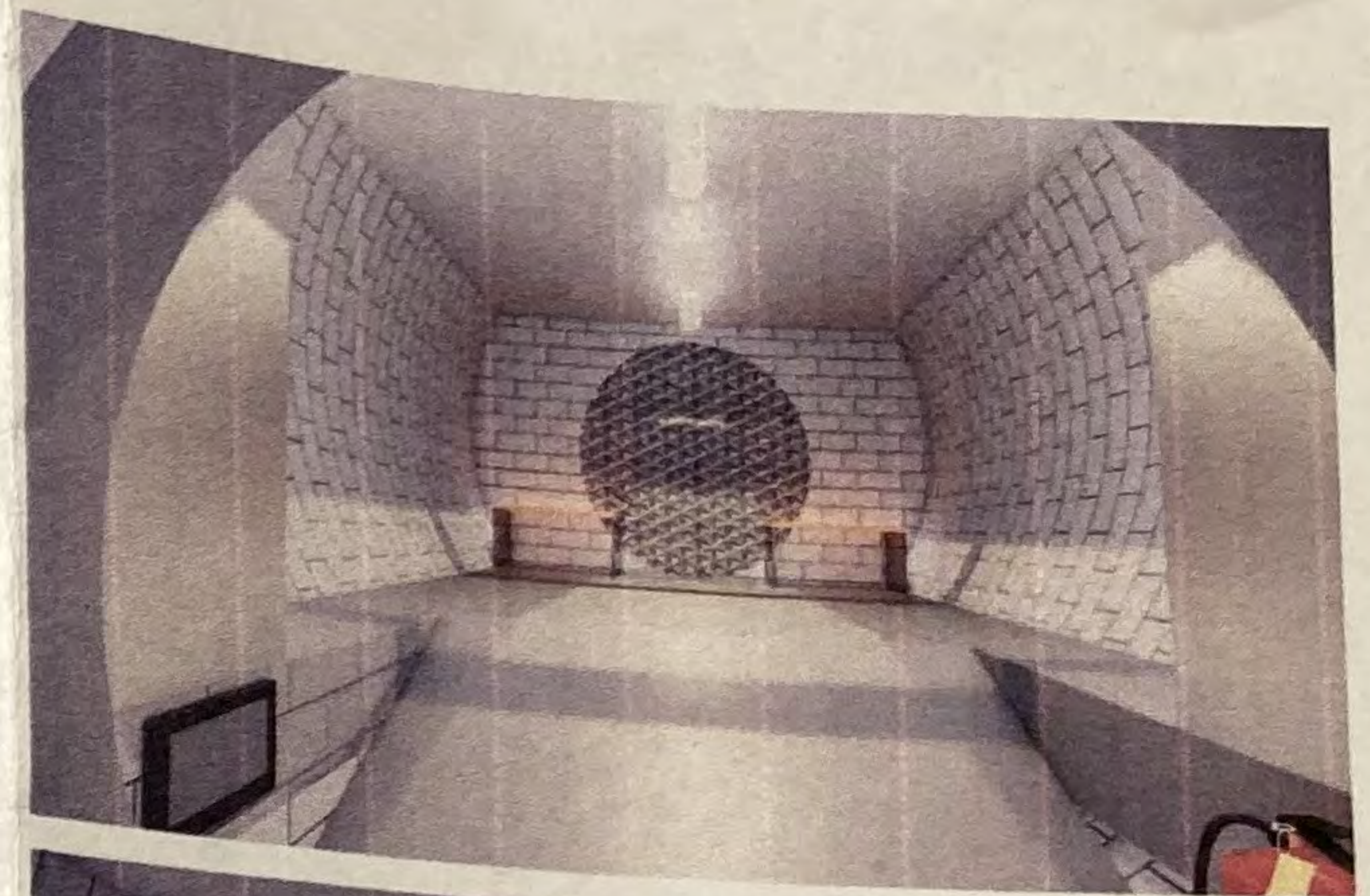
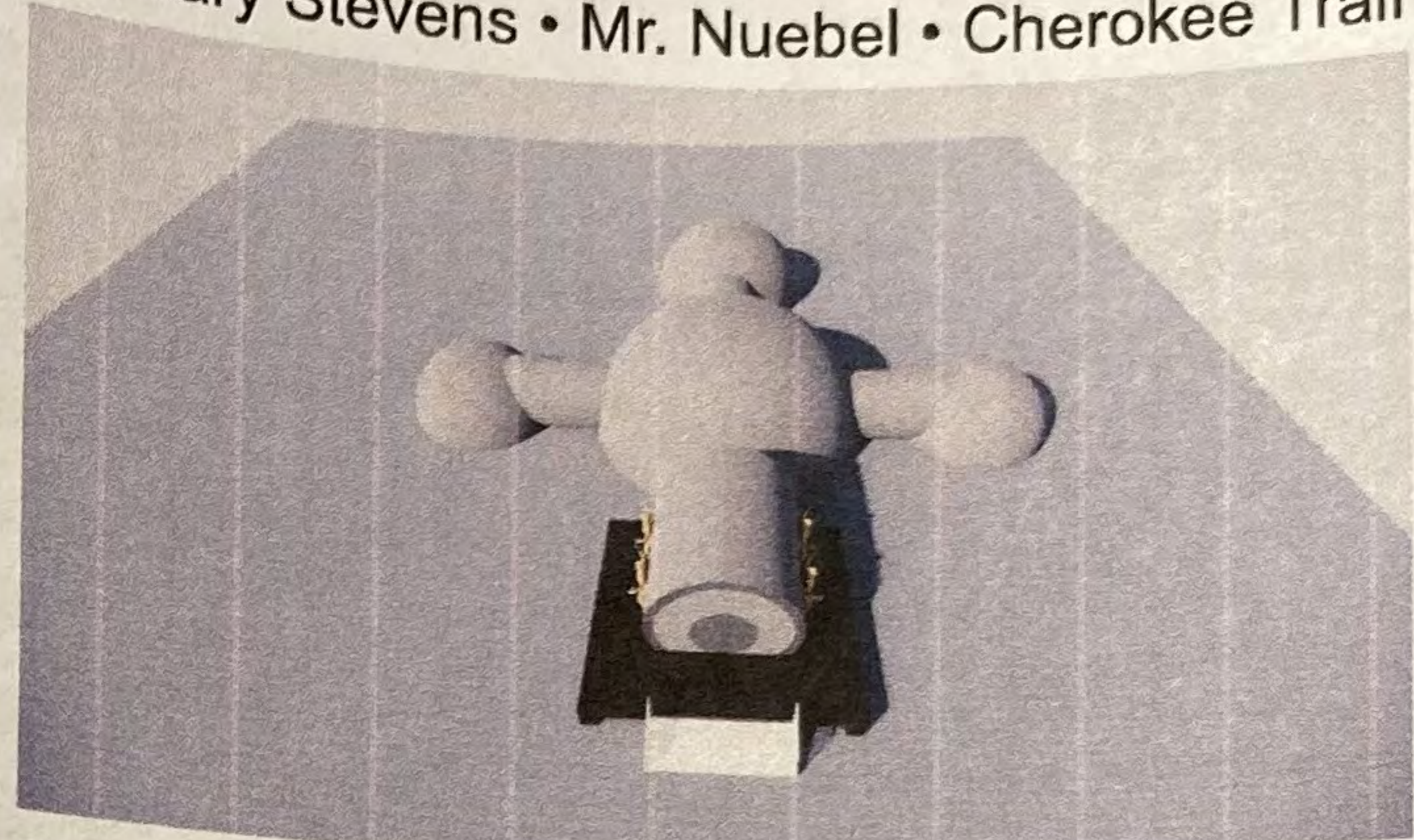
The interior sketch that our design was based on.

Progress

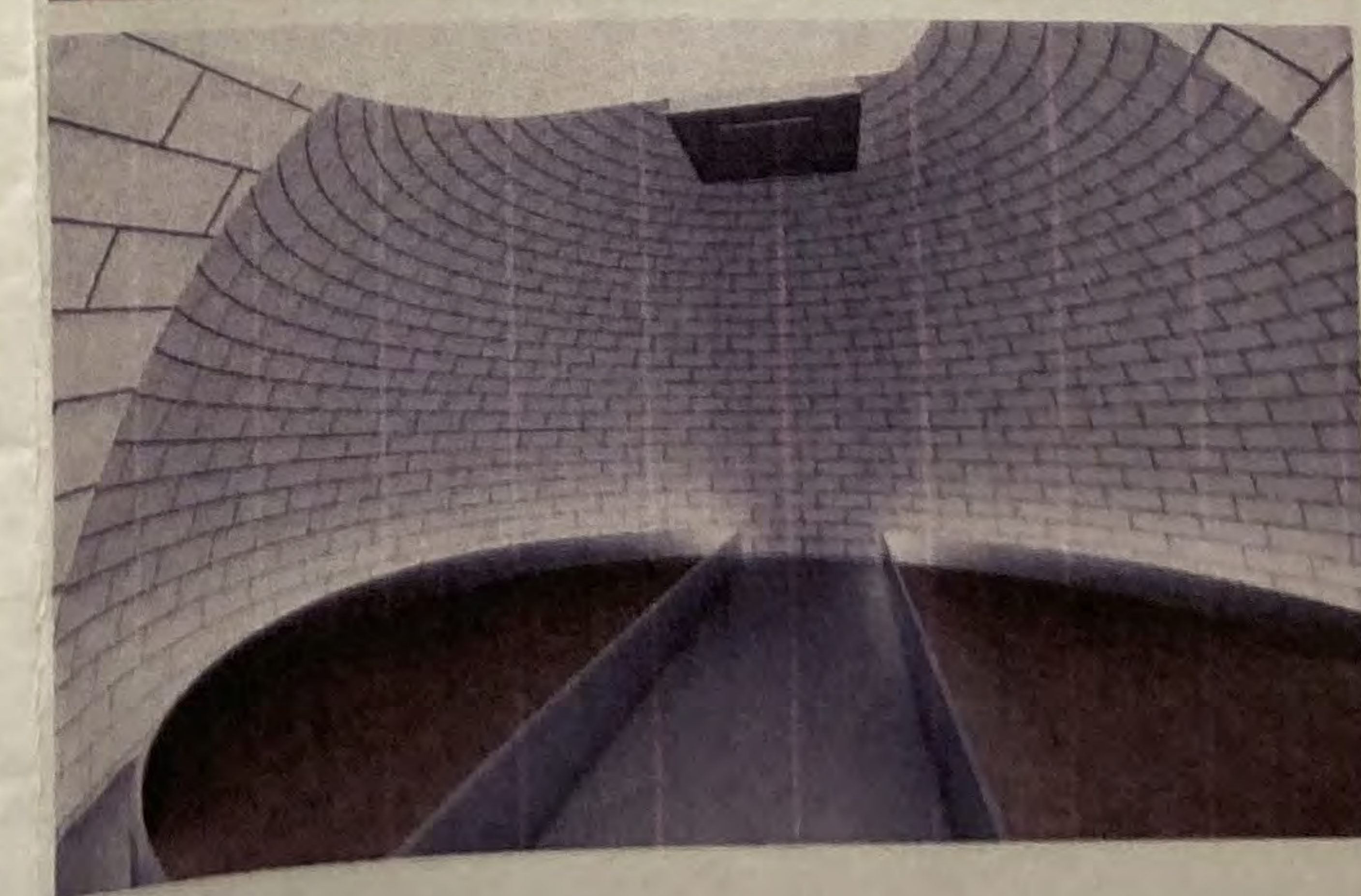
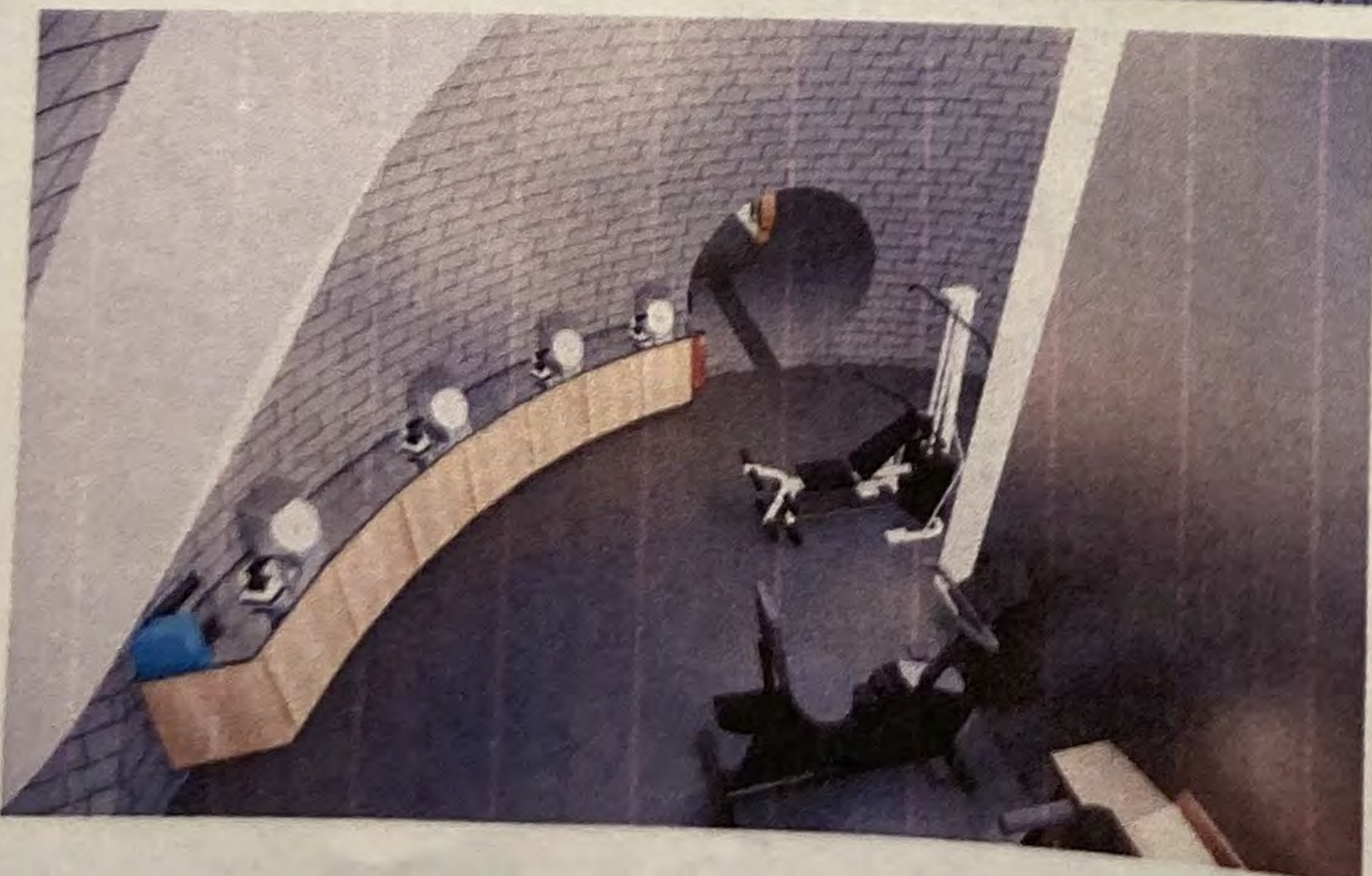
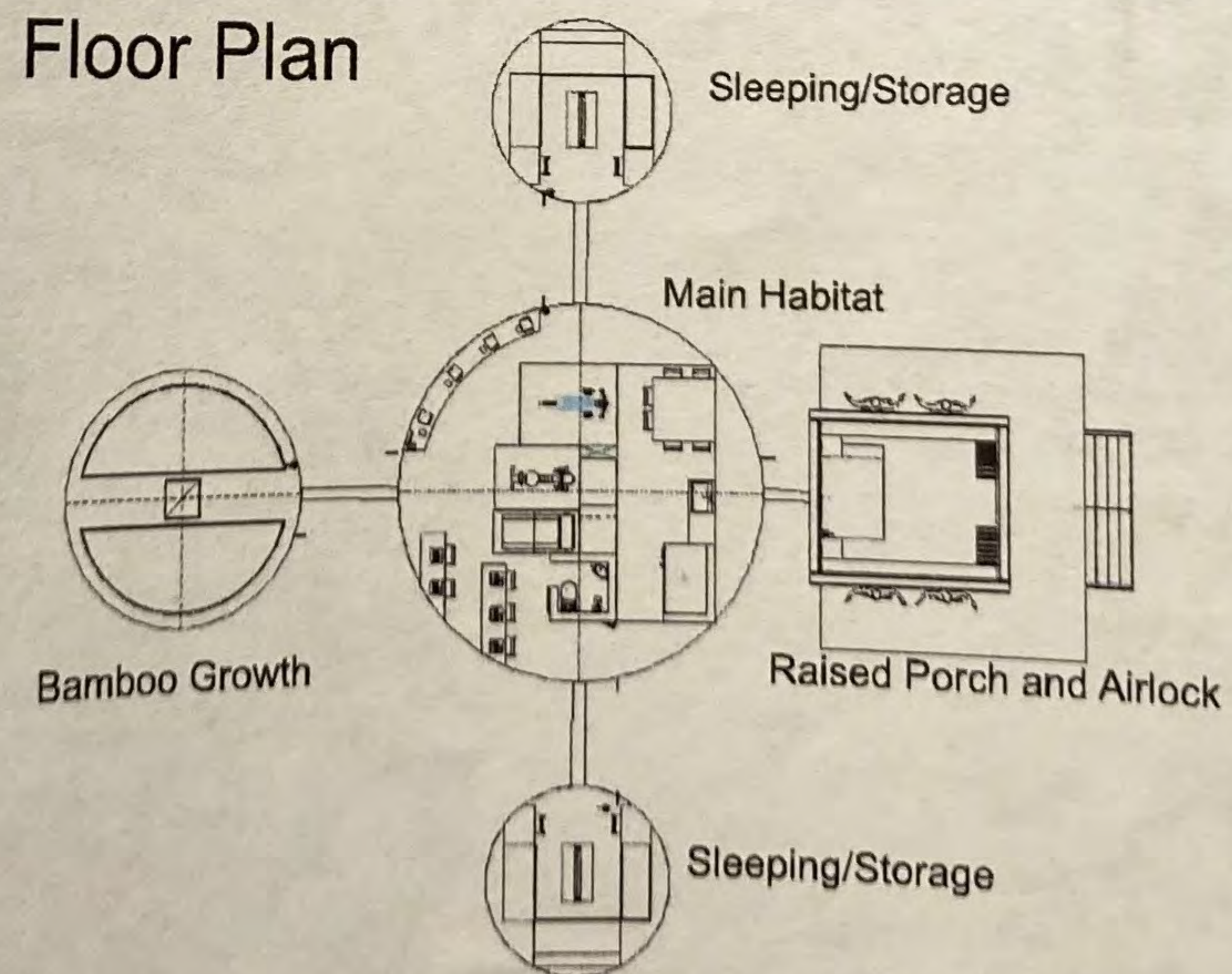
During our design process, we worked tirelessly to 3D model, texture, and implement a functional simulation that can be accessed through VR.



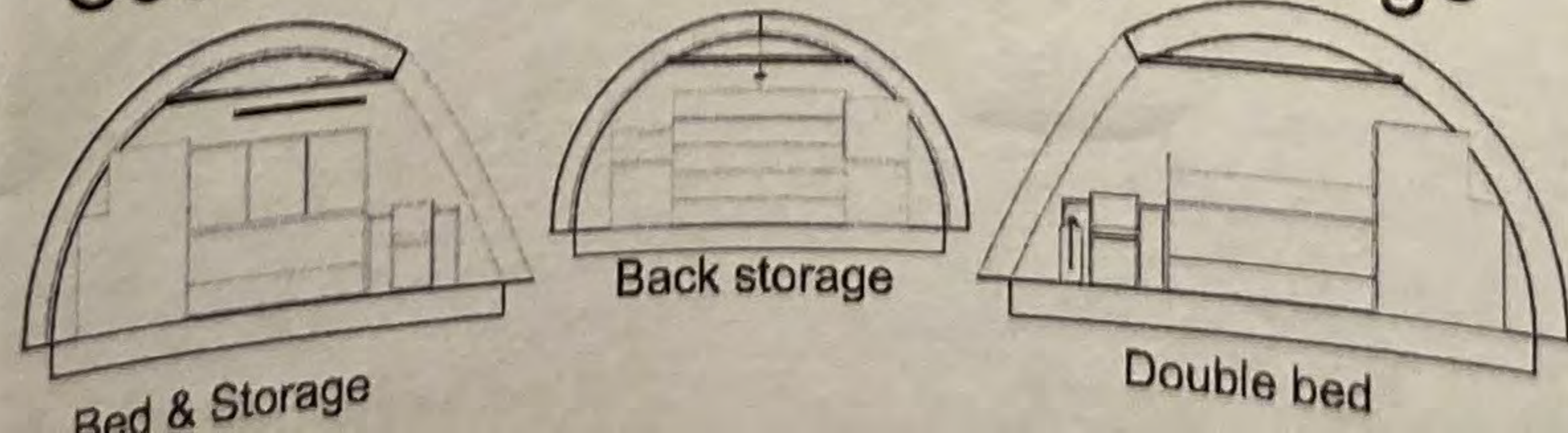
VR Lunar Habitat Design
 Zachary Stevens • Mr. Nuebel • Cherokee Trail



Floor Plan



Section views of Sleeping/storage



A VIRTUAL REALITY
SIMULATION CREATING
THE ENVIORNMENT OF
LIVING ON THE MOON.



CONTACT US!

EVELYN EMCH:
emchevelyn2@gmail.com

MS. PEDERSON:
173409e@jeffcoschools.us



NASA HUNCH

LUNAR HABITAT VIRTUAL
REALITY

LAKWOOD HIGH SCHOOL

MS. PEDERSON

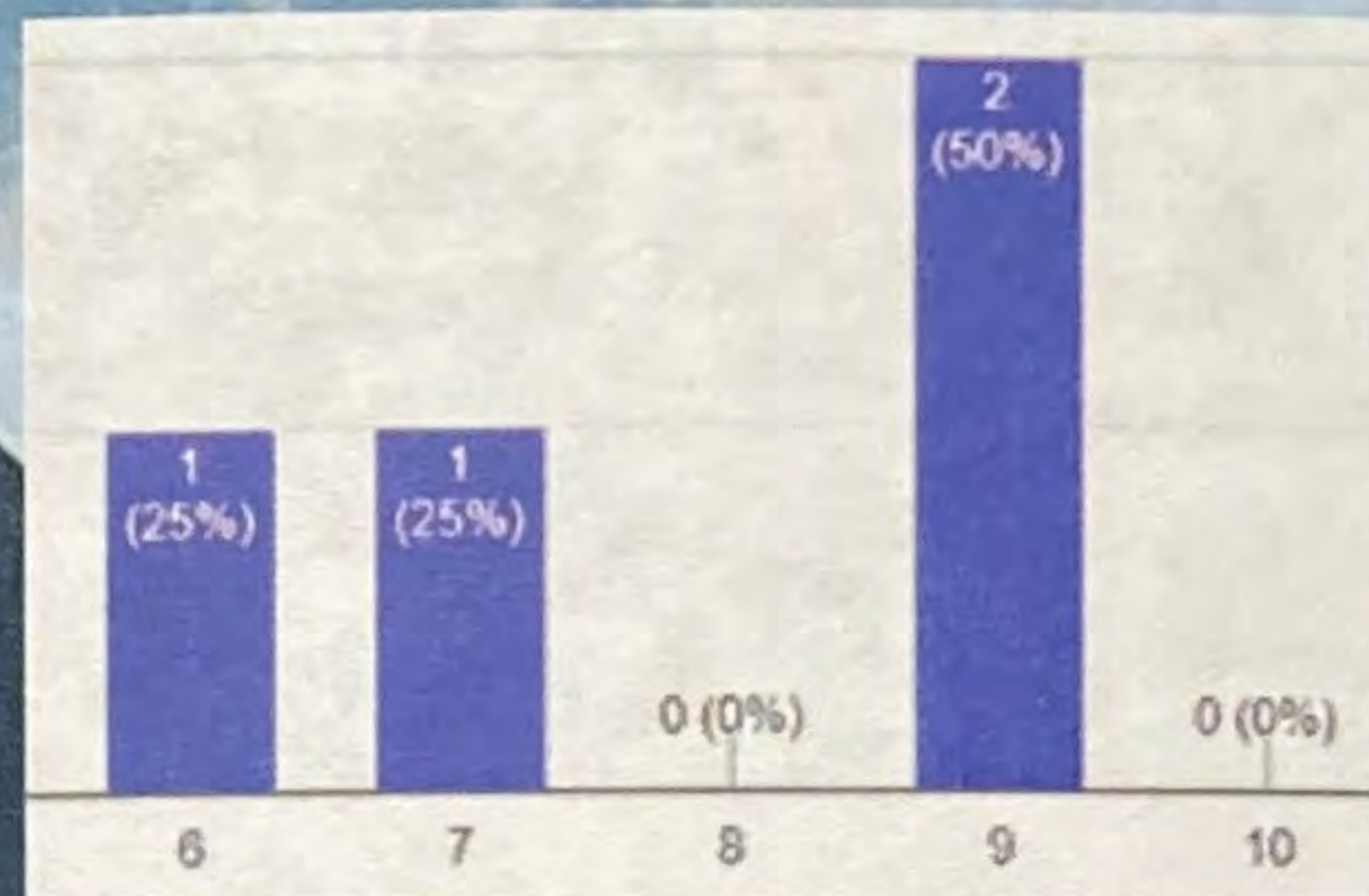
EVELYN EMCH

VISUAL PROGRESSION

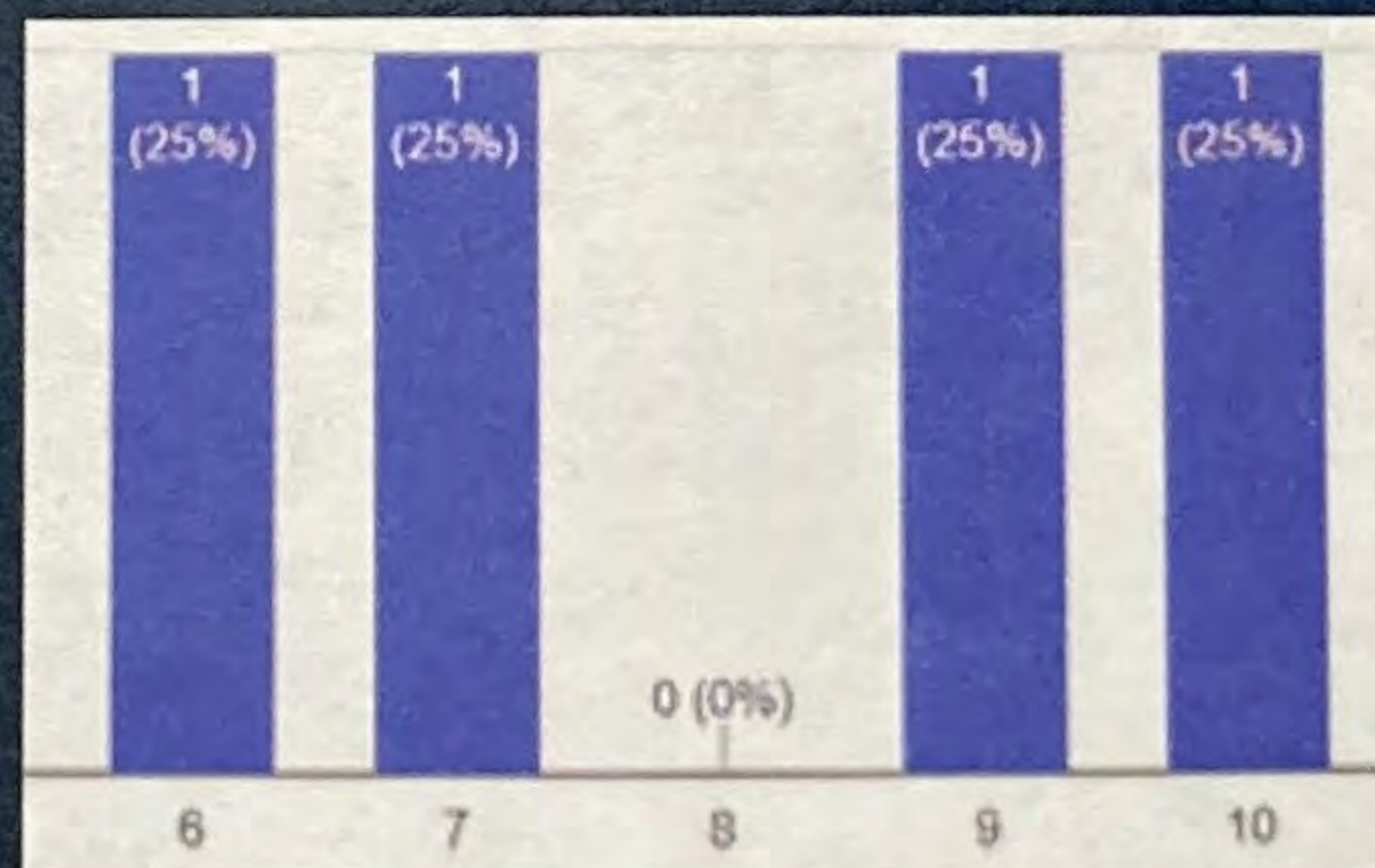


TESTING

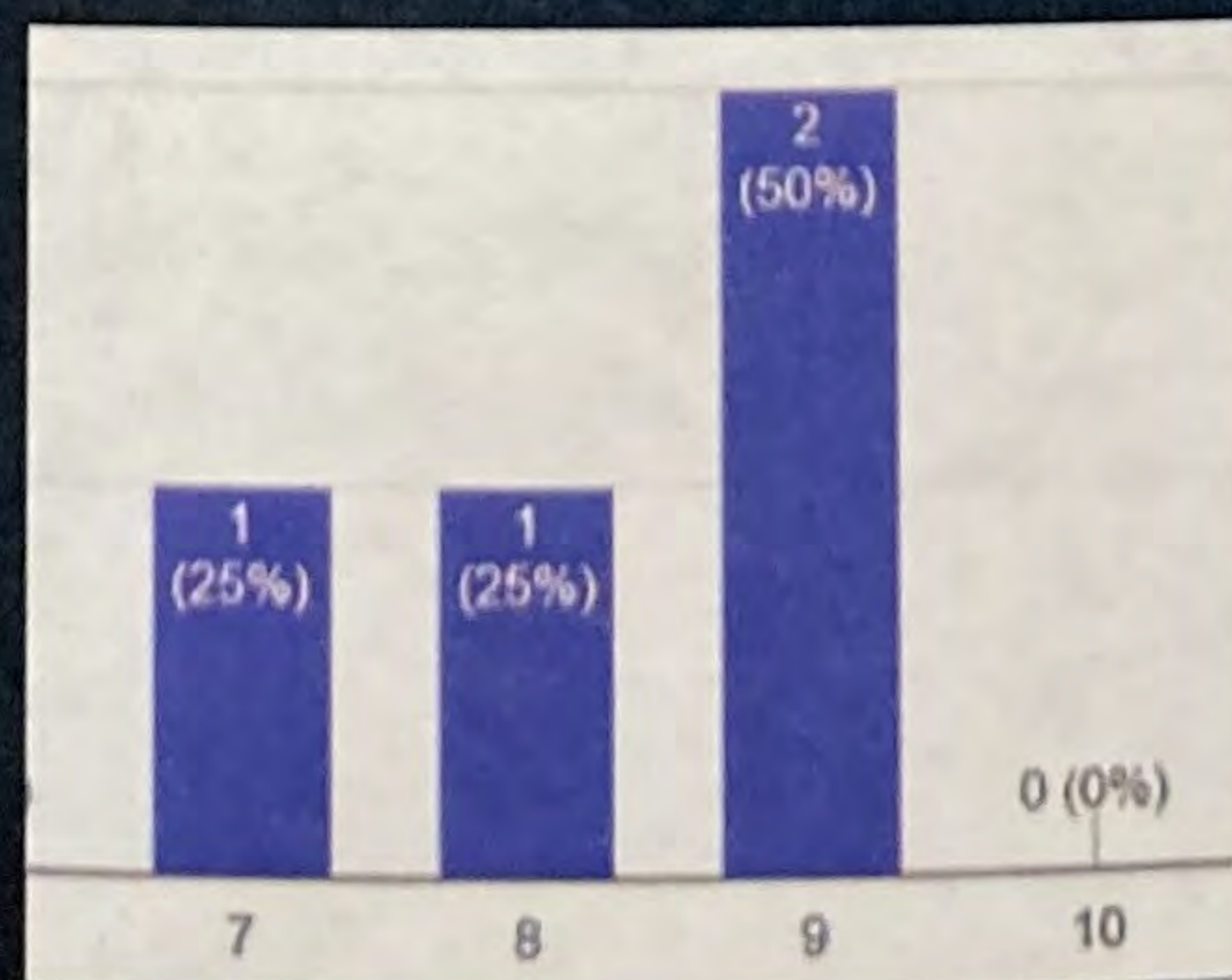
- Used a tarp to layout the sleeping quarters and had people walk around the area and see how comfortable the space is
- On a scale from 1 to 10, how comfortable did you feel in the space?



- On a scale from 1 to 10, for the size restrictions, how much would you feel comfortable living here for 30 days?



- On a scale from 1 to 10, how livable is this space?



KEY FEATURES

- Sleeping Quarters:
 - Has two beds with curtains for privacy
 - Each bed has a personal storage underneath and a personal dresser
 - Bulletin board for personal space
- Bamboo Greenhouse:
 - There will be a representation of the bamboo and the growing modules
- Main Habitat:
 - The main dome will get split up into four parts: the exercise room; the lounge, kitchen, and dining area; the ECLSS racks and bathroom area (they are close together for more efficient plumbing); and the communications center
 - A loft area held up by beams for extra storage
 - for more efficient plumbing); and the communications center



Sawyer Kitei, Devin Monthathong, Jared Klasse, Jerick Urbana

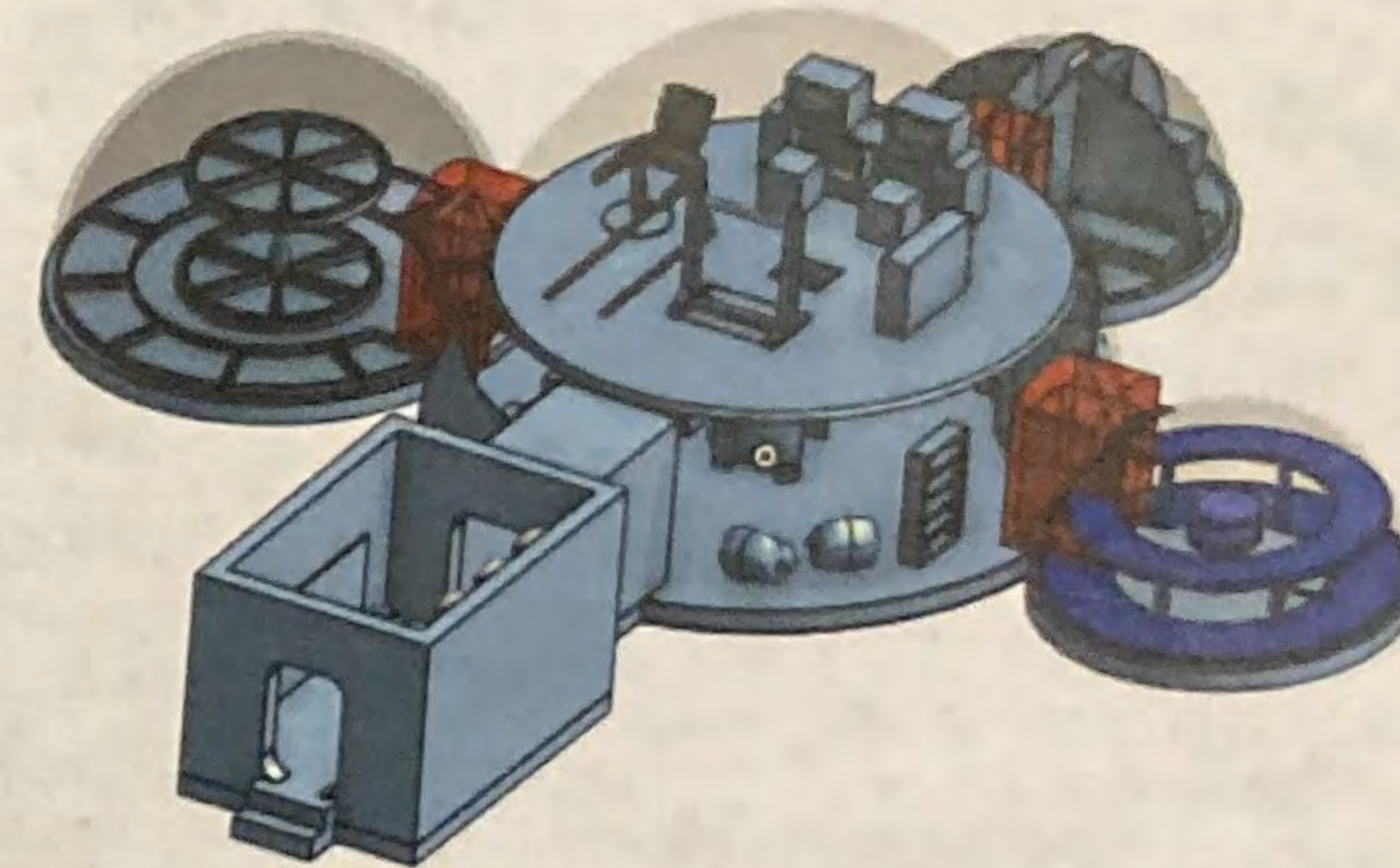


DENVER SOUTH HIGH SCHOOL
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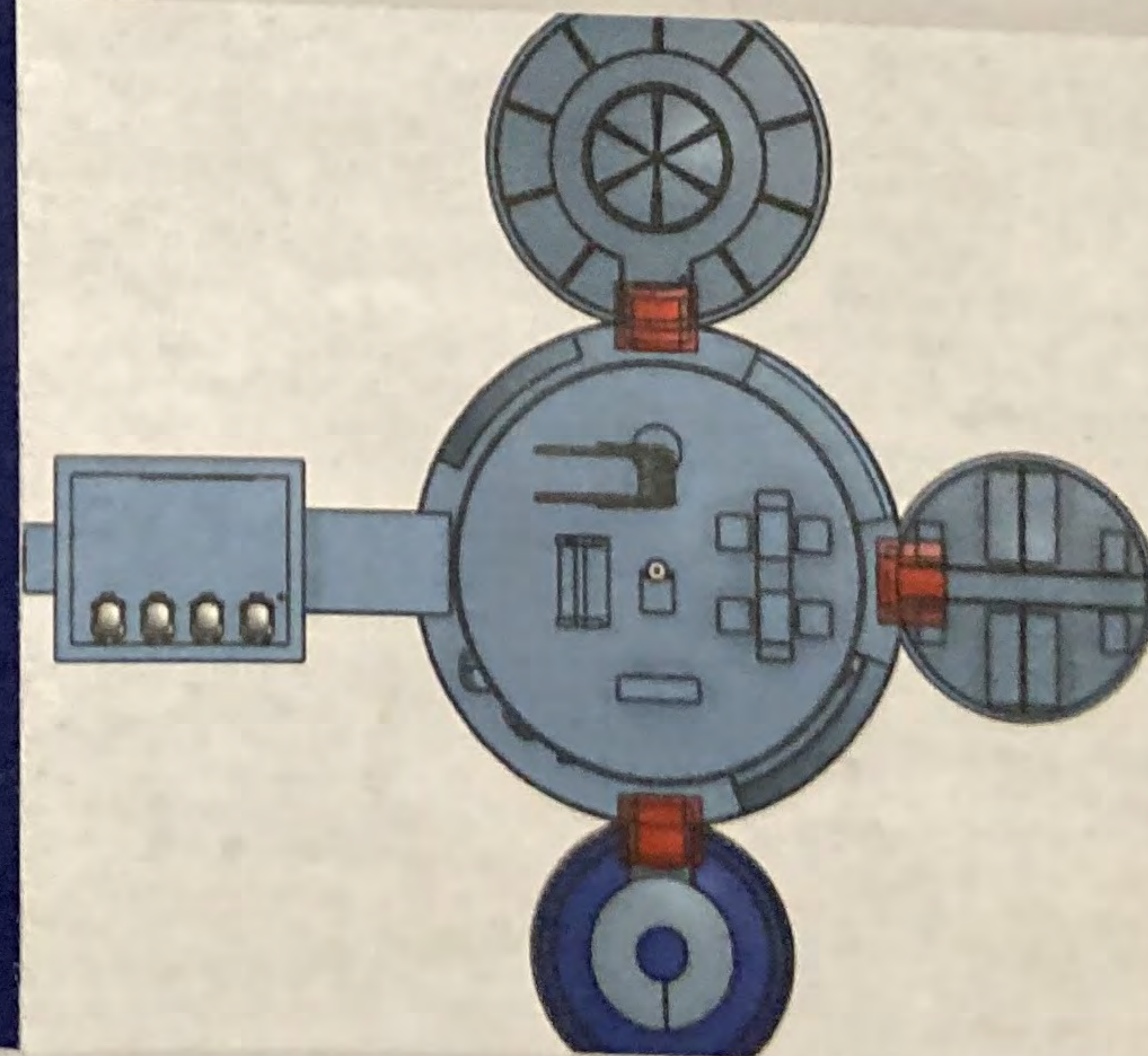


SCAN ME

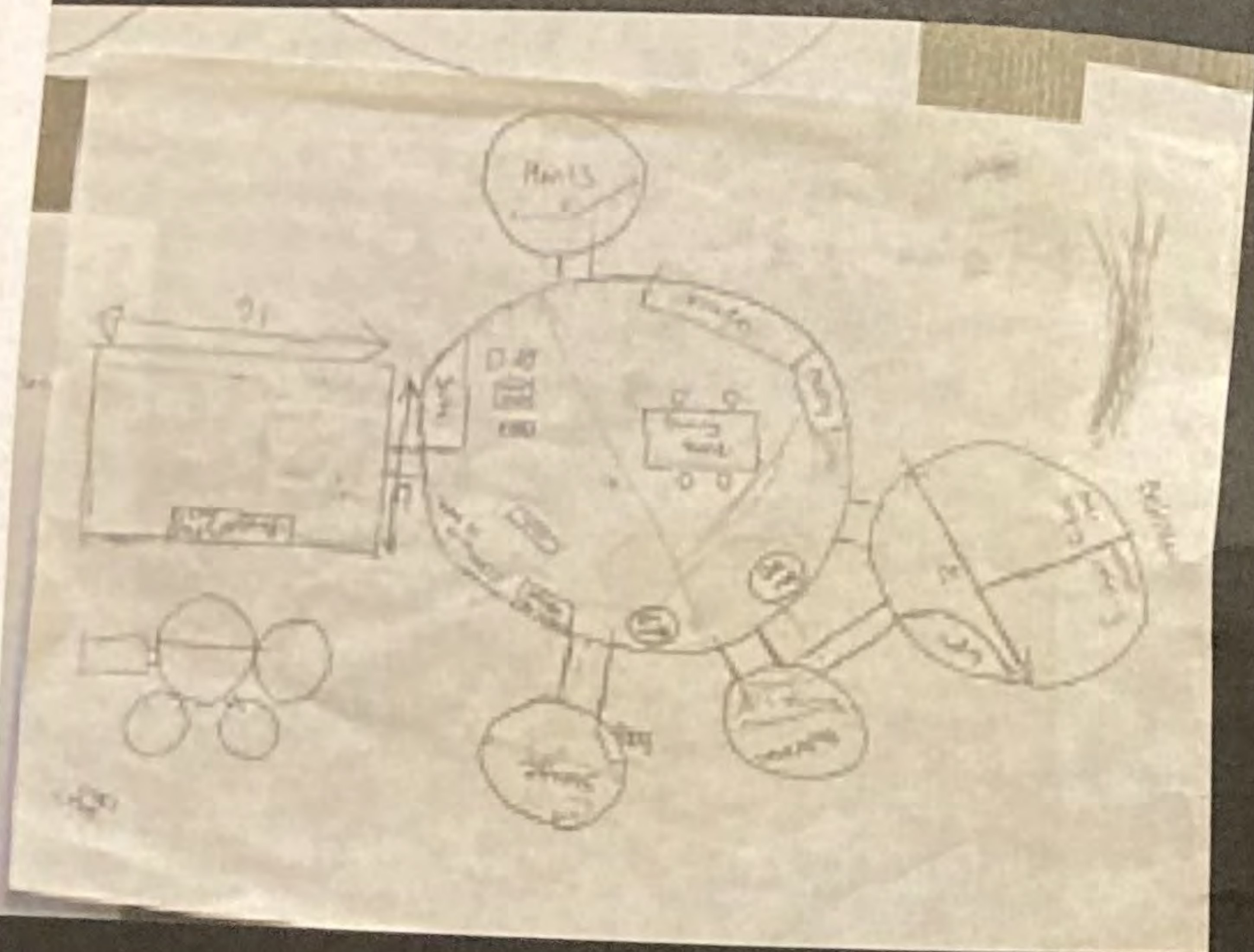
Link to Our VR Lunar Habitat Website



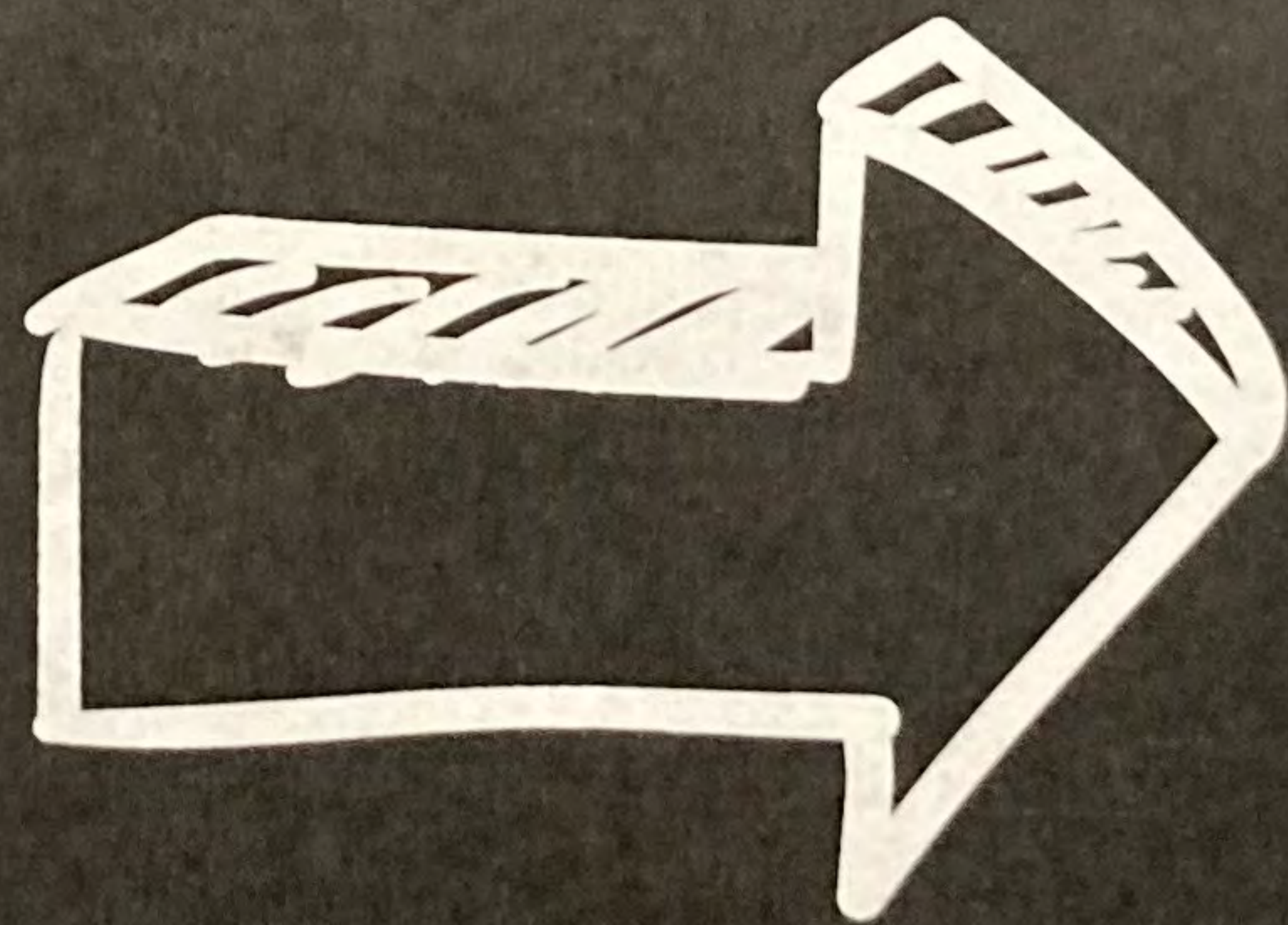
ONSHAPE DESIGN



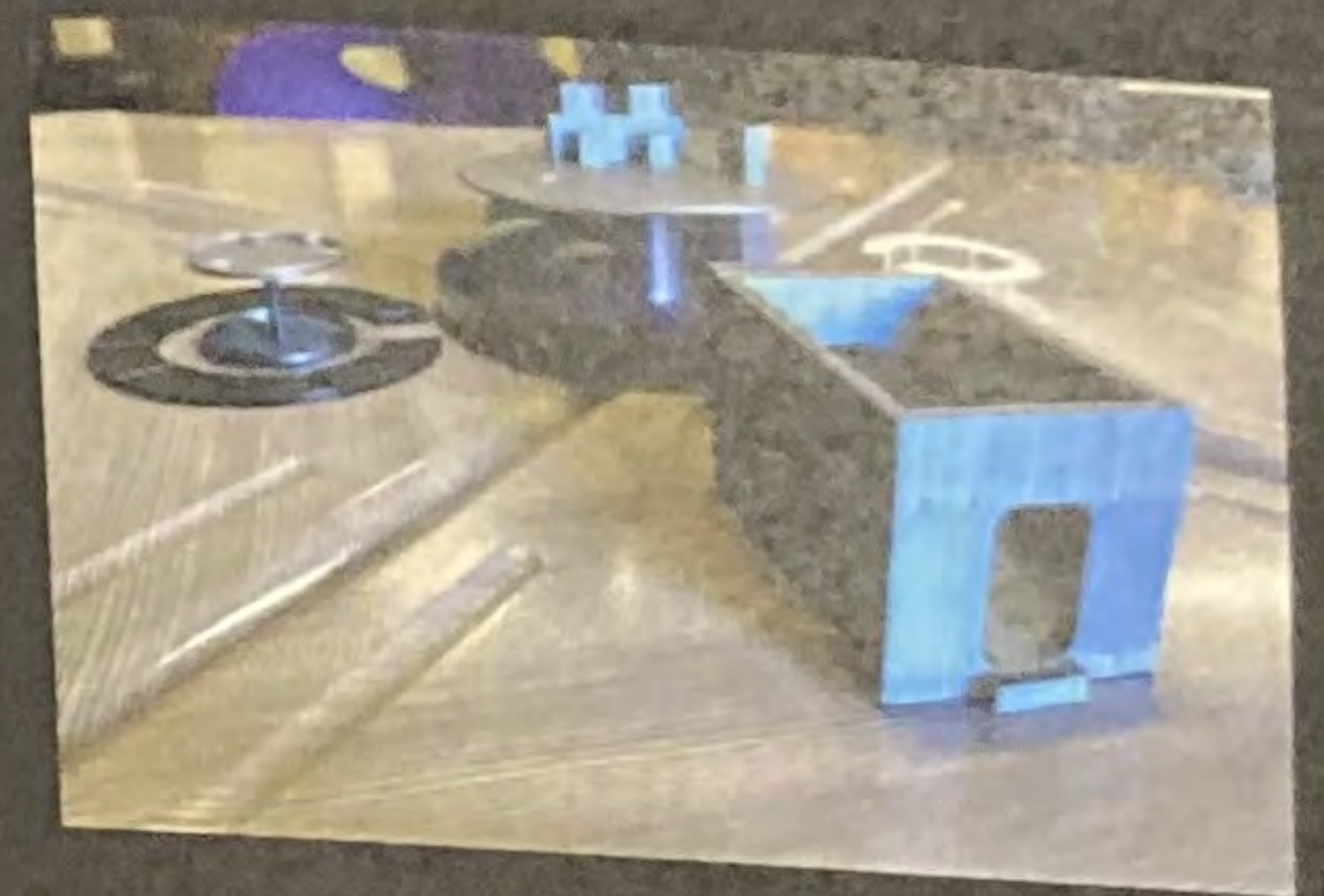
Initial Design



We began with a sketch of the habitat, planning out the layout of each room and where they should be positioned. This gave us a good starting point.



3D Print of Habitat



We 3D printed our final design to examine the habitat with a real model. It contains all rooms, and accurately relays the layout of the lunar habitat. Even though it does not contain all of the *small* details we added, it is still a good model to display our design.



Research

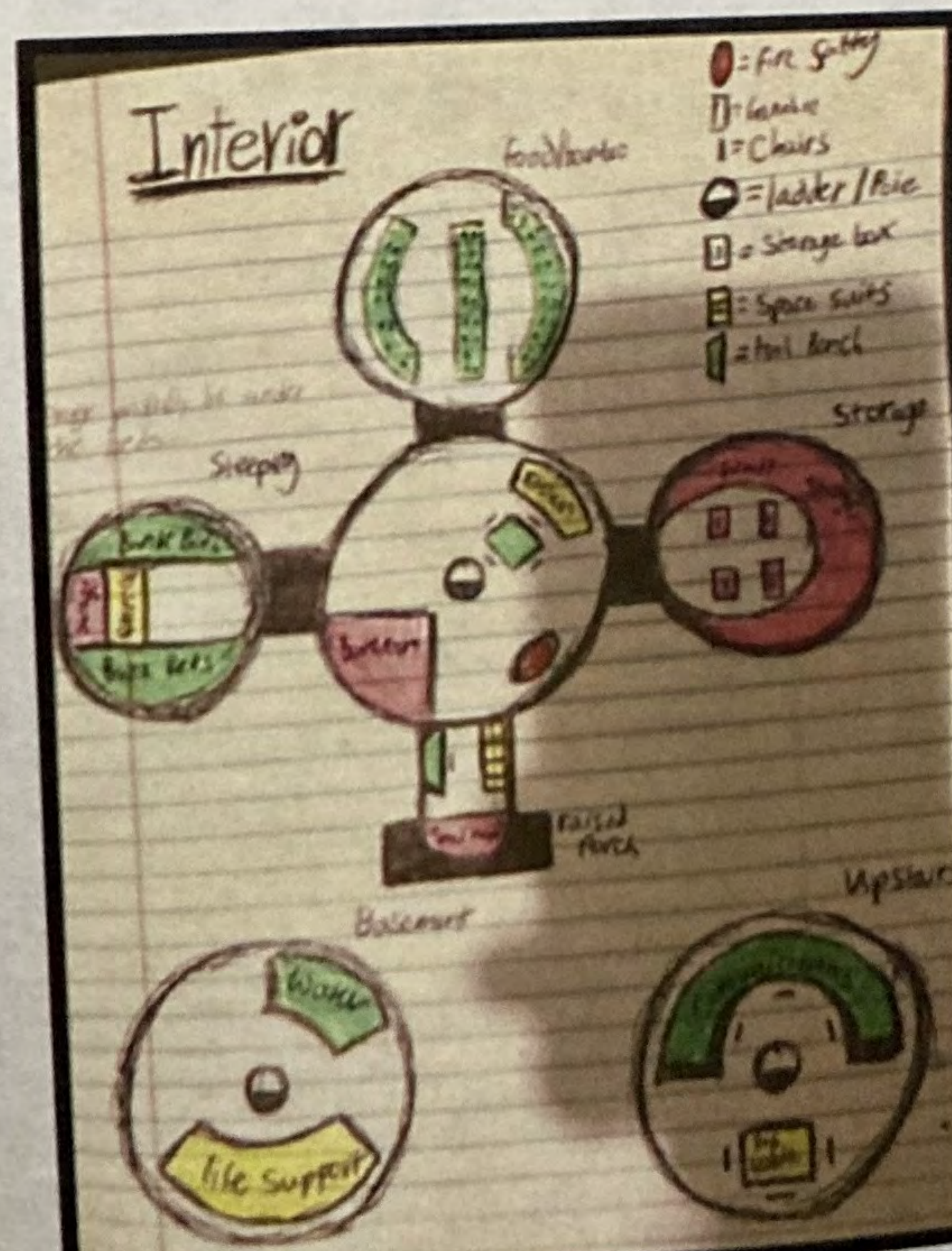
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Always at
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Design



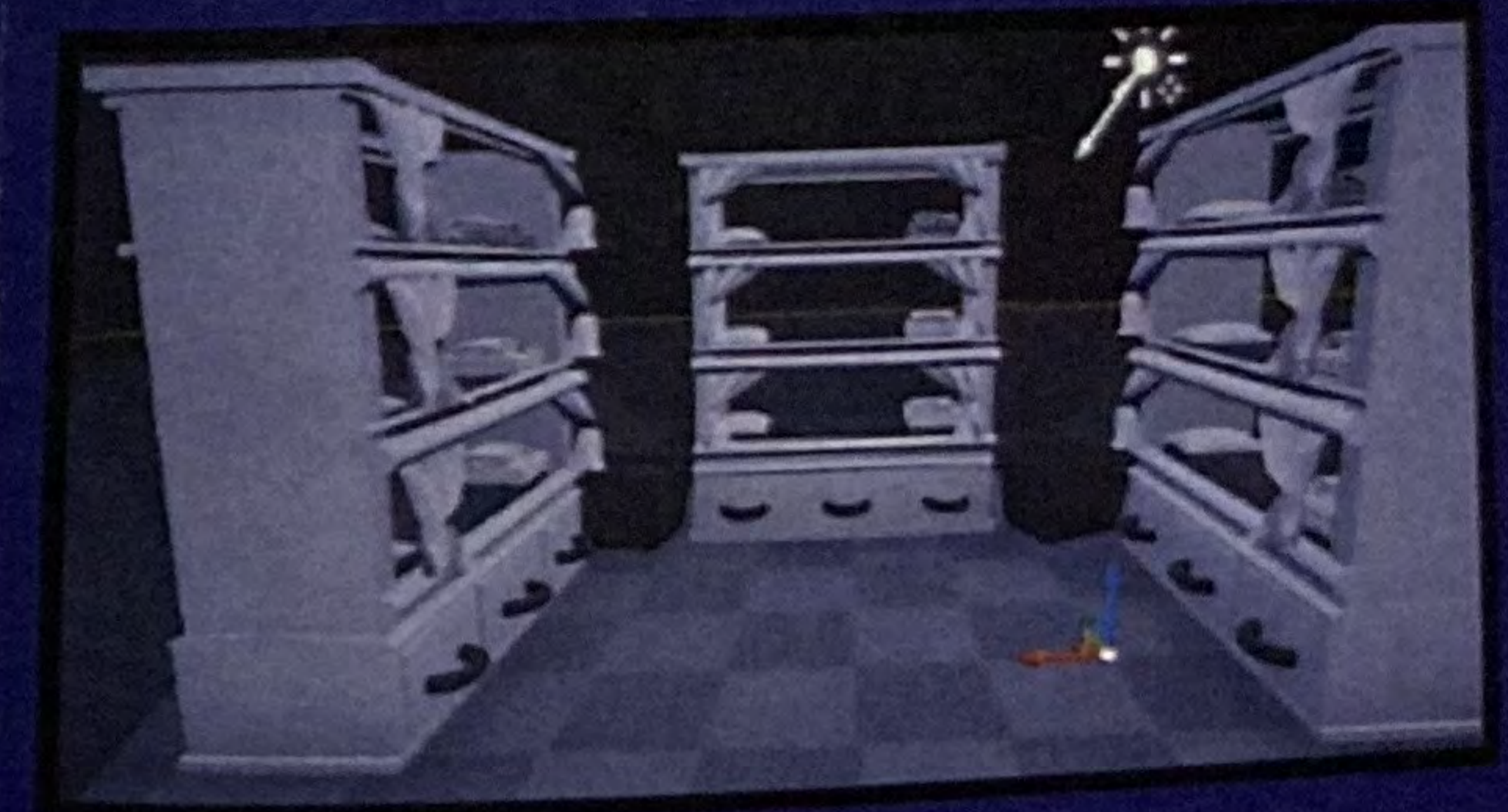
Outside view of the base



The interior sketch that our design was based on.

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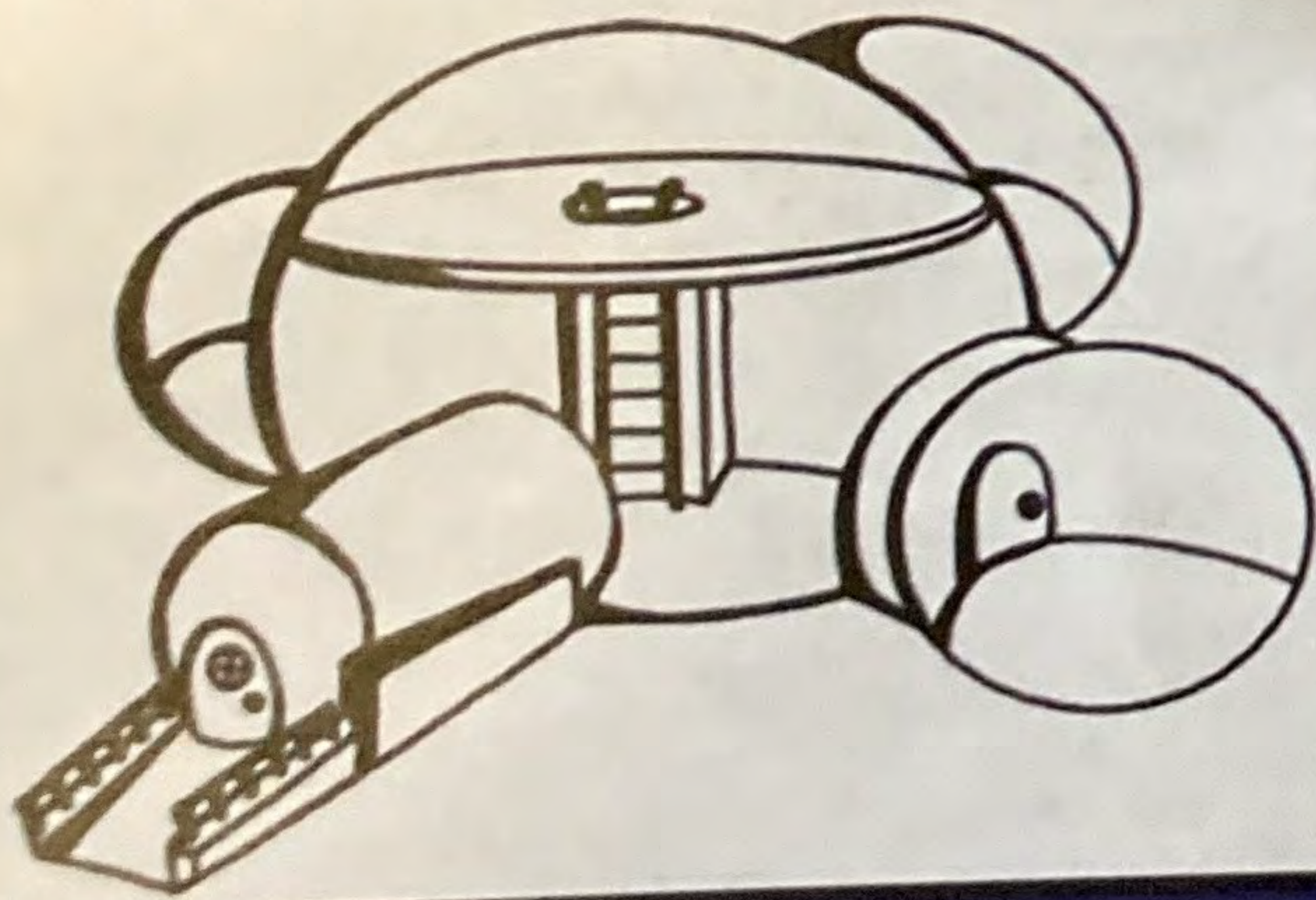
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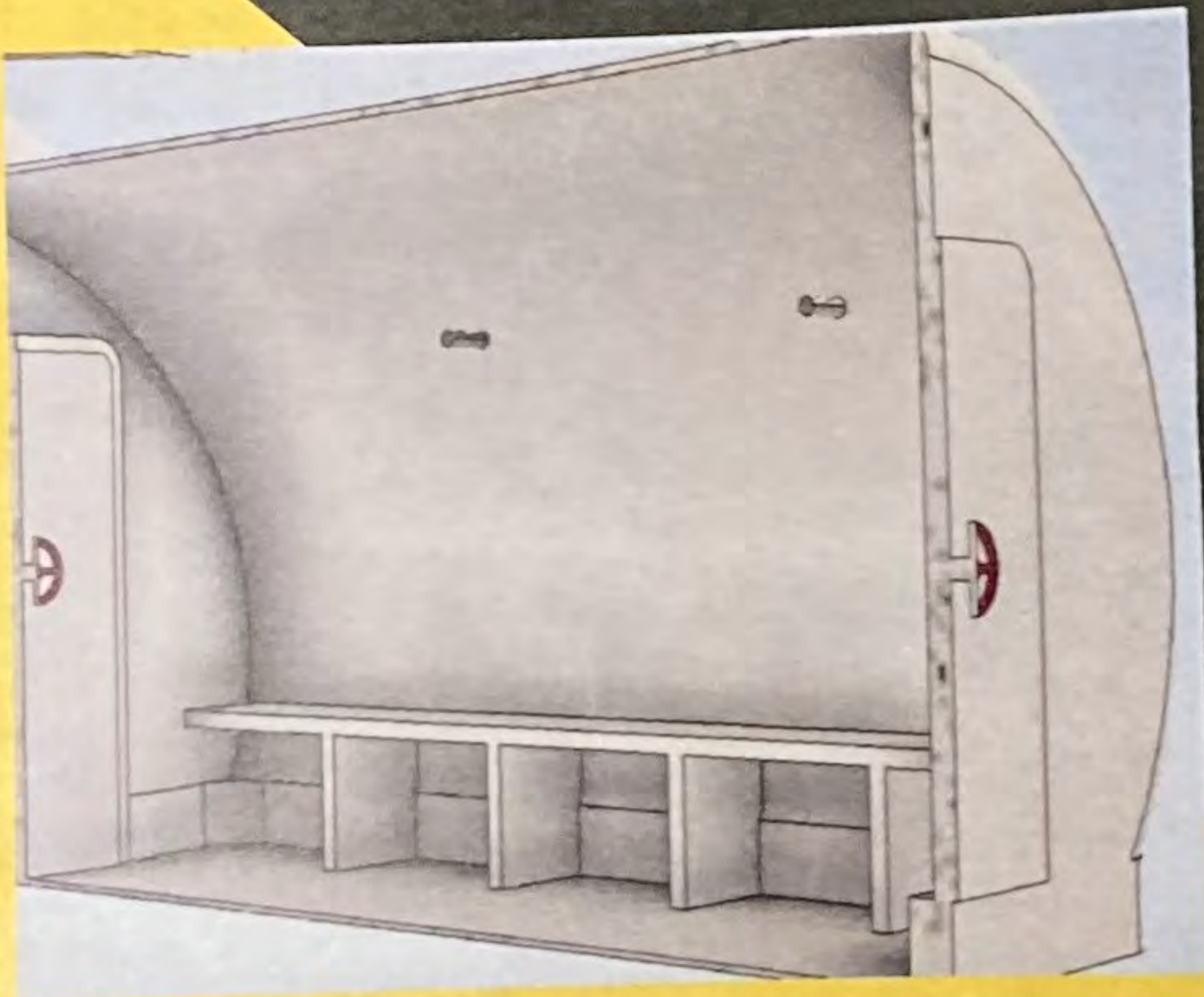
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Lunar Habitat

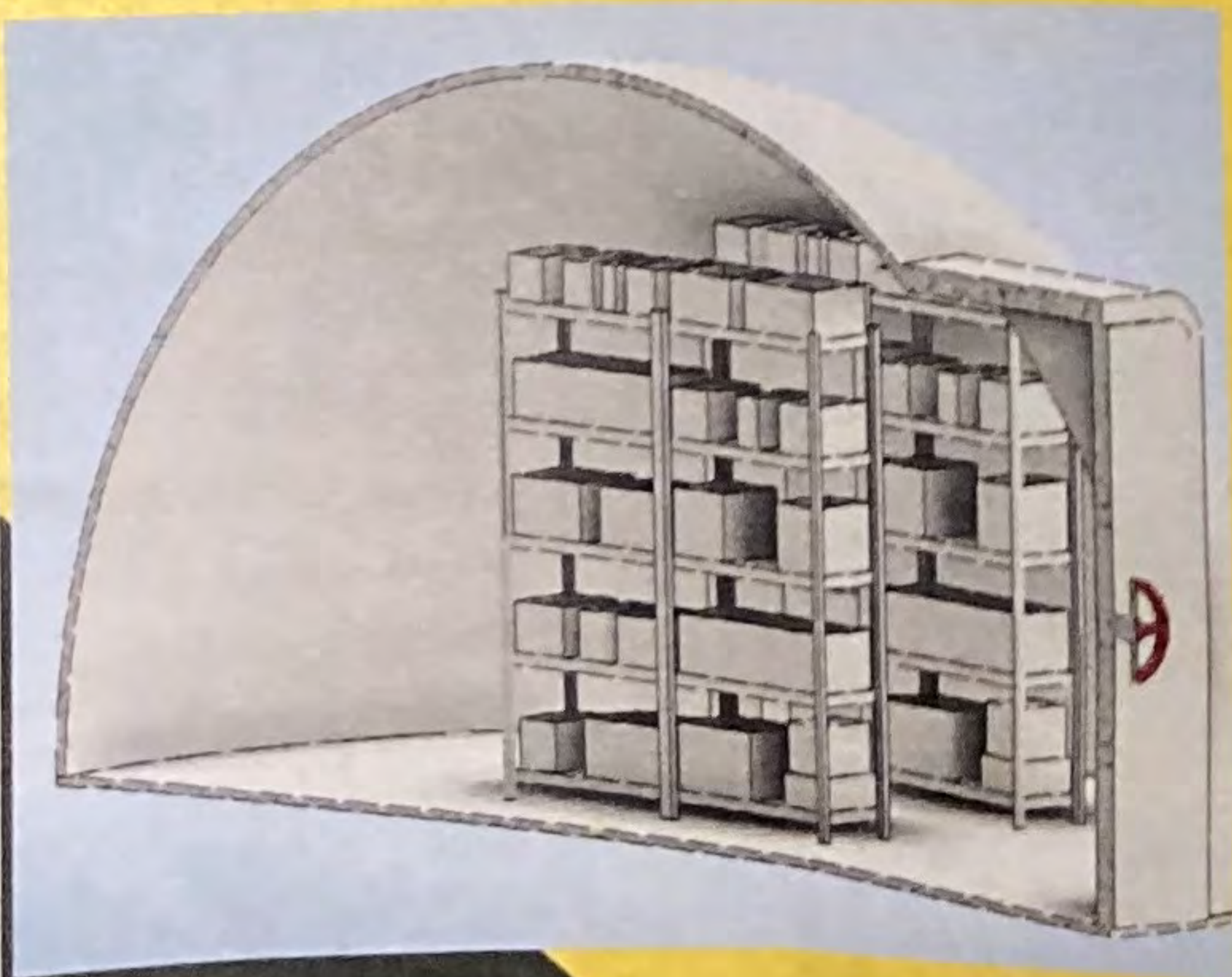


Domanique Turner, Lee Head, Connor Wood

AIRLOCK



STOWAGE



Contact Us

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Connor Page- 100054639@ccsid.net



NASA
HUNCH
High school students United with NASA to Create Hardware

LUNAR HABITAT

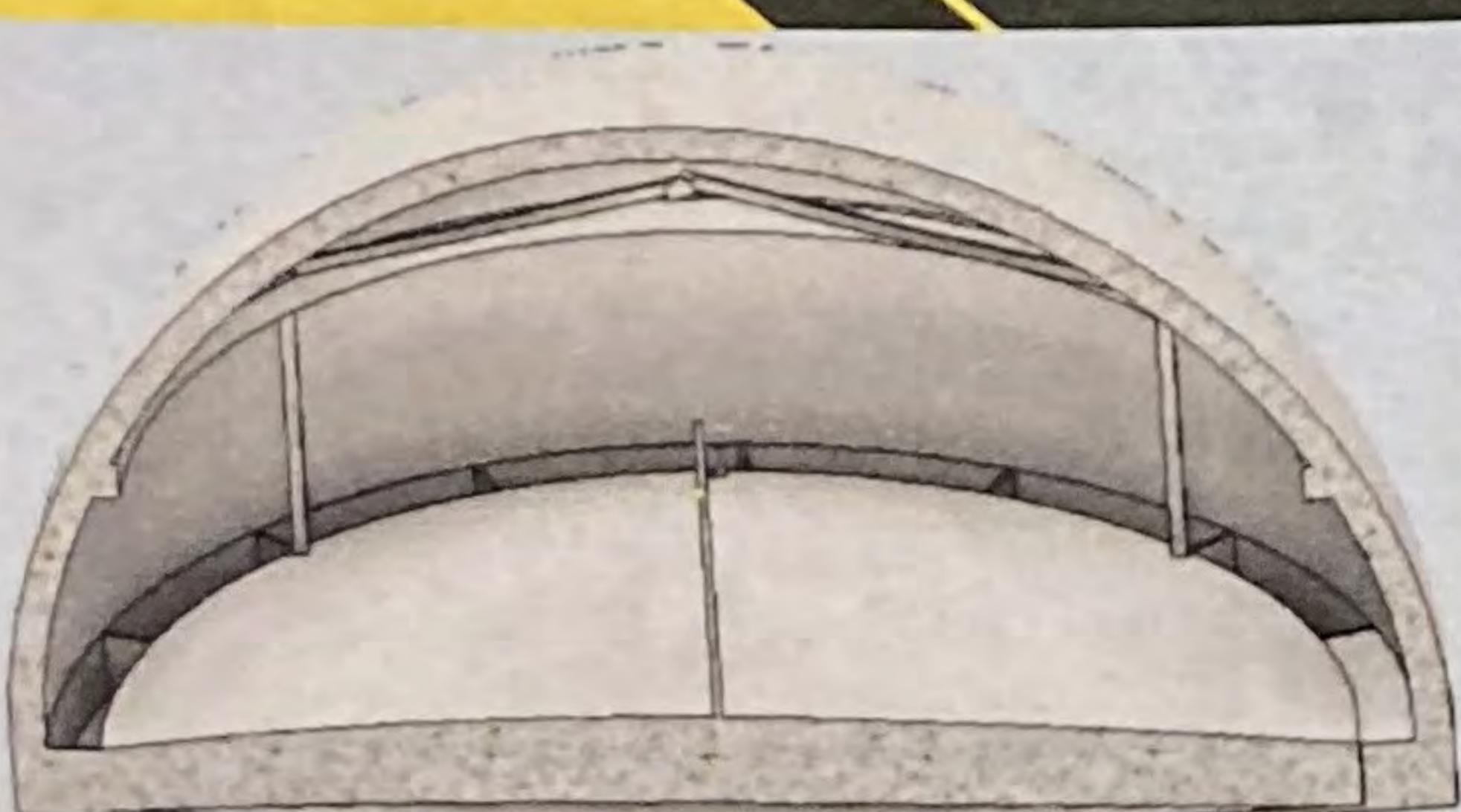
CREATED BY LANDON
TREVILLION AND
CONNOR PAGE
CLEAR CREEK HIGH
SCHOOL

2305 East Main Street, League
City TX 7573
Instructor: Mr. Merrit

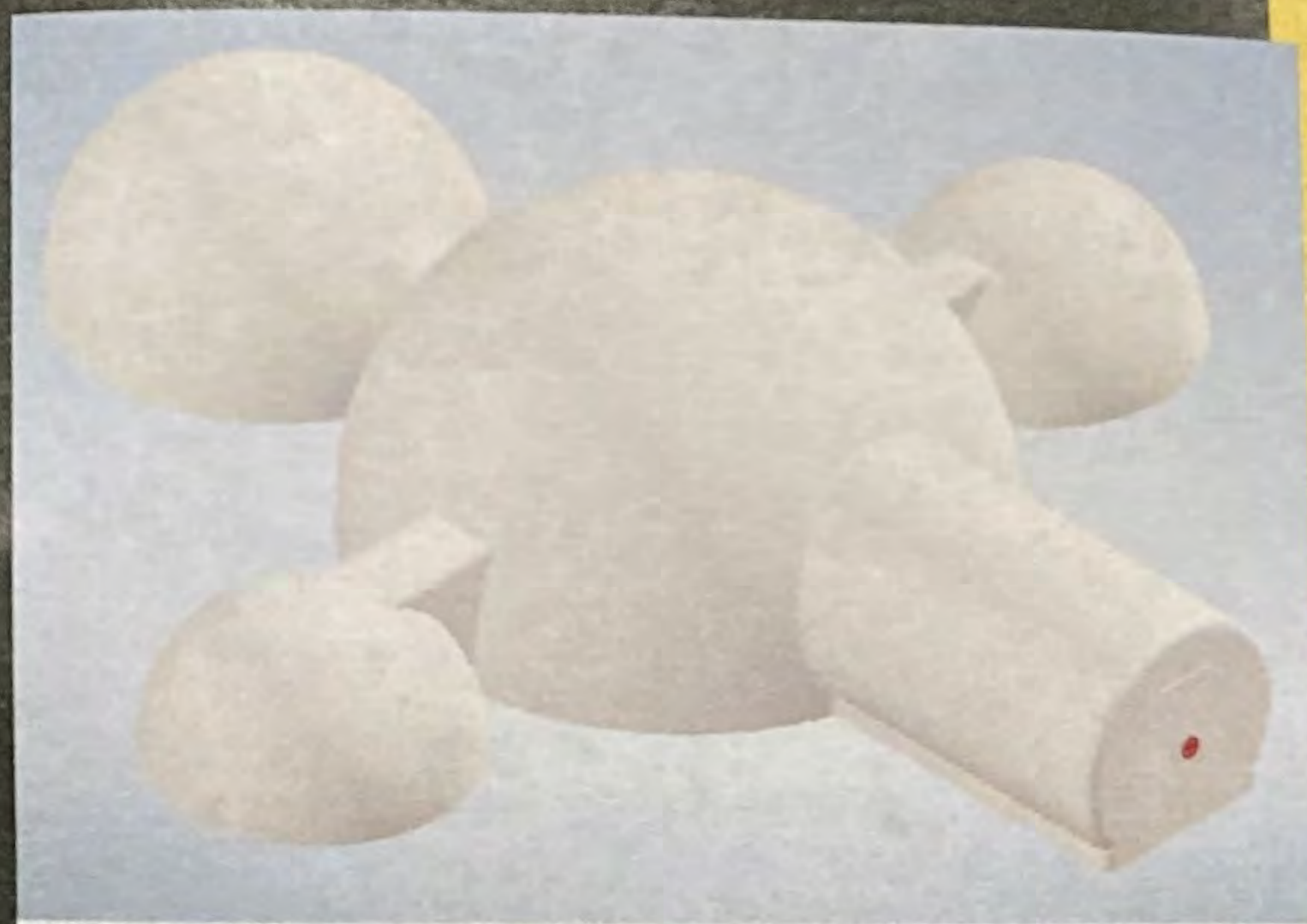
Research

For our first two weeks of research we had to figure out where we had to organize everything in each dome. We thought about having two floors for more space, but we decided on only having one.

BAMBOO DOME



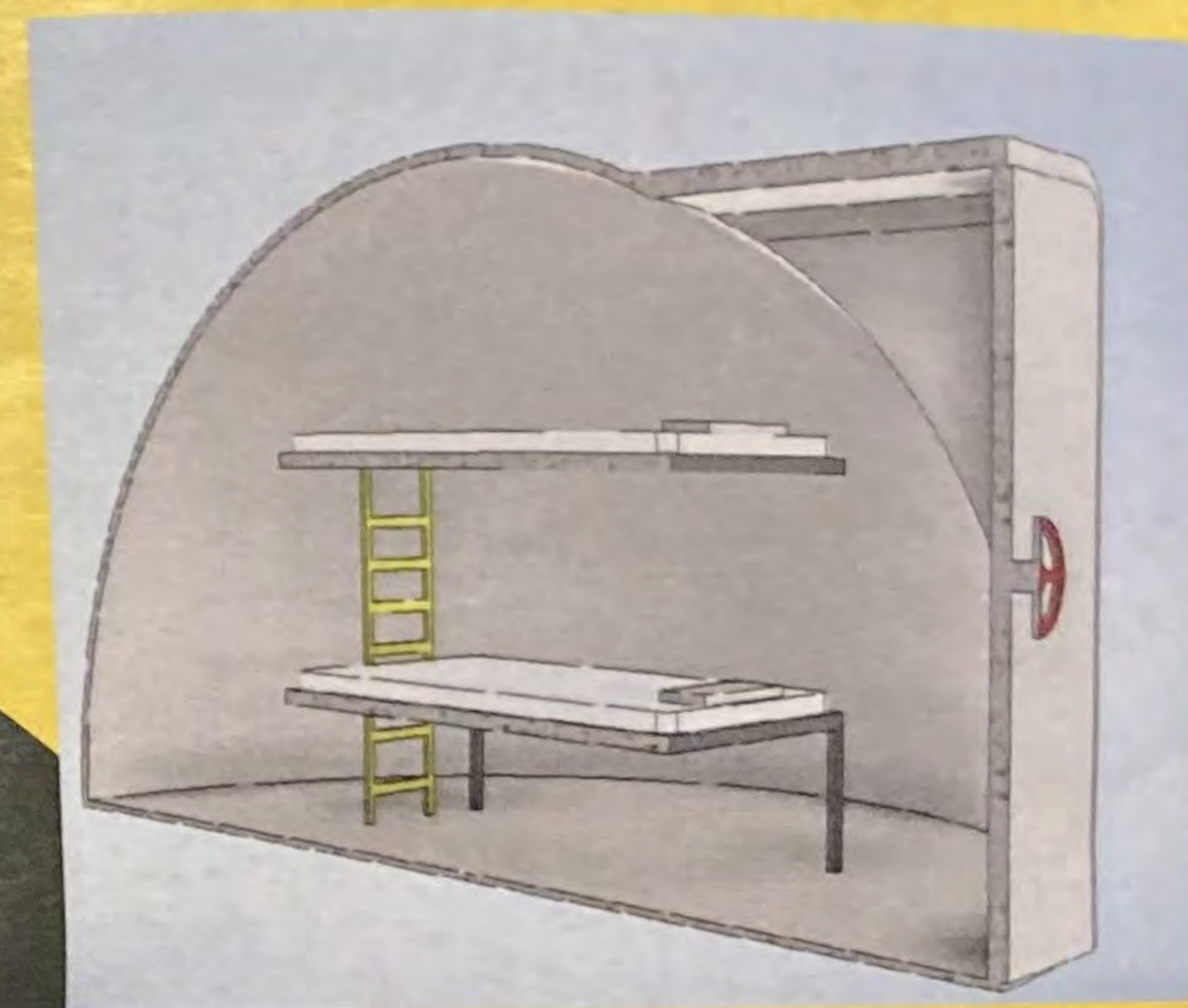
Project



Problem statement

The objective of our project is to Develop a Virtual Reality, multi-room, lunar habitat that allows viewers to see the dirt covered outside and the inside of the habitat with its assortment of equipment and supplies. This will help engineers and astronauts visualize the kind of work that needs to be done for this future living space.

SLEEPING QUARTERS



Background

For the upcoming Artemis program, astronauts will be returning to the moon and establish a permanent presence, which will require the design and implementation of a lunar habitat. But before that becomes a reality, astronauts will need to be trained and prepared for lunar habitation, which is the main purpose of this project

Mission Goal

Our goal is how do we design a habitat that is both functional and contains all of the necessary components in a compact space for sustainable lunar living, while also being comfortable for astronauts to live in?



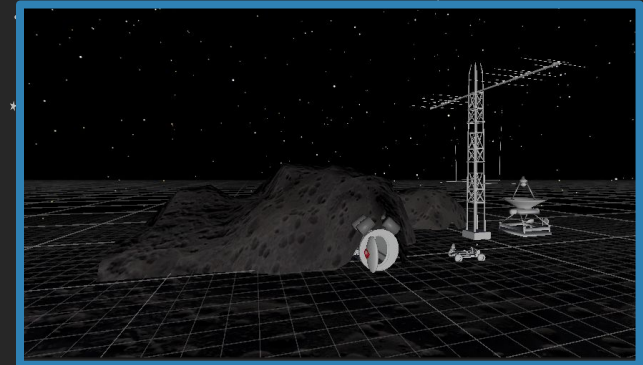
Contact Us

We are a dedicated, four-man team located in Council Rock High School South in Holland PA. For any questions, comments, or concerns, please contact us at crslunarhabitat@gmail.com

**SCAN ME FOR MORE
VIDEOS AND EXTRAS**



VR LUNAR HABITAT



Council Rock High School
South

- Brody Hanejko
- Artur Kis
- Jacob Lane
- Michael Murphy

Teacher: Dr. Christine Marsden

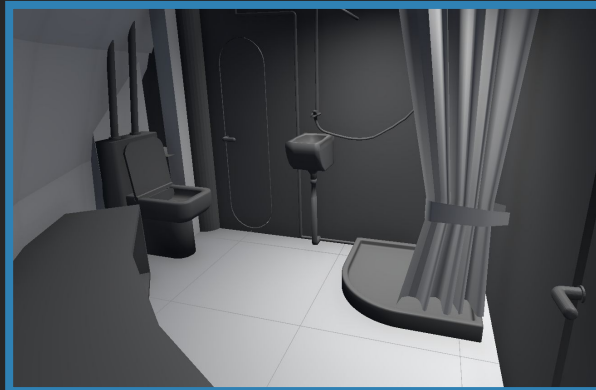
Materials

- ✓ Oculus VR headset
- ✓ Unity Engine v2022.3.4f1
- ✓ Github repository
- ✓ Any computer

Key Features

- ✓ 2 sleeping quarters
- ✓ Bathroom
- ✓ ECLASS
- ✓ Light and climate controls
- ✓ Exercise equipment
- ✓ Communications center
- ✓ Computers, laptops
- ✓ Hatches
- ✓ Kitchen
- ✓ Lots of stowage
- ✓ Greenhouse
- ✓ AND MORE!

Pictures



Video Demonstration

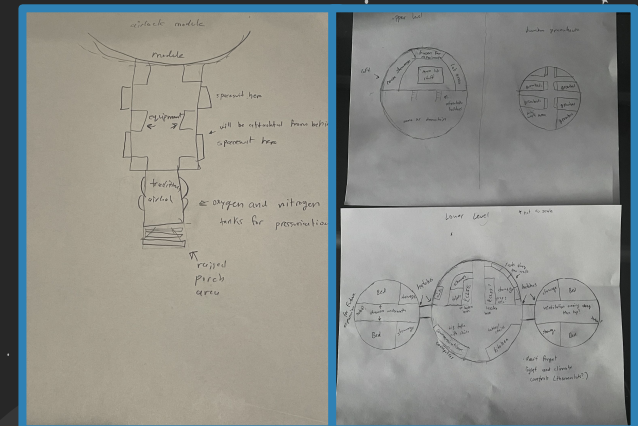


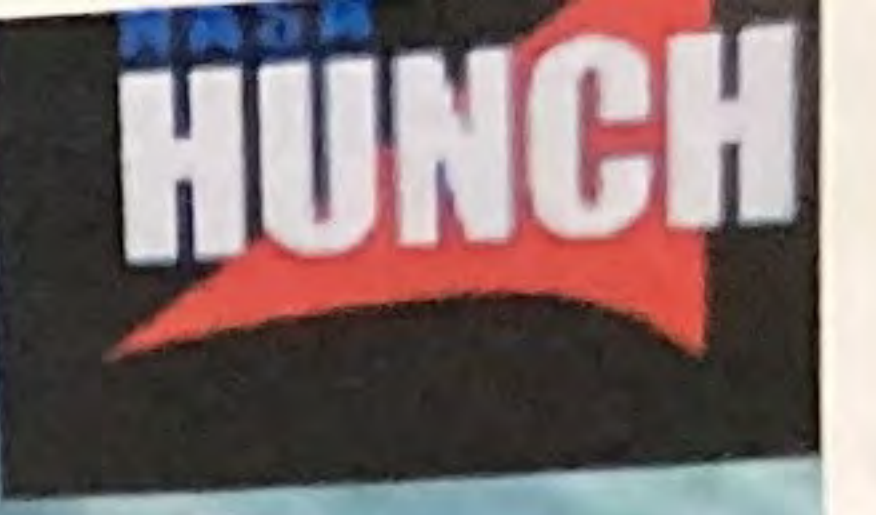
Areas of Research

For our project we had to consider what kinds of things can affect astronauts while they are on the moon. We have to build with these factors in mind. Some elements that were researched but not limited too are:

- Lunar Gravity
- Radiation protection
- Electricity generation
- Type of antennas need
- Ventilation
- Growing plants in space
- Other existing lunar habitat concepts and proposals
- And more!

Sketches





QR codes

This is a QR code to bring you to a website with all of our videos on it



This is a QR code to score our team



Gia Tovar

100045328@ccisd.net

281-702-2020



Wyatt Siebenlist

100044642@ccisd.net

832-915-8136



Lunar Habitat

By: WYATT SIEBENLIST
AND GIA TOVAR

For

Instructor

Robin Merritt

Clear Creek High School

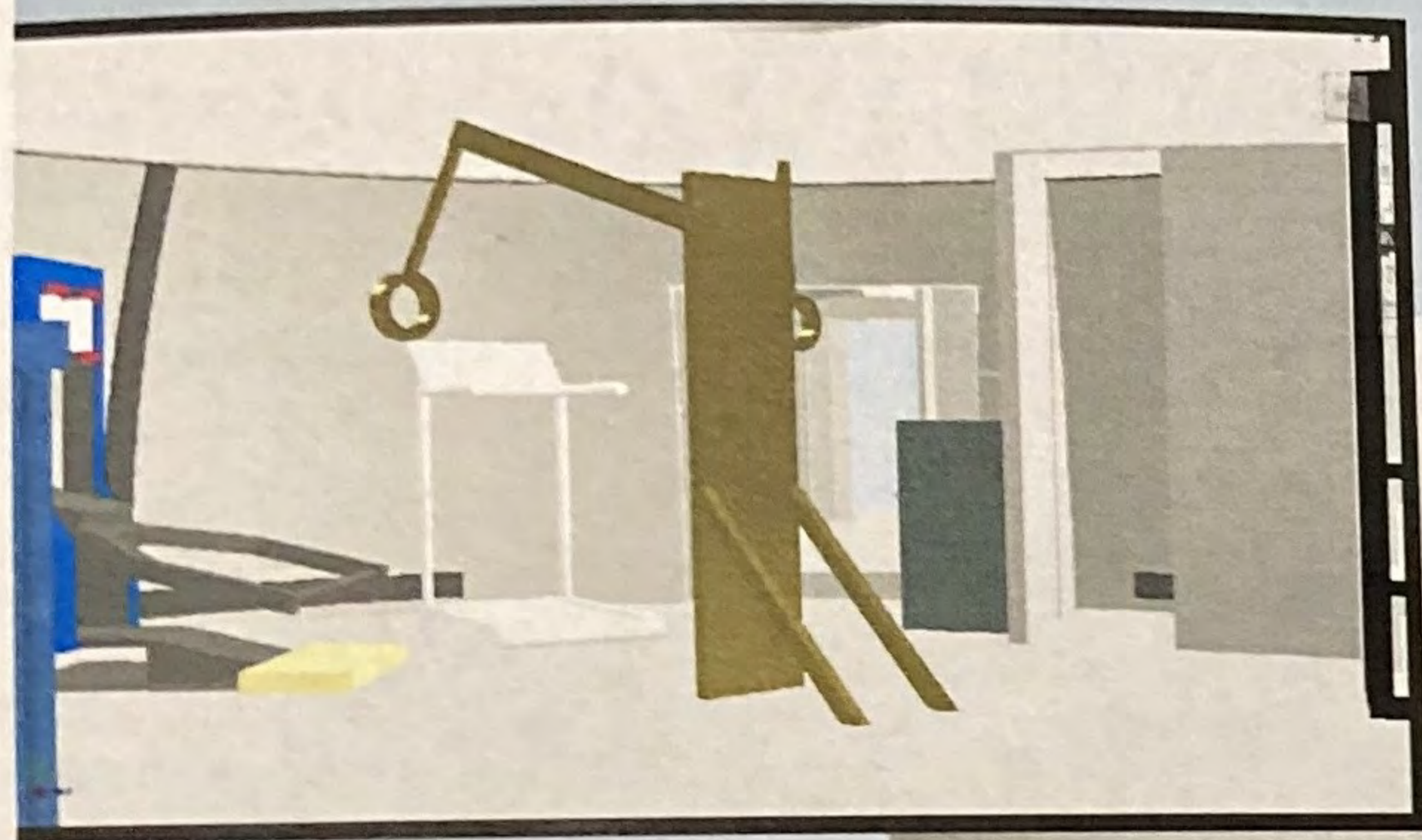
Civil and Architecture

Clear Creek ISD

League City Texas

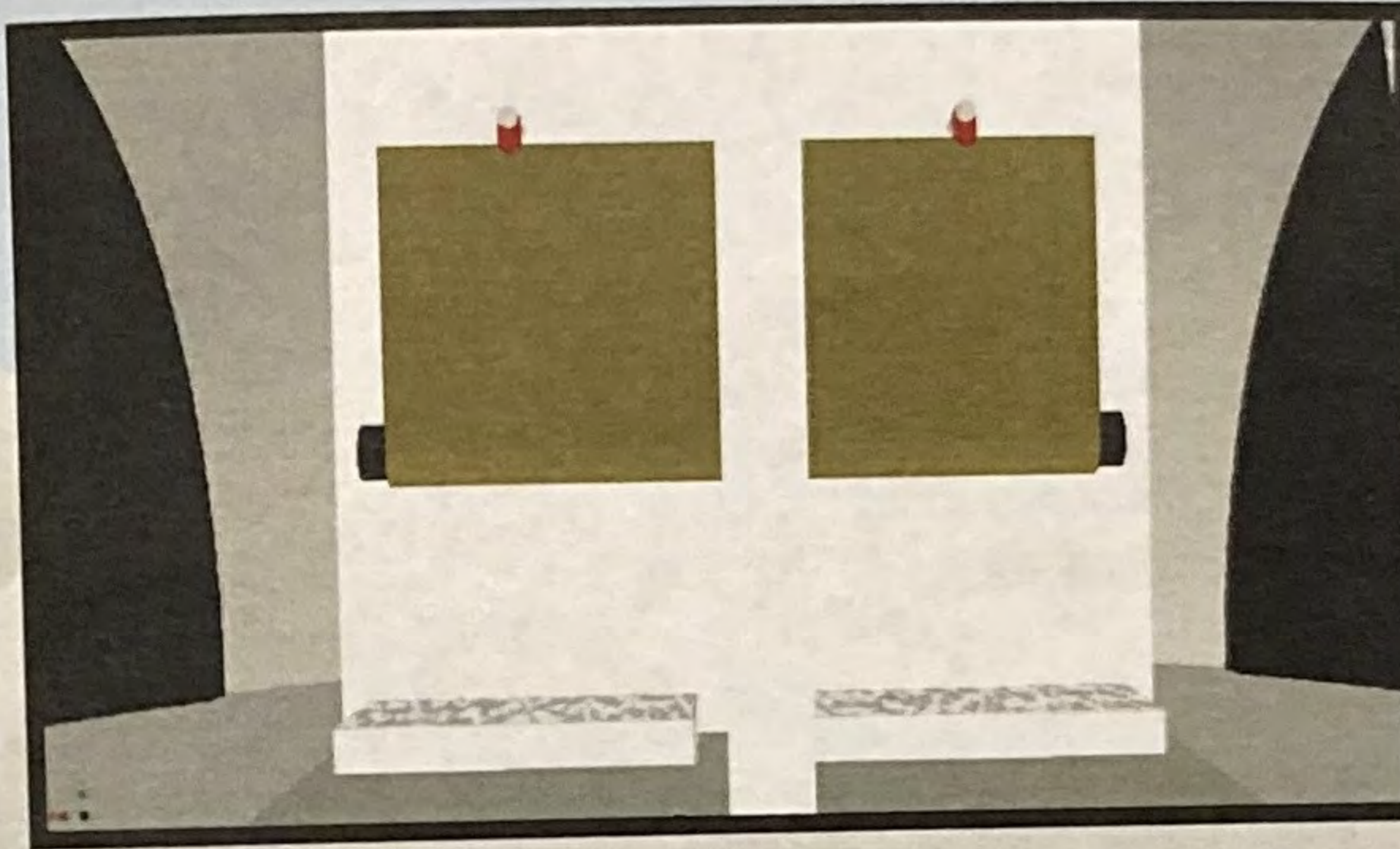
2503 E main Street League
City

Main Dome



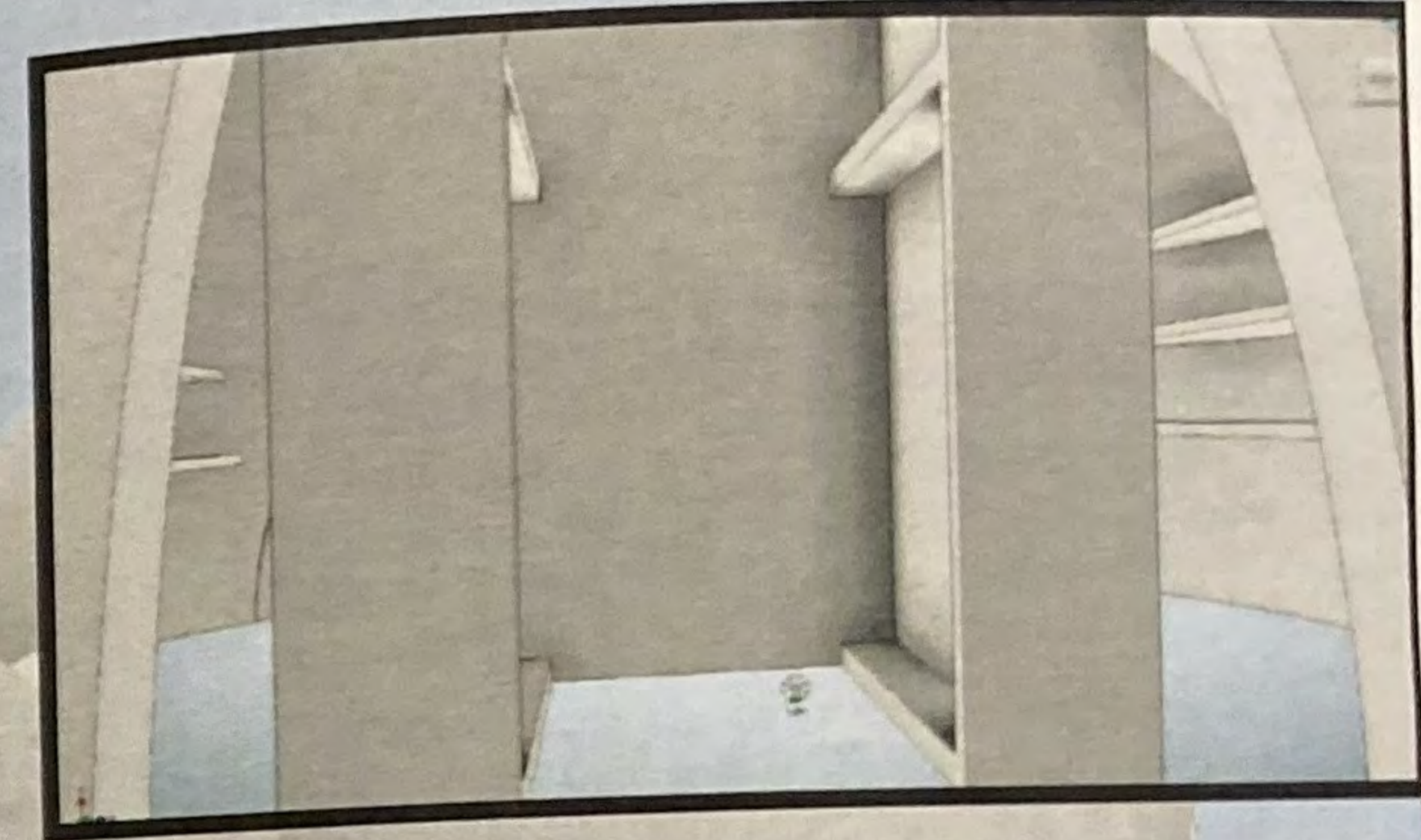
This is a view of the main dome with exercise equipment.

Sleeping Dome



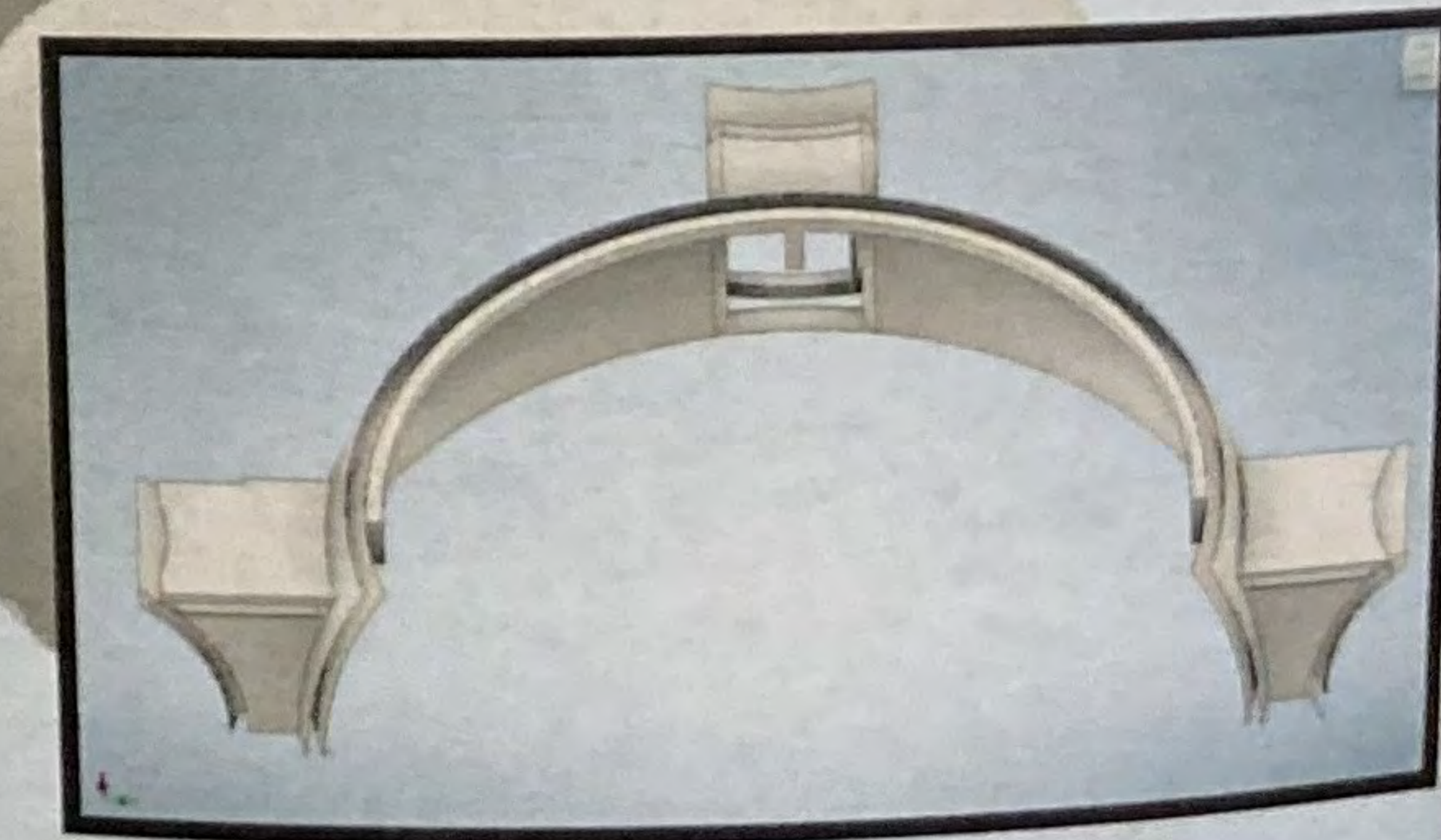
This is the front view of the sleeping dome.

Stowage Dome

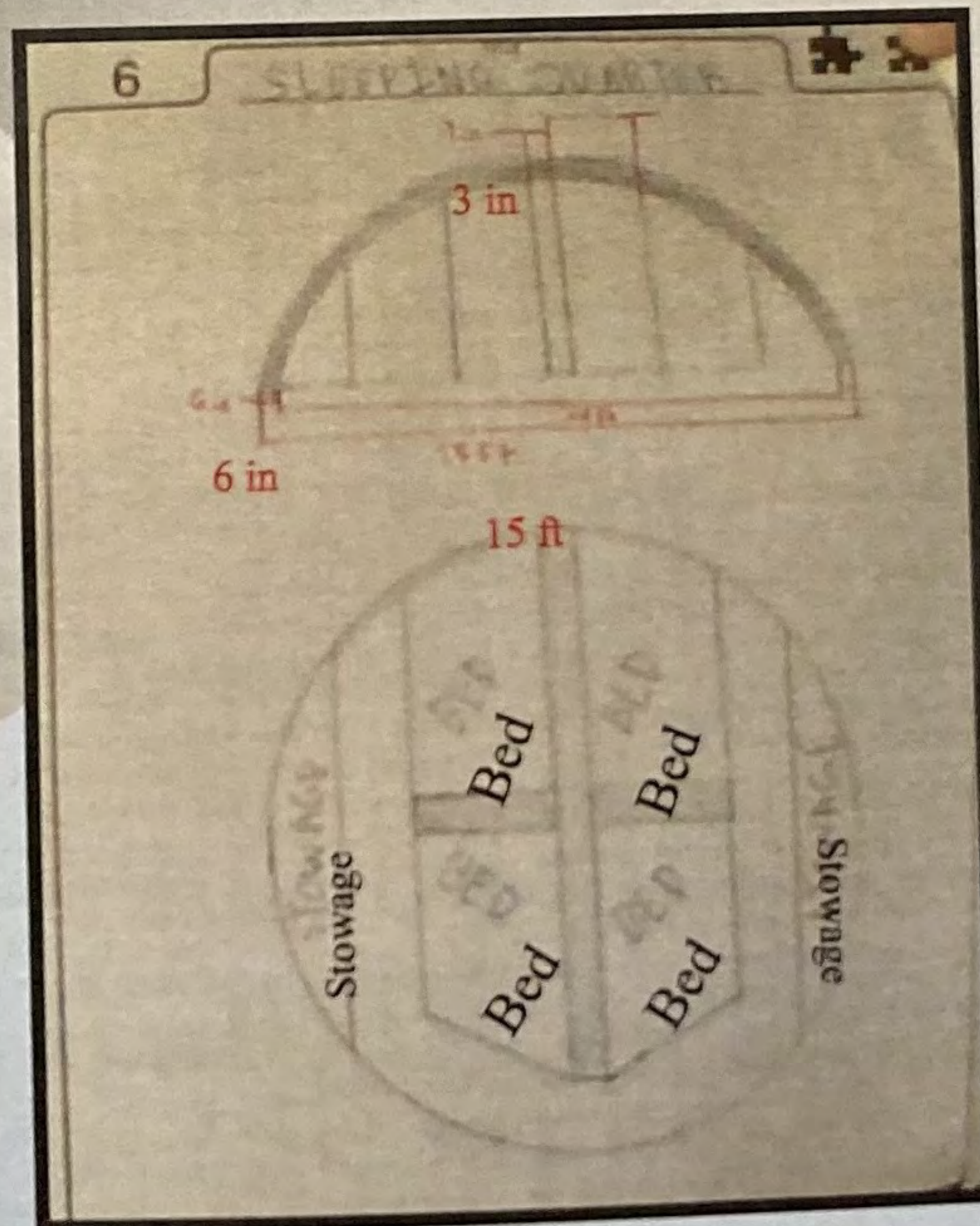


This is the front view of the stowage dome.

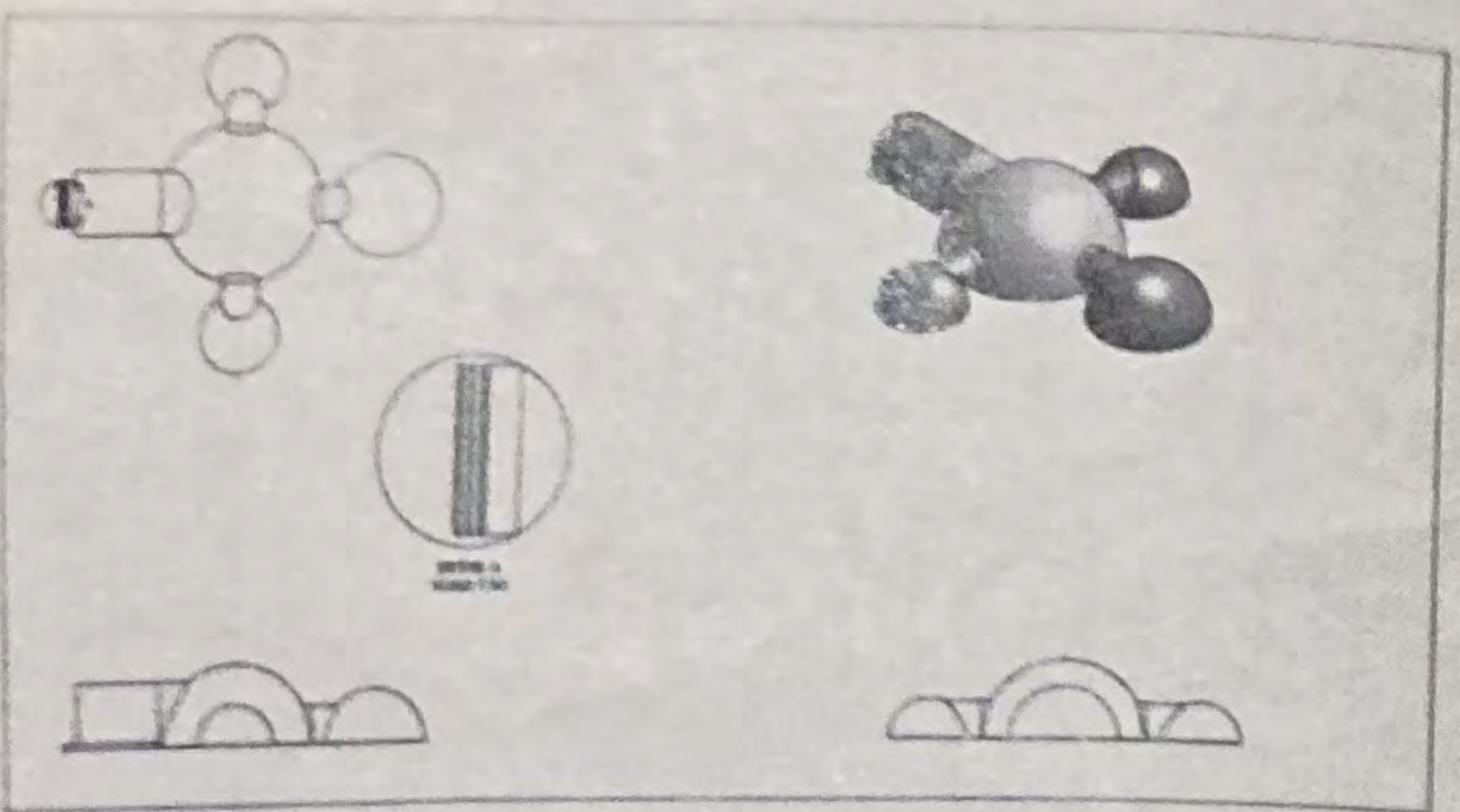
Vents and Hatches



This is a view of the main dome's upper story communications center.



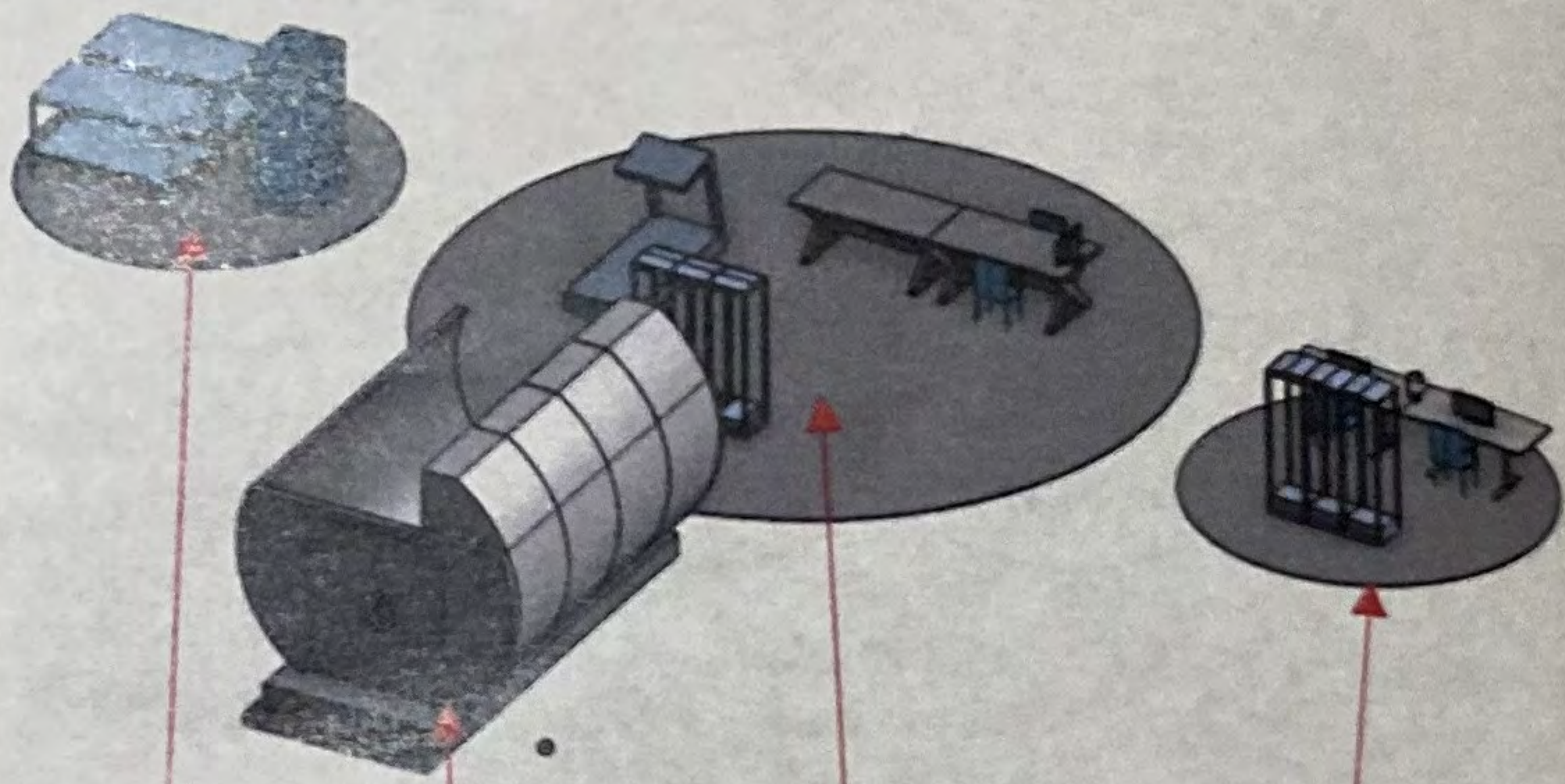
This is the stowage dome sketch.



Solutions to our Problem

We are developing a game-like VR experience that allows the user to see and interact with the inside of the Lunar Habitat.

The VR experience is being made on Unity. We are using an online CAD software called Onshape, we will export those models and import them into Blender (3D modeling software) to add textures to them. We will then send them in to Unity where we can then make our Lunar Habitat.

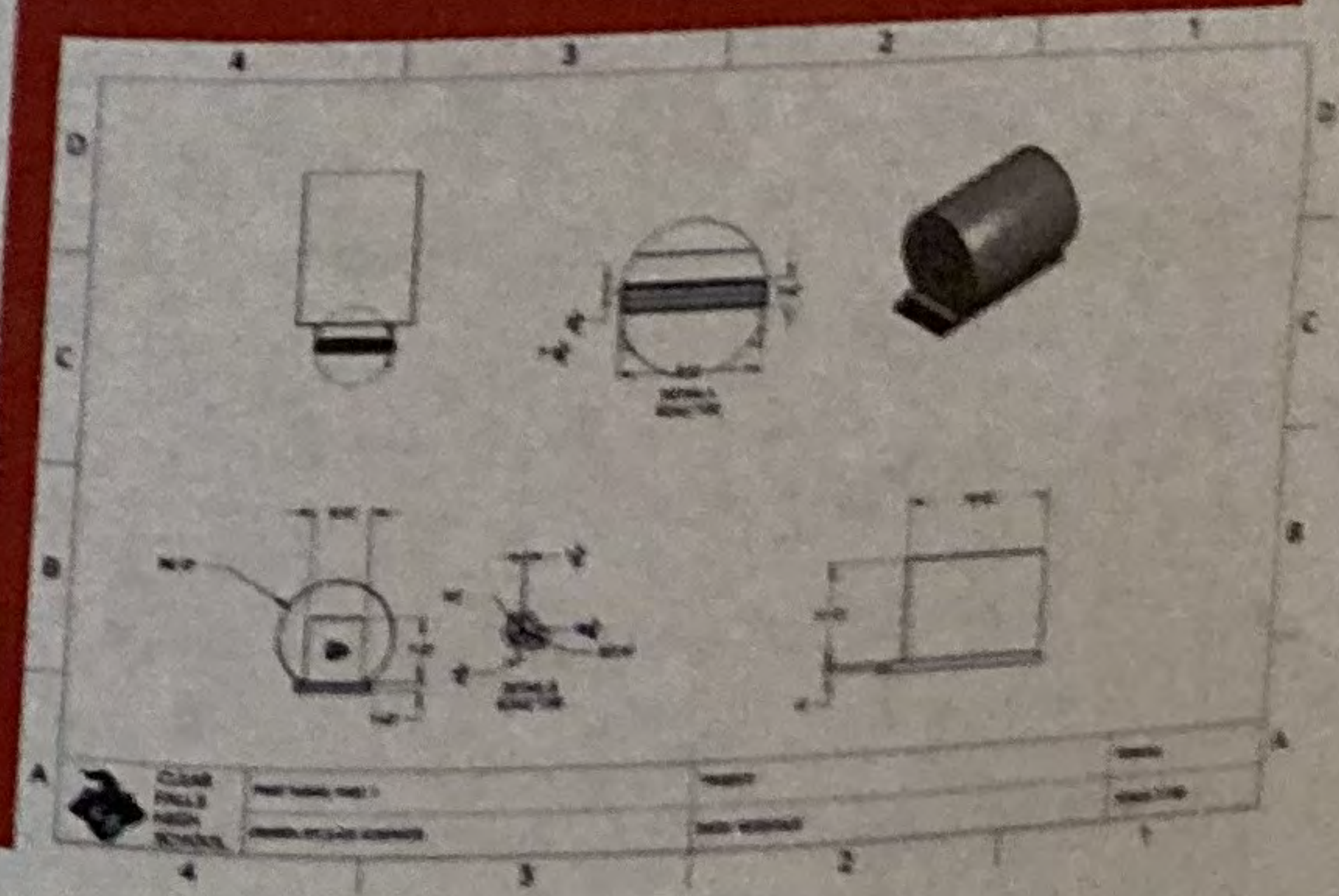
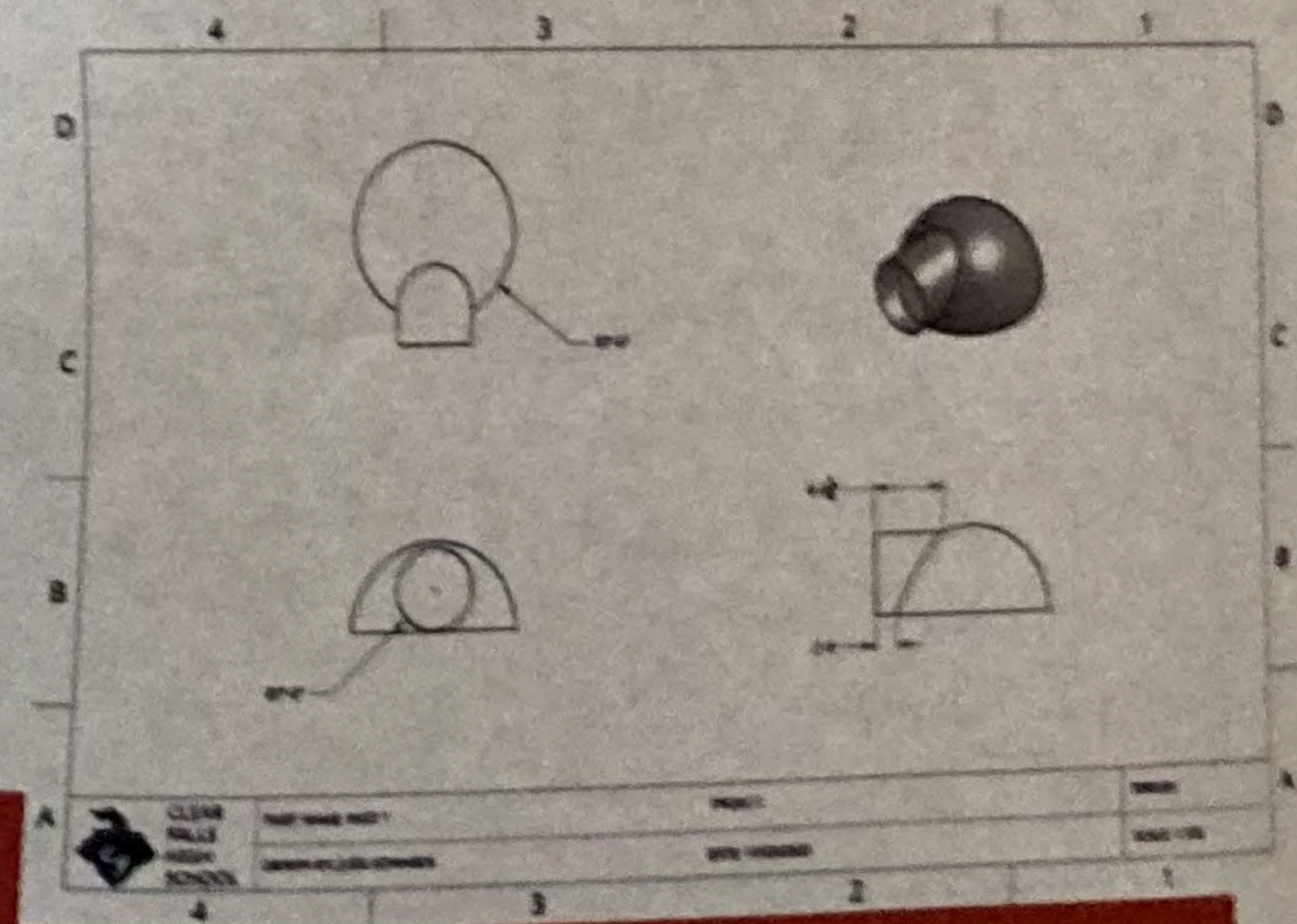
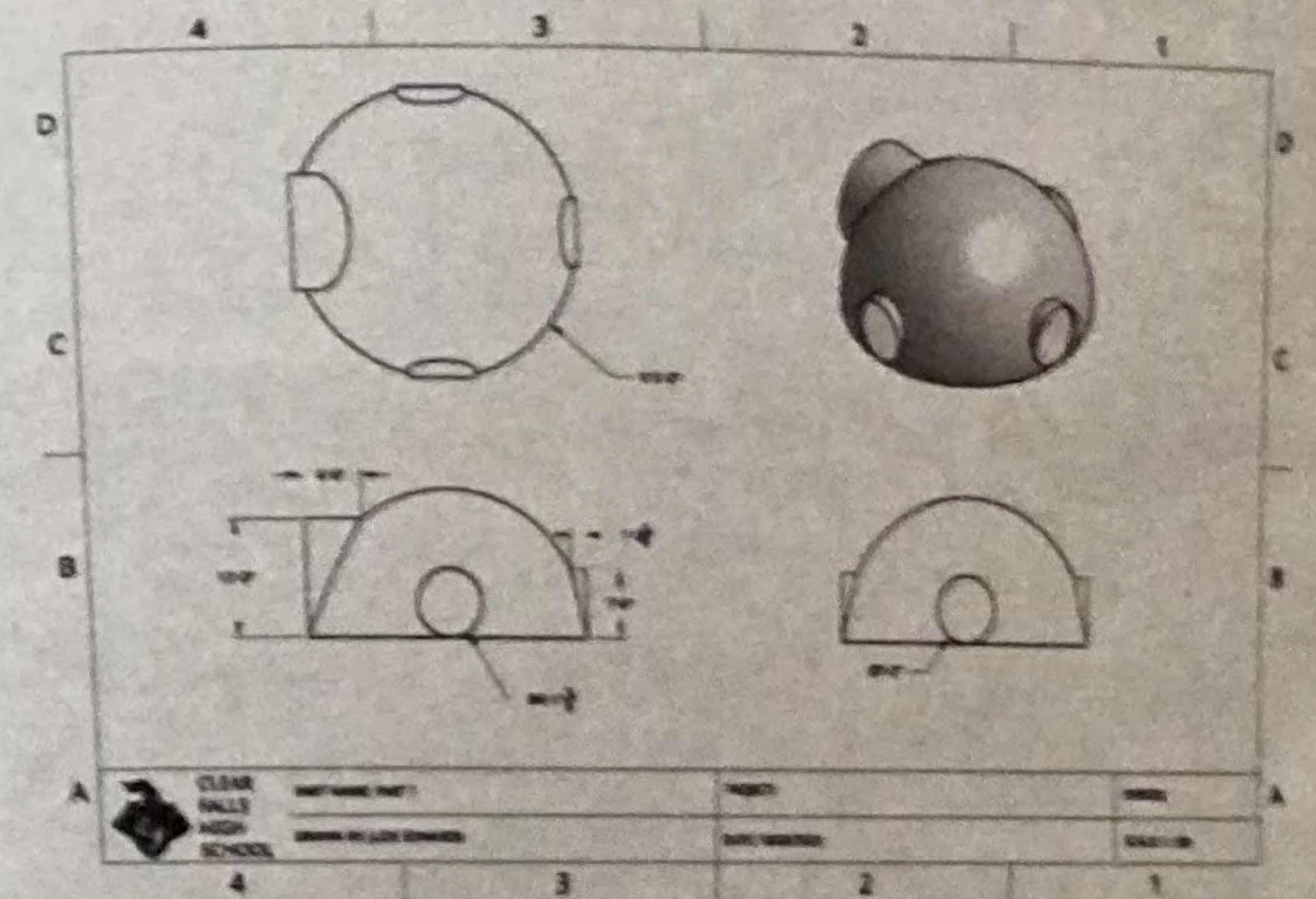
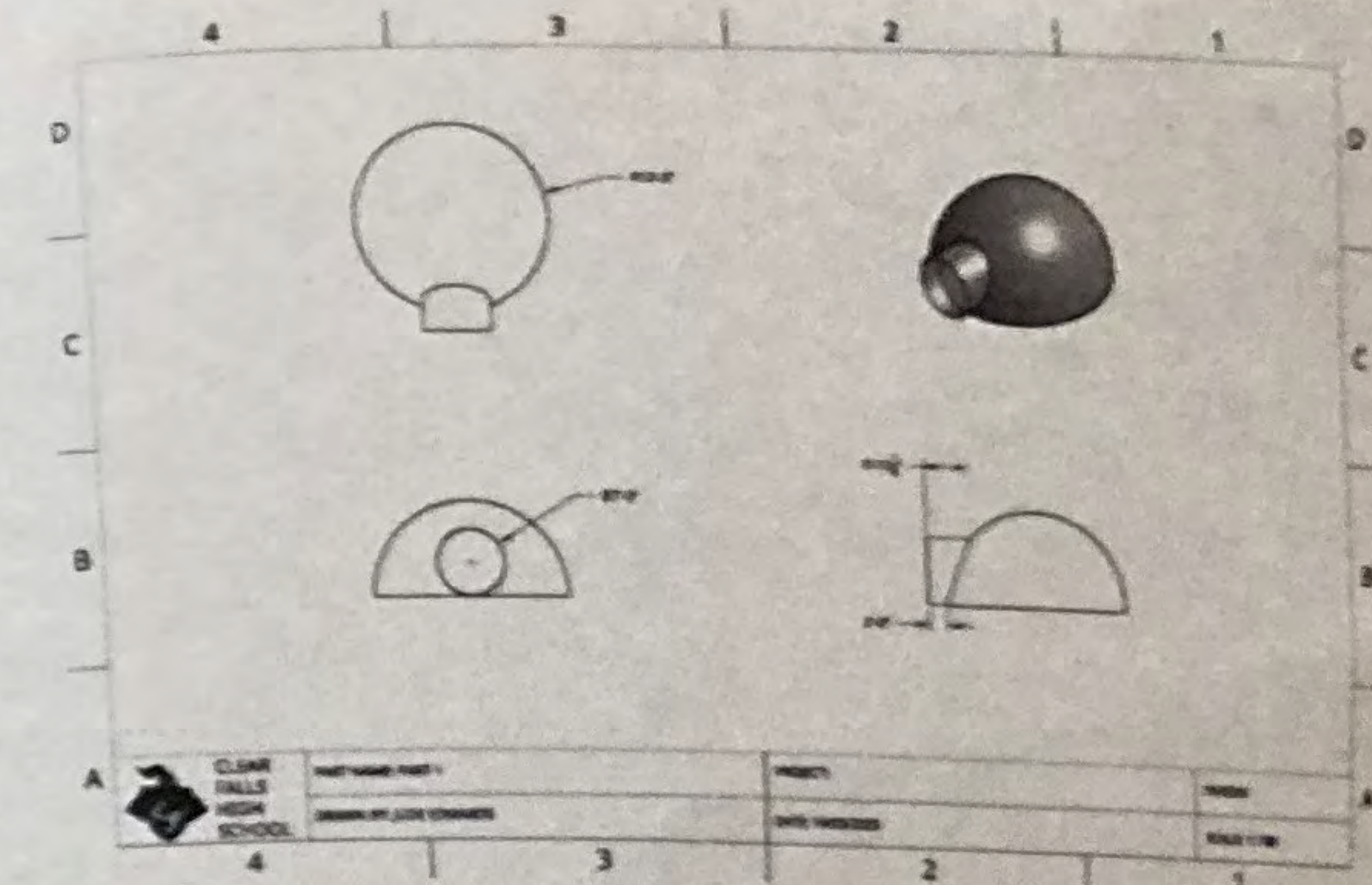


Bedroom module with bedding and a hygiene area

Habitat Module that will allow the astronauts to eat, rest and workout

Air lock that contains four lockers for the astronauts' space suits

A communications/storage area that will allow the astronauts to communicate with earth and store items



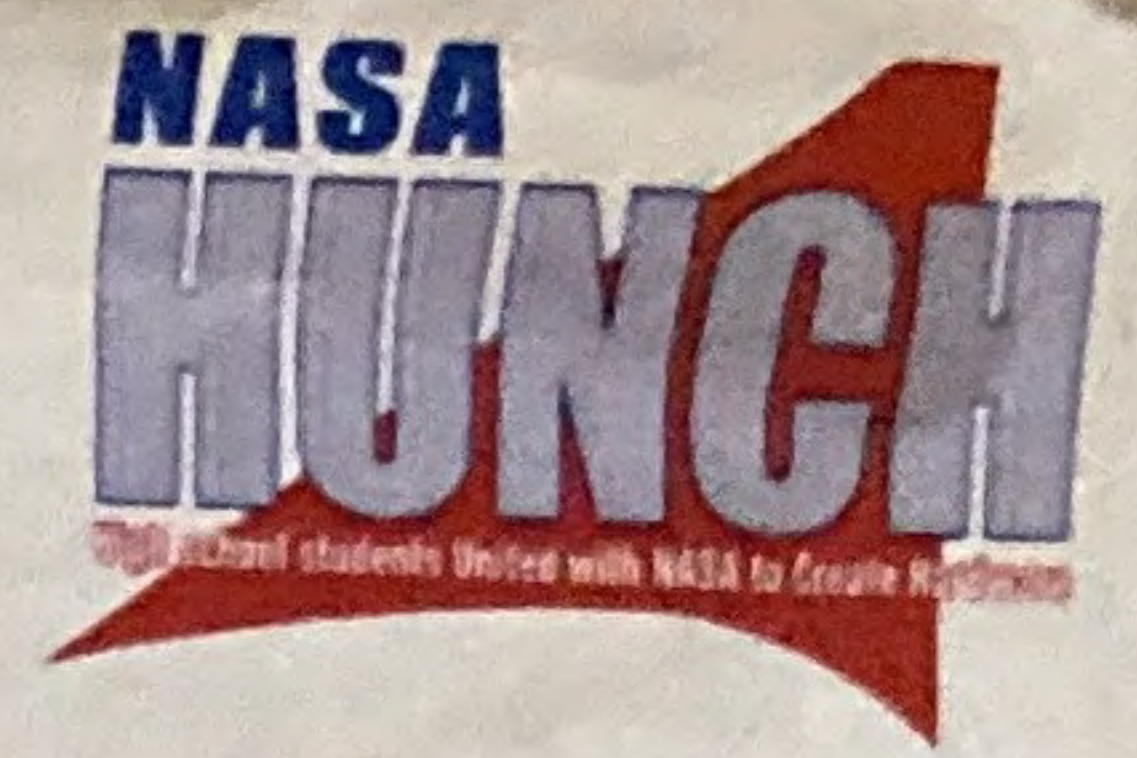
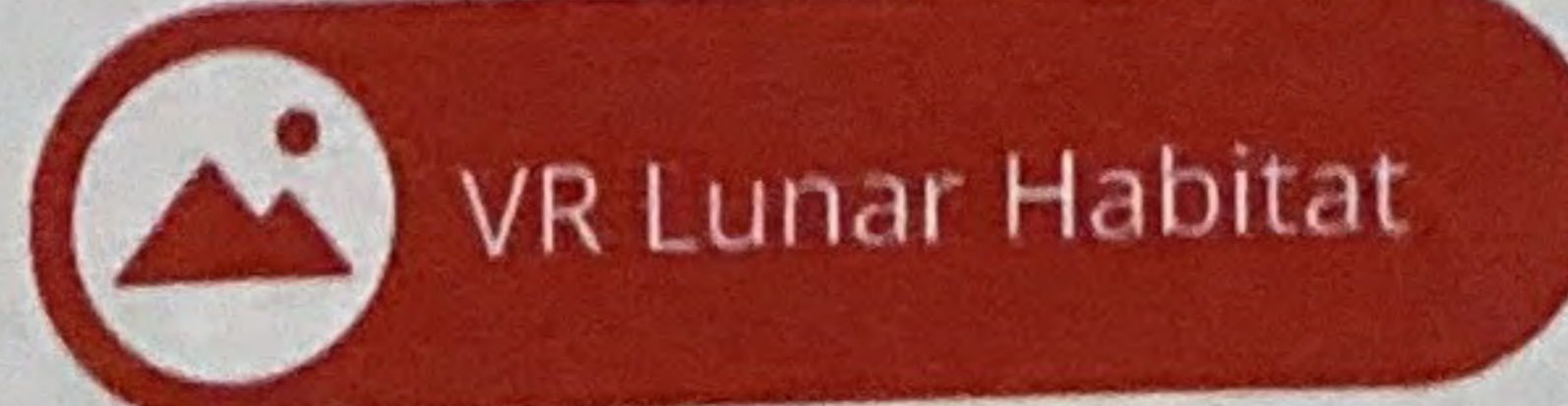
Problem Statement

Nasa is planning to send up to 4 astronauts to the moon in the years 2025 - 2030 and they will need comfortable yet functional sleeping quarters, a living area, storage and locker space in an air lock that fits in the 1389.8 square foot restraint.

The minds behind the project



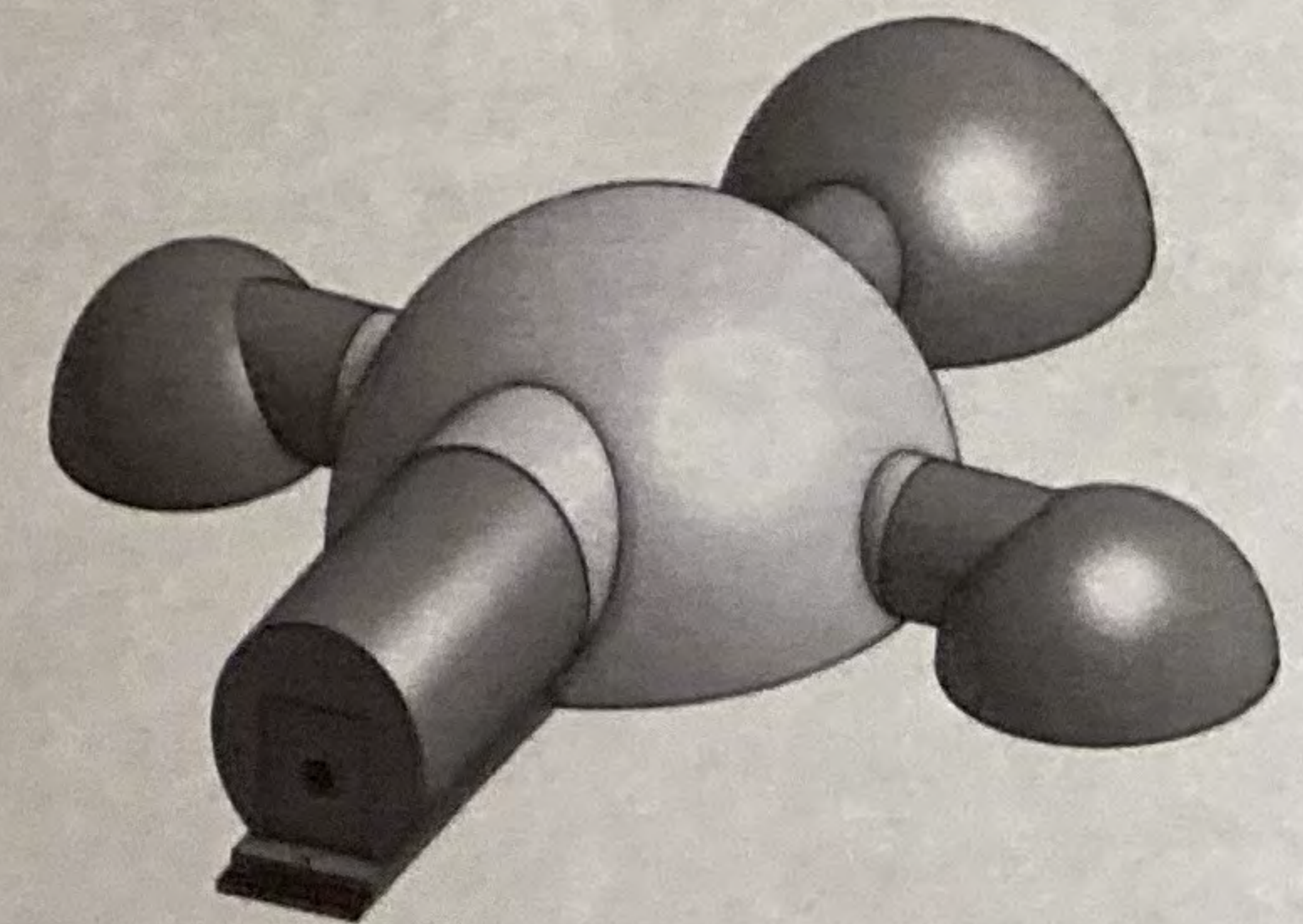
More images of the Lunar Habitat



VR Lunar Habitat

Designed by: Jude Edwards, Thomas Smith and Anthony Raven
Teacher: Trevor Curtis
Clear Falls High School

We were tasked to develop a virtual reality, multi room Habitat that allows viewers to see the inside of the lunar habitat.



Background

For the upcoming Artemis program, astronauts will be returning to the moon and establish a permanent presence, which will require the design and implementation of a lunar habitat. But before that becomes a reality, astronauts will need to be trained and prepared for lunar habitation, which is the main purpose of this project.

Mission Goal

Our goal is how do we design a habitat that is both functional and contains all of the necessary components in a compact space for sustainable lunar living, while also being comfortable for astronauts to live in?

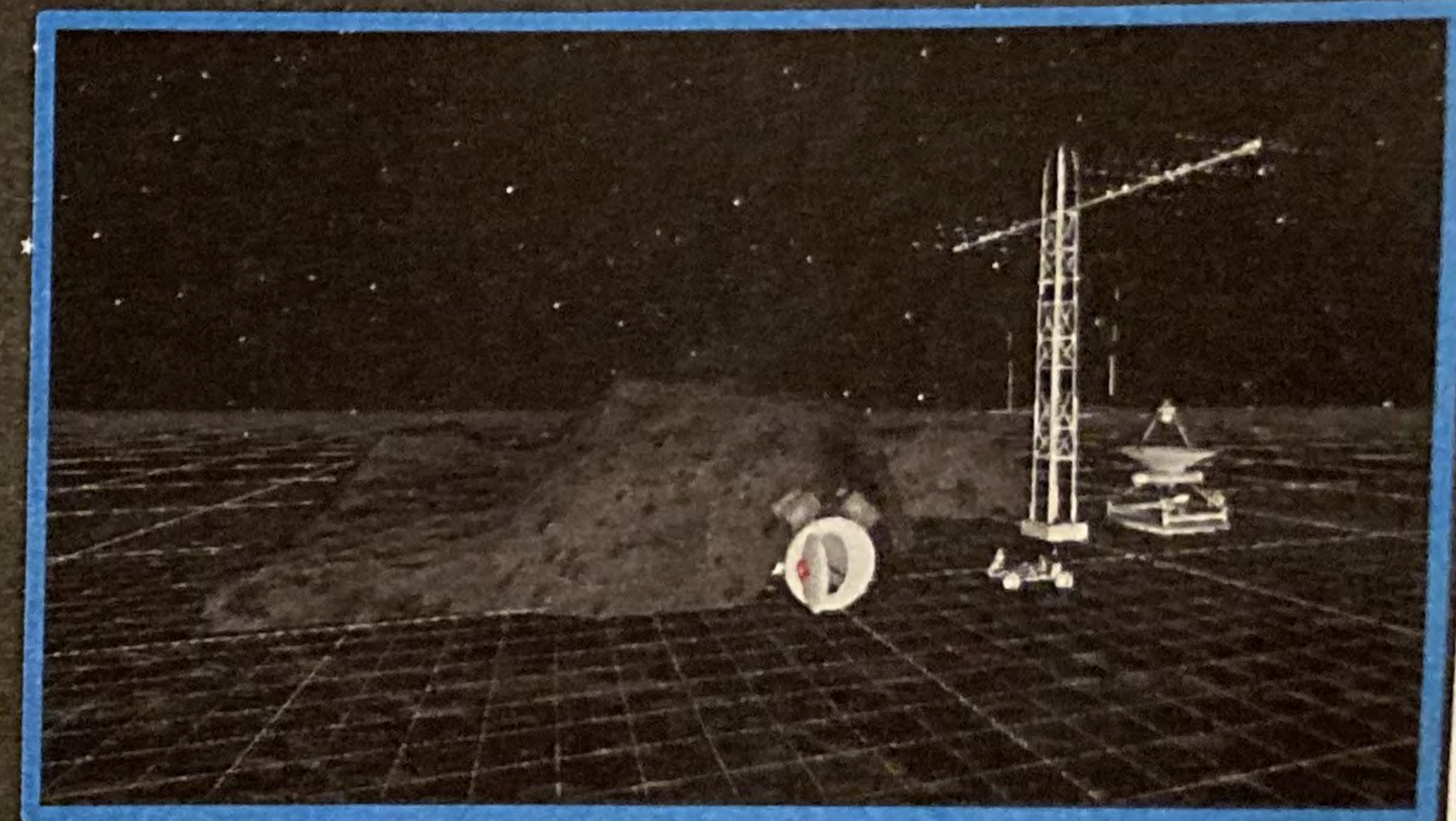
Contact Us

We are a dedicated, four-man team located in Council Rock High School South in Holland PA. For any questions, comments, or concerns, please contact us at crslunarhabitat@gmail.com

SCAN ME FOR MORE
VIDEOS AND EXTRAS



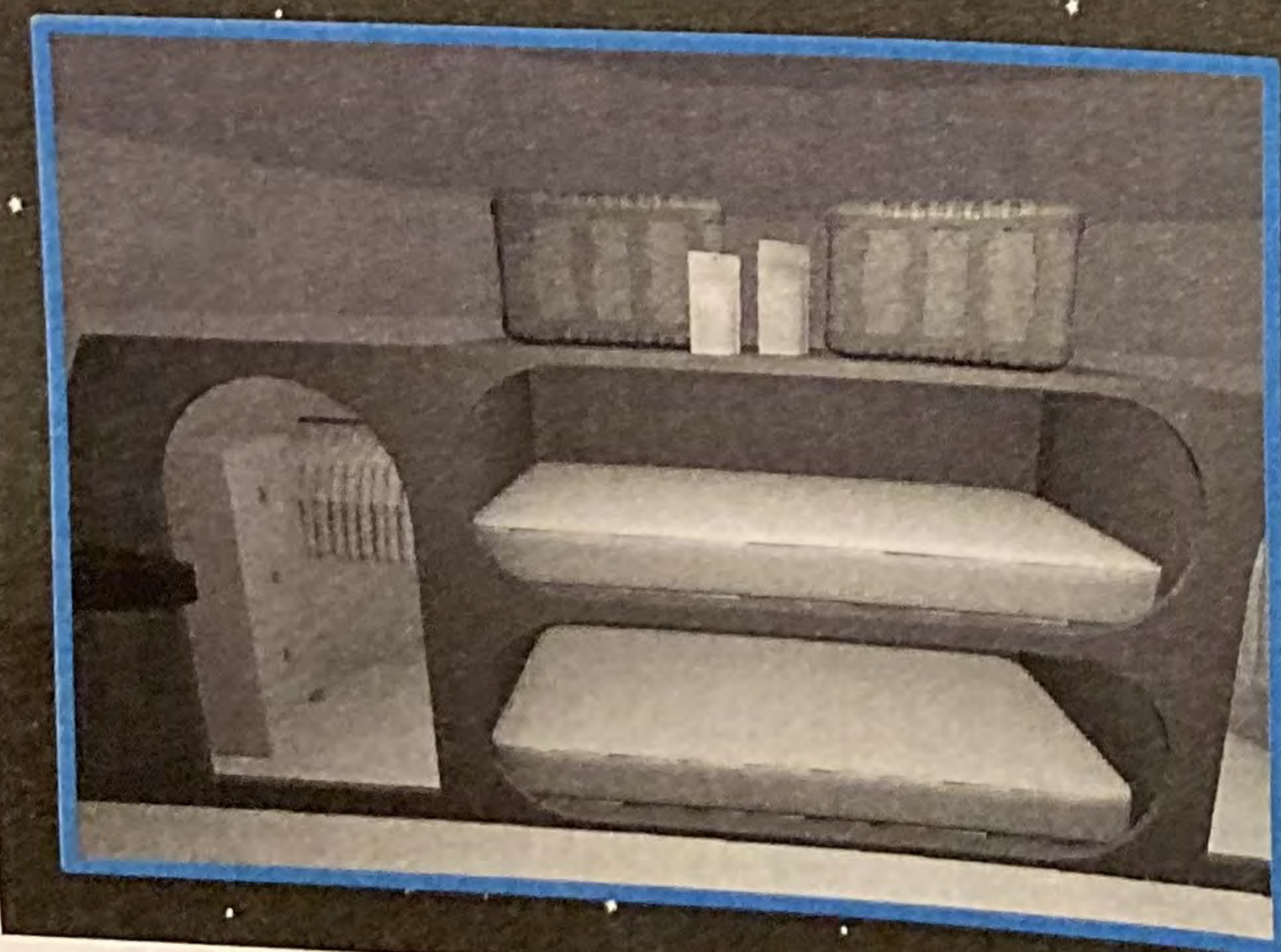
VR LUNAR HABITAT



Council Rock High School
South

- Brody Hanejko
- Artur Kis
- Jacob Lane
- Michael Murphy

Teacher: Dr. Christine Marsden

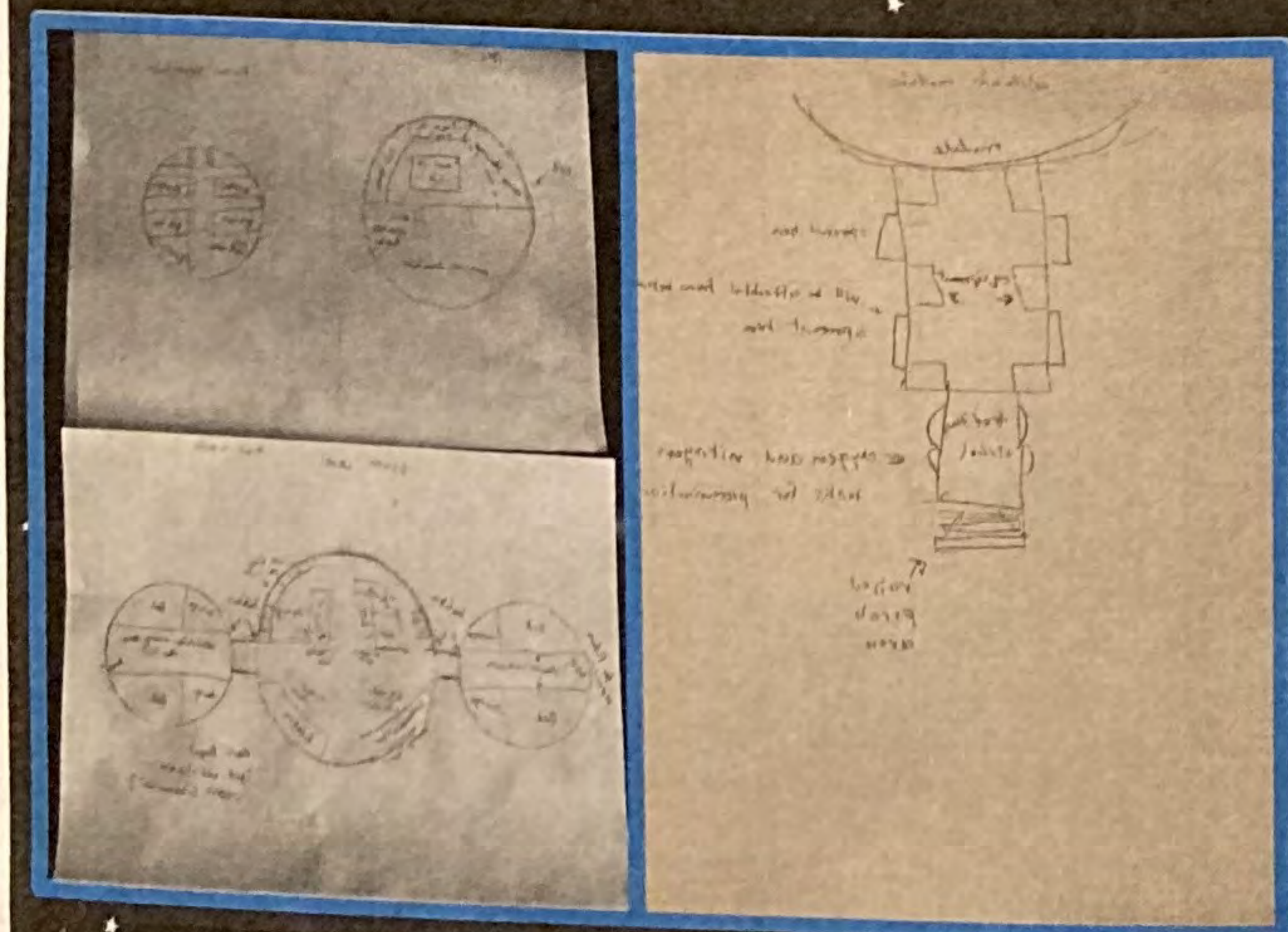


Areas of Research

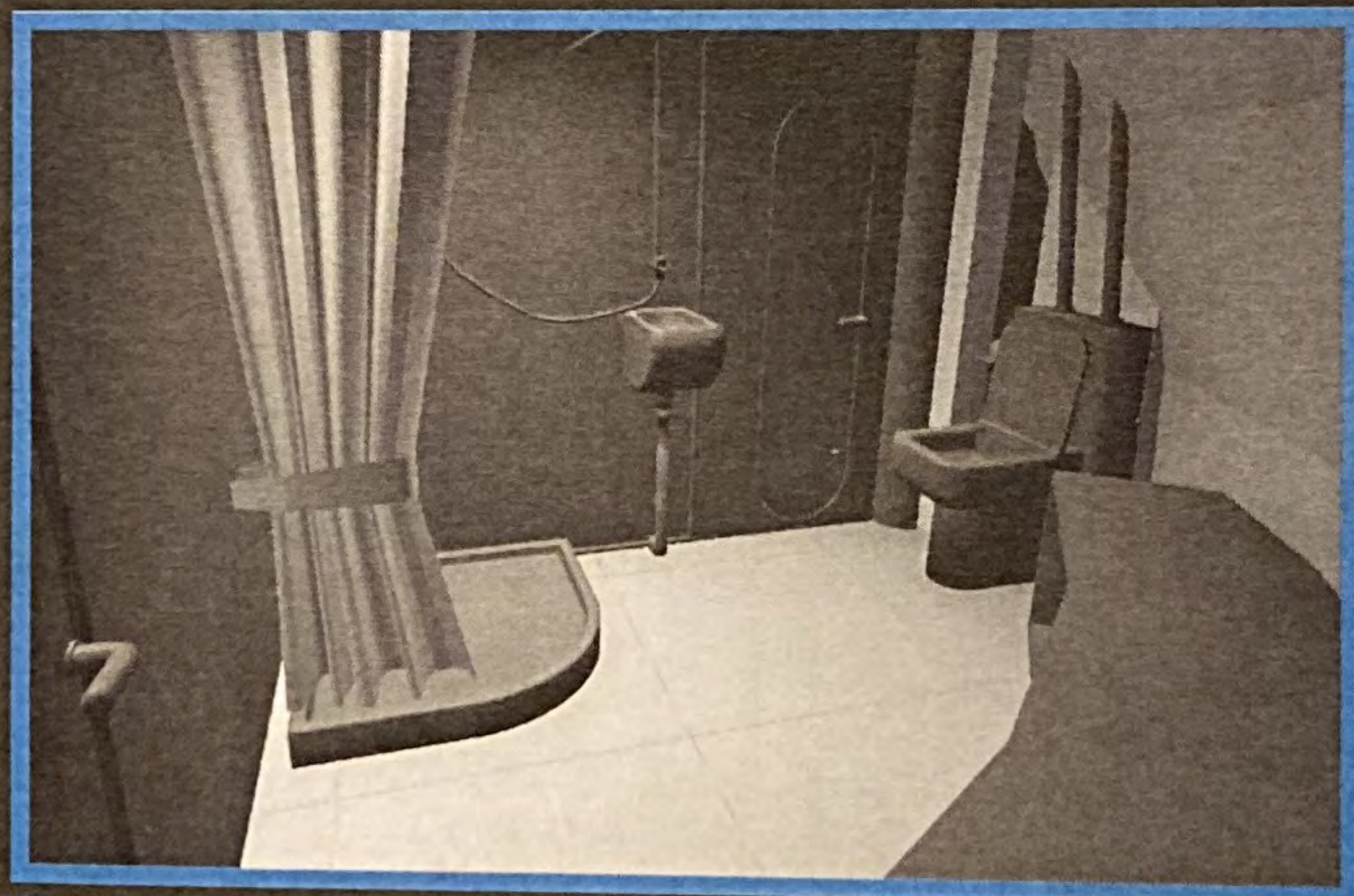
For our project we had to consider what kinds of things can affect astronauts while they are on the moon. We have to build with these factors in mind. Some elements that were researched but not limited too are:

- Lunar Gravity
- Radiation protection
- Electricity generation
- Type of antennas need
- Ventilation
- Growing plants in space
- Other existing lunar habitat concepts and proposals
- And more!

Sketches



Pictures



Video Demonstration



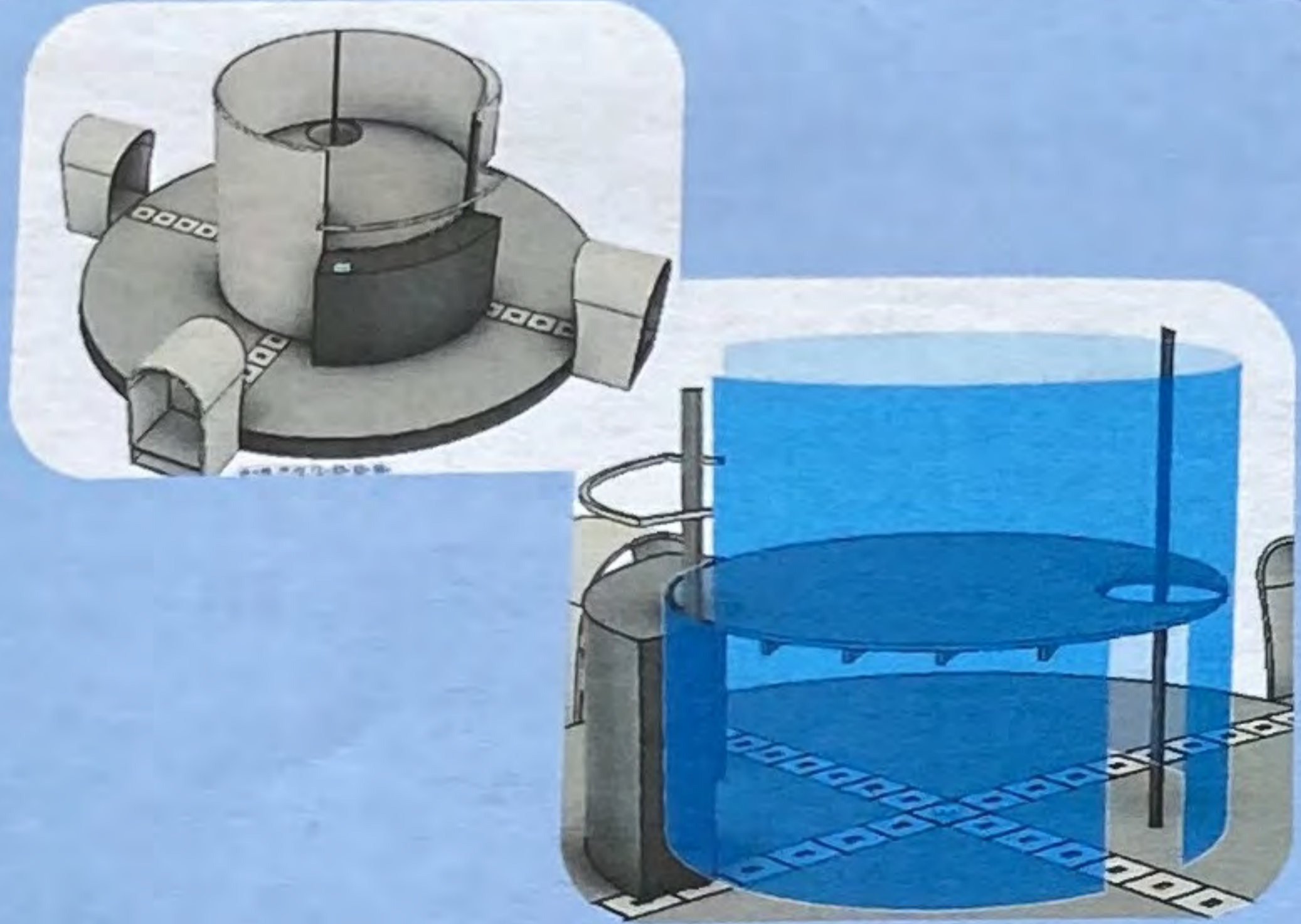
Materials

- ✓ Oculus VR headset
- ✓ Unity Engine v2022.3.4f1
- ✓ Github repository
- ✓ Any computer

Key Features

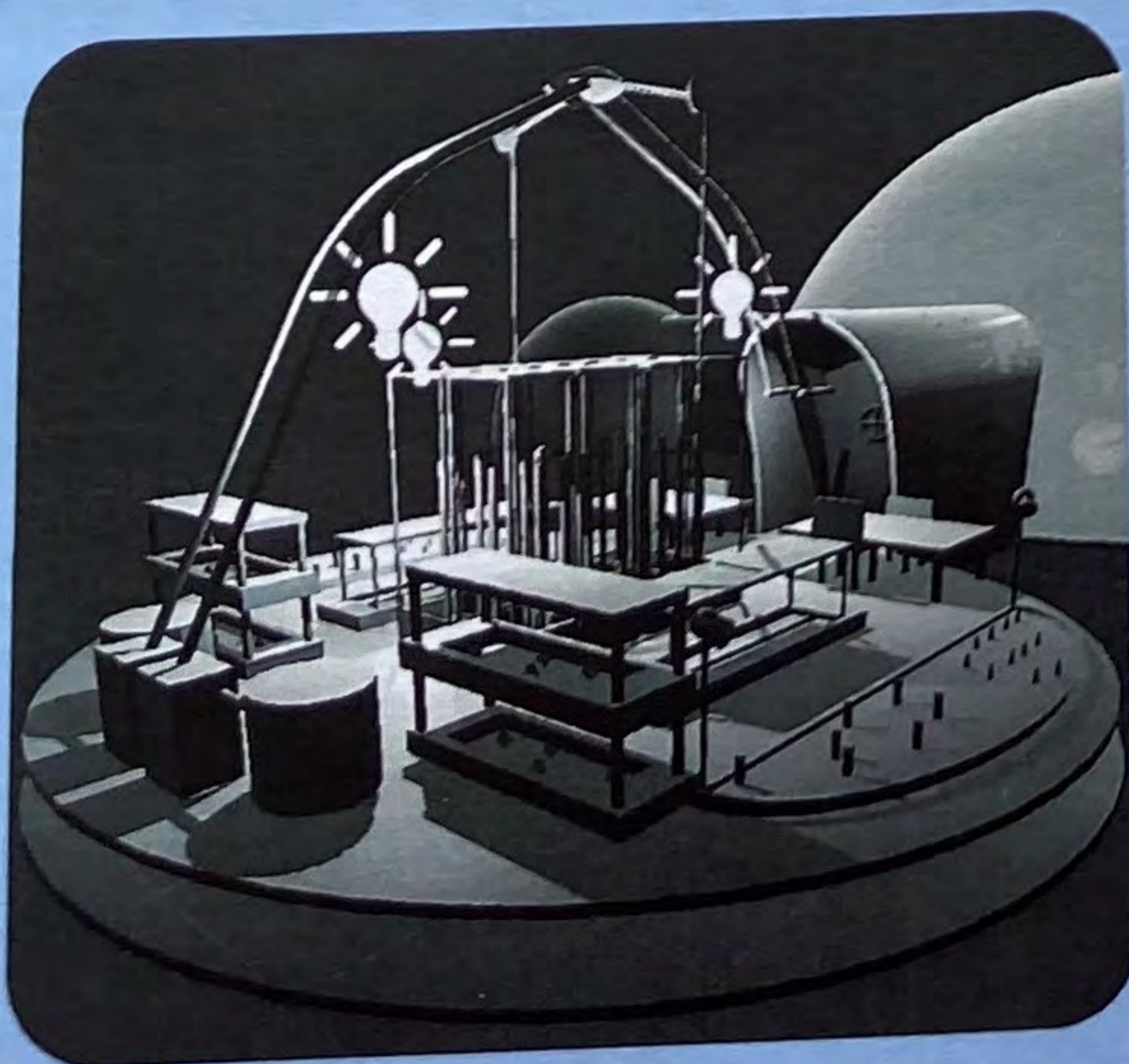
- ✓ 2 sleeping quarters
- ✓ Bathroom
- ✓ ECLASS
- ✓ Light and climate controls
- ✓ Exercise equipment
- ✓ Communications center
- ✓ Computers, laptops
- ✓ Hatches
- ✓ Kitchen
- ✓ Lots of stowage
- ✓ Greenhouse
- ✓ AND MORE!

Main Module

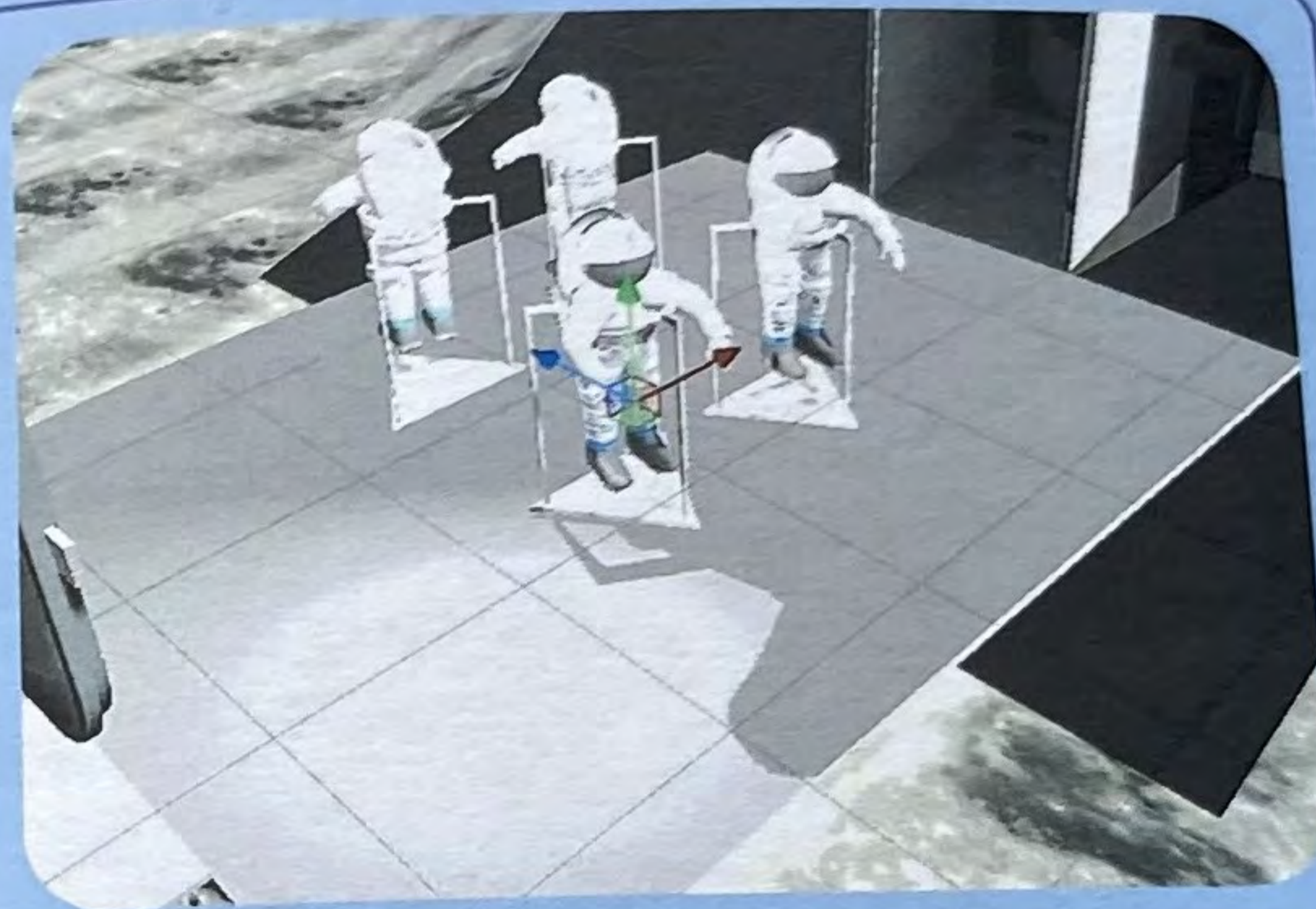


- Interior Shell/2nd Floor which can fit inside a Falcon Heavy Rocket for transport
- Fire pole instead of stairs, utilizes moon gravity

Grow Module

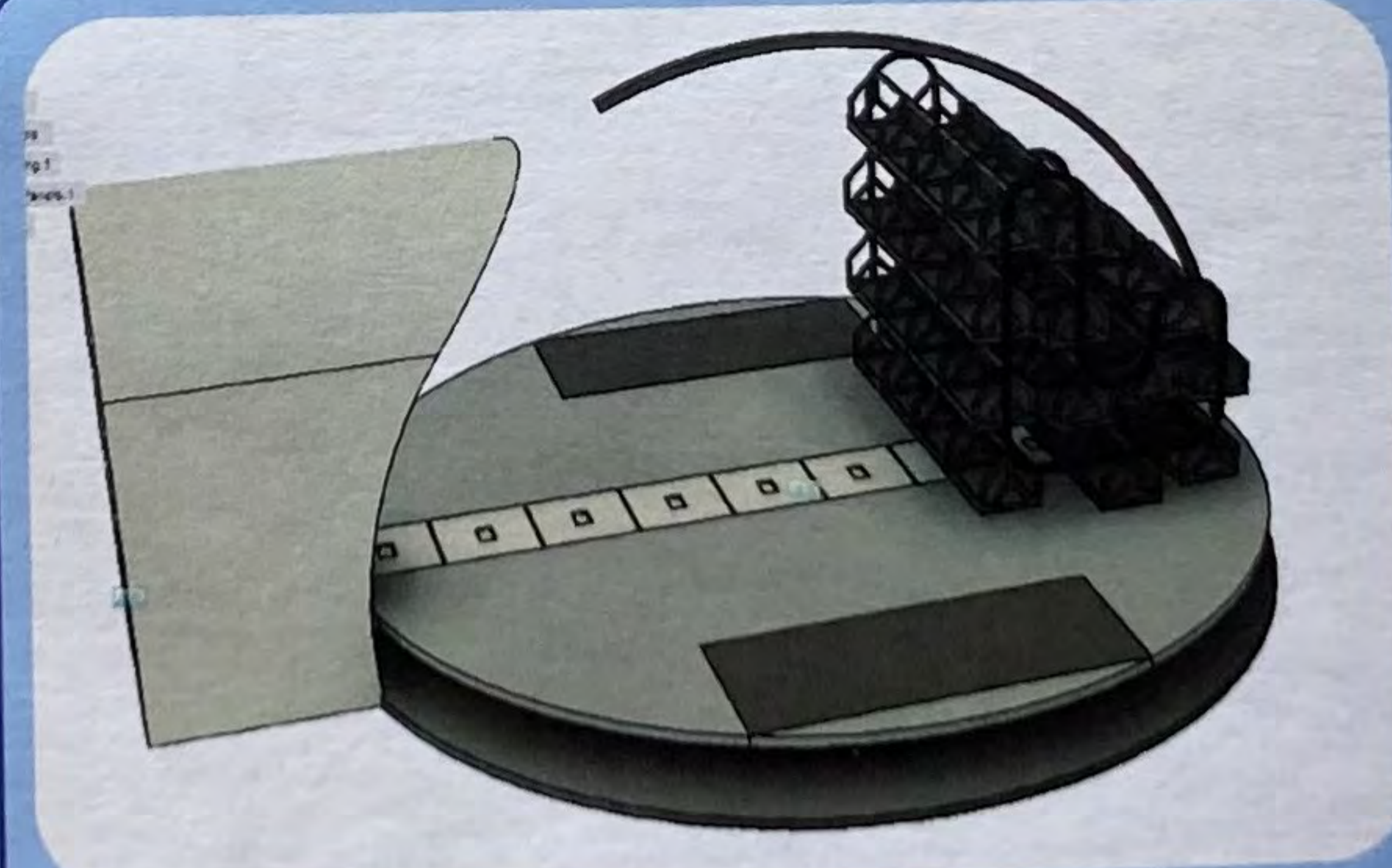


Airlock



- AxEMU Suits, Climb in from back using handrails (to utilize moon gravity)

Storage/Quarters



- | | |
|---|--|
| <h3>Sleeping Quarters</h3> <ul style="list-style-type: none">• Floor Panel Beds which can be covered during the day• Desk that doubles as Personal Storage | <h3>Storage</h3> <ul style="list-style-type: none">• Moving Rack System (like Wall-E's bedroom!)• Racks come in different sizes and are removable |
|---|--|

Key Project Features

- Every module except for the Airlock is on a raised floor to allow for piping and venting
- 3D models fitted to walls to use space efficiently
- VR Glove Teleportation

Our Next Steps

SCAN ME!



VR Lunar Habitat

SCAN ME!



Group Members

Amanuel Adane
Ben Mack

Teacher

Cuke Becker

School

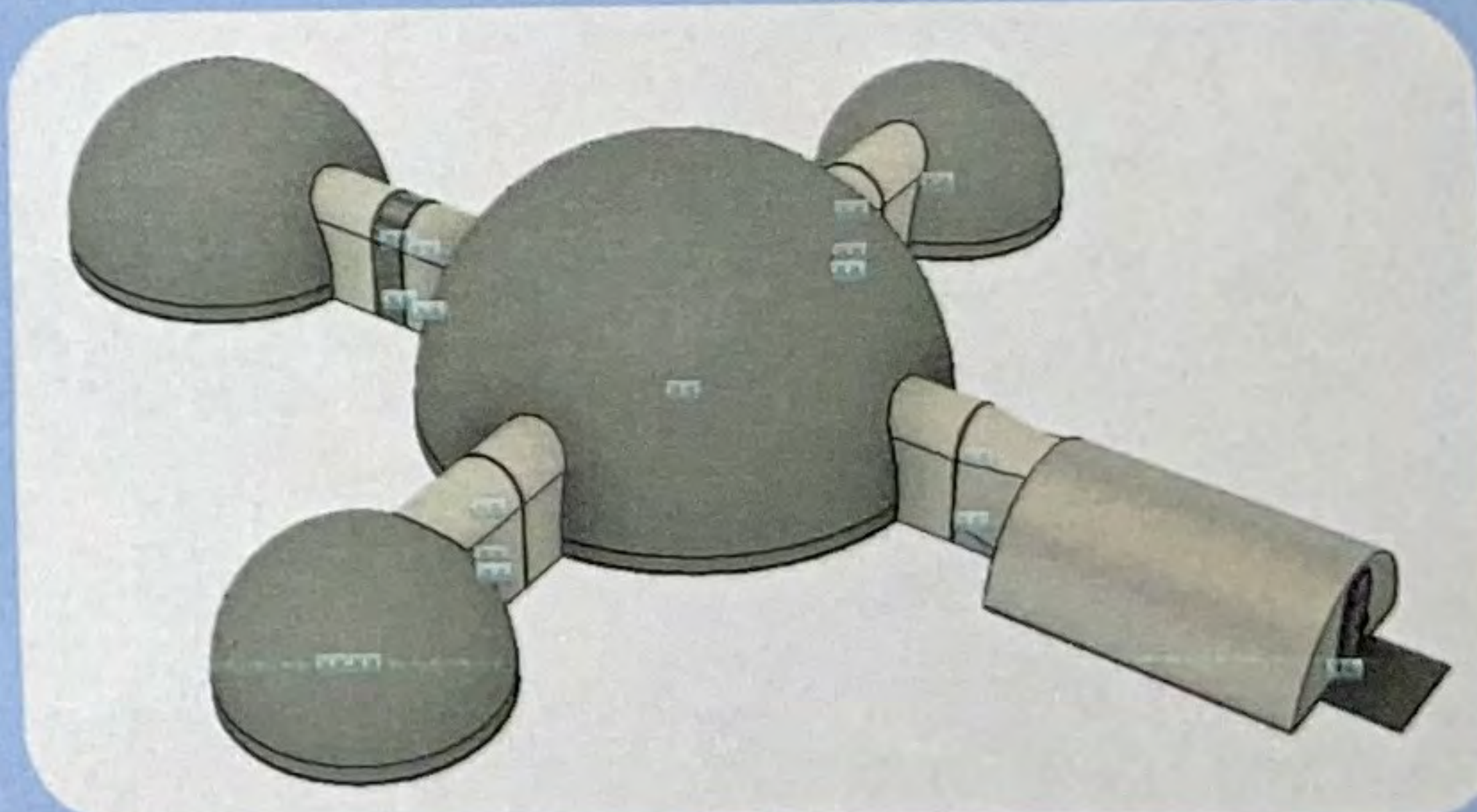
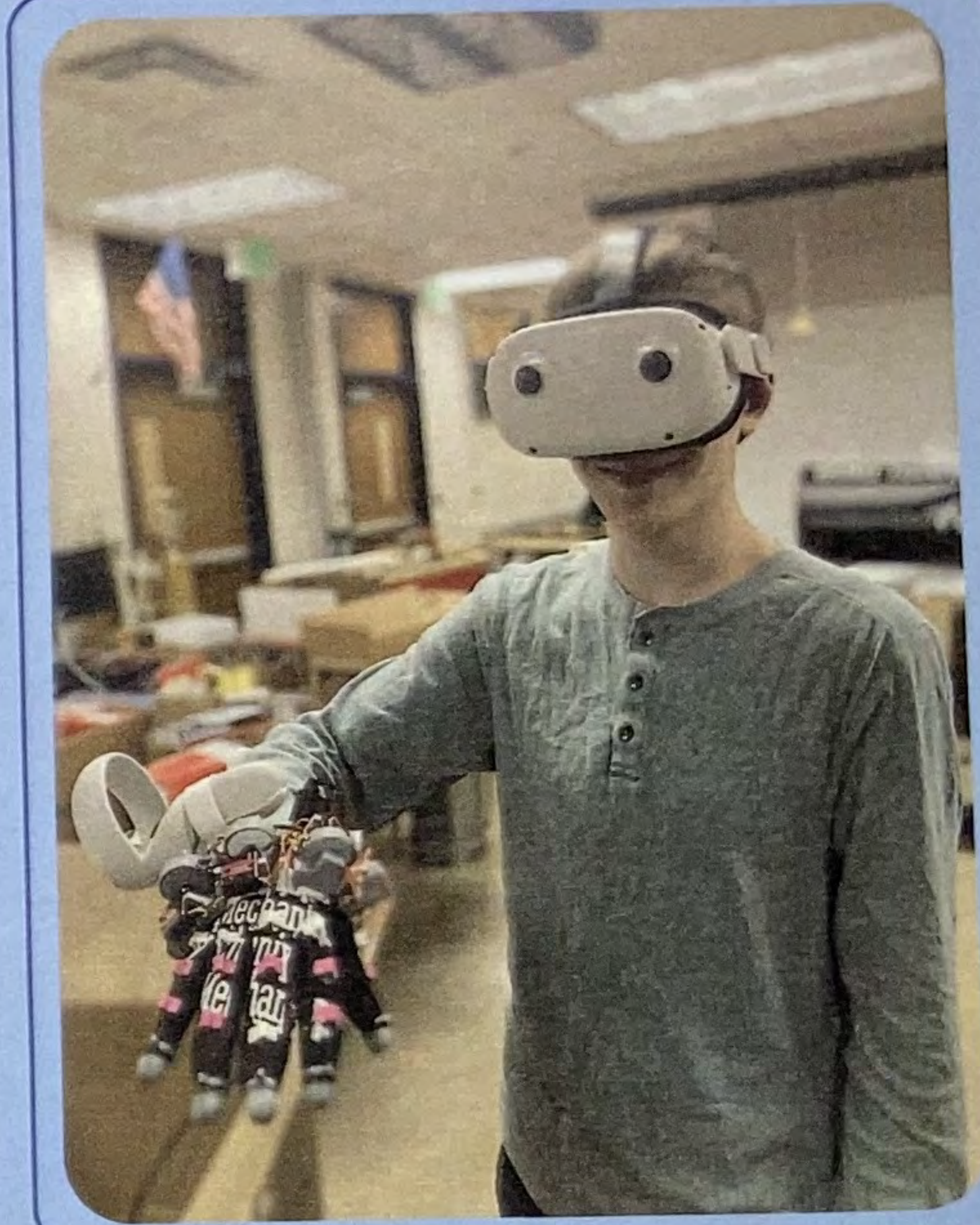
Armstrong High School

Project Overview

We must provide a tool for engineers to visualize what a Lunar Habitat would look like using Virtual Reality.

01 We decided on creating a Haptic Glove using an Oculus Quest in order to provide a more realistic model of our Lunar Habitat

02 We took Inspiration from the ISS, Submarines, Skylab, and a 2020 rendering created by students at the Rhode Island School of Design. We even took inspiration from Wall-E!



Project Statement

Develop a VR, multi-room lunar habitat that is able to be used on the moon. The habitat needs to be suitable for astronauts to live and work in. The habitat will create visualizations of future habitats on the moon and can be a project that NASA can build on and improve.

Learn More:



Scan to view our project playbook & slideshow

Contact Us

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Instructor: TJ Hendrickson

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THE ASTRONAUTS



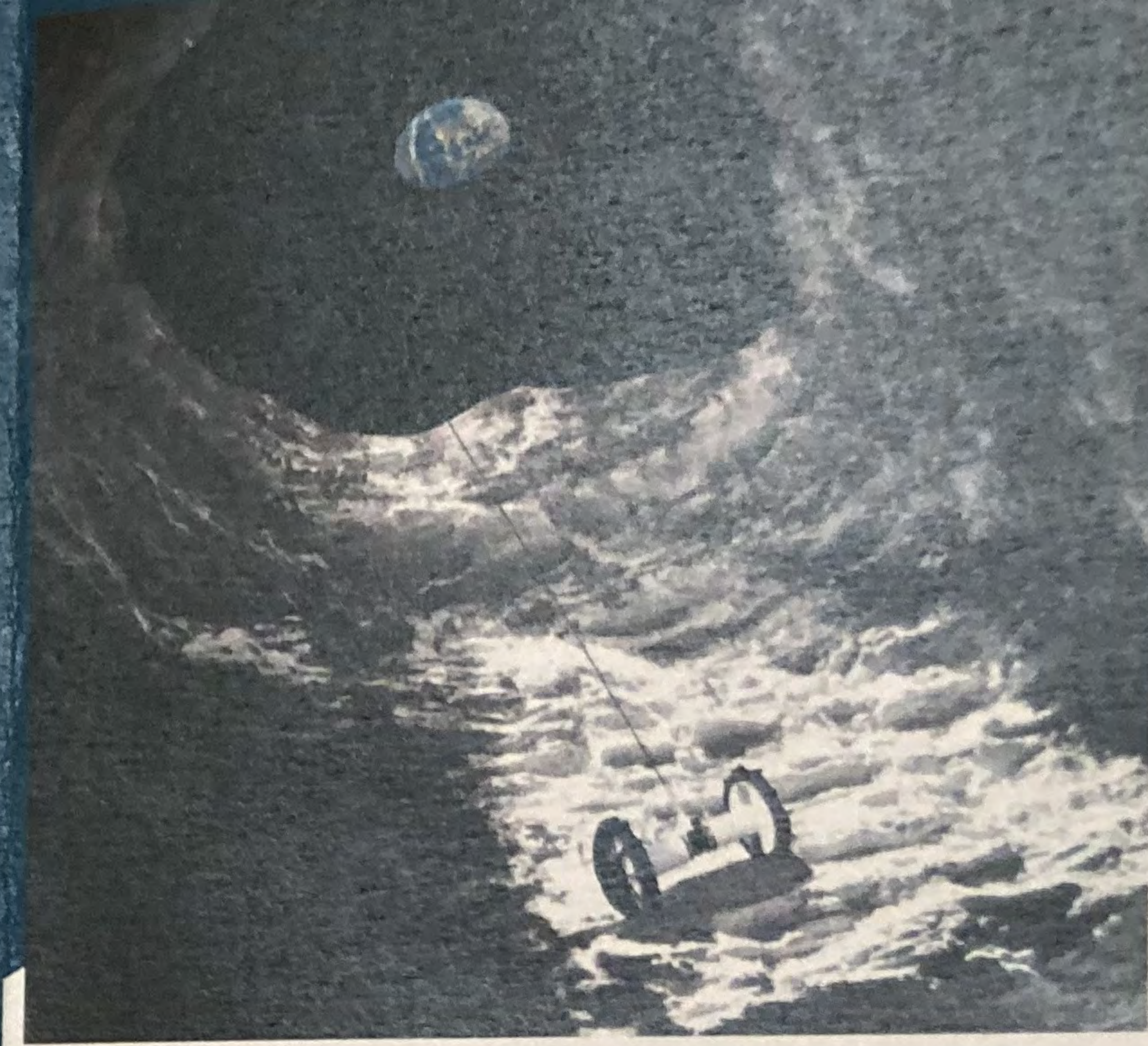
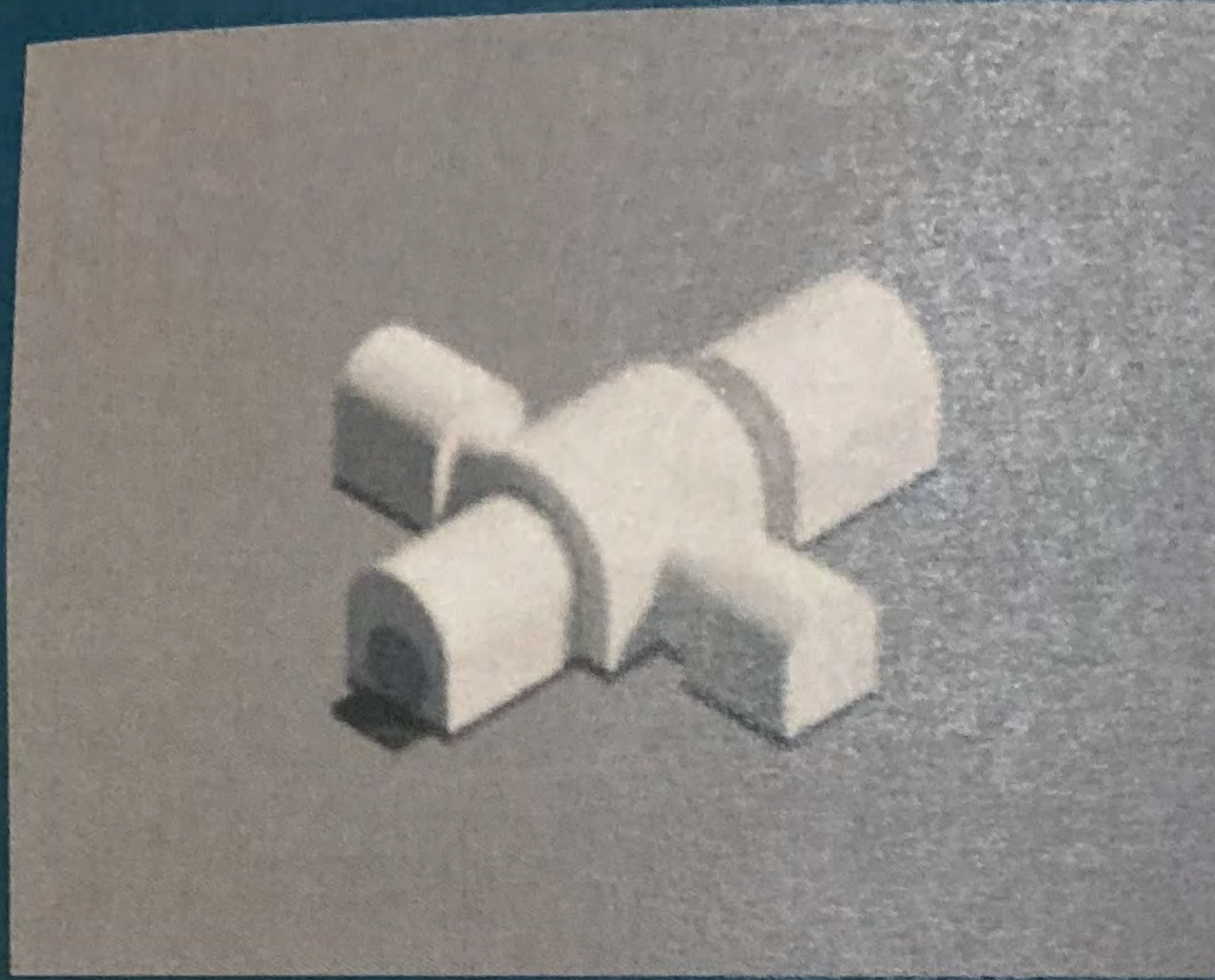
NASA VR LUNAR HABITAT



Our Team



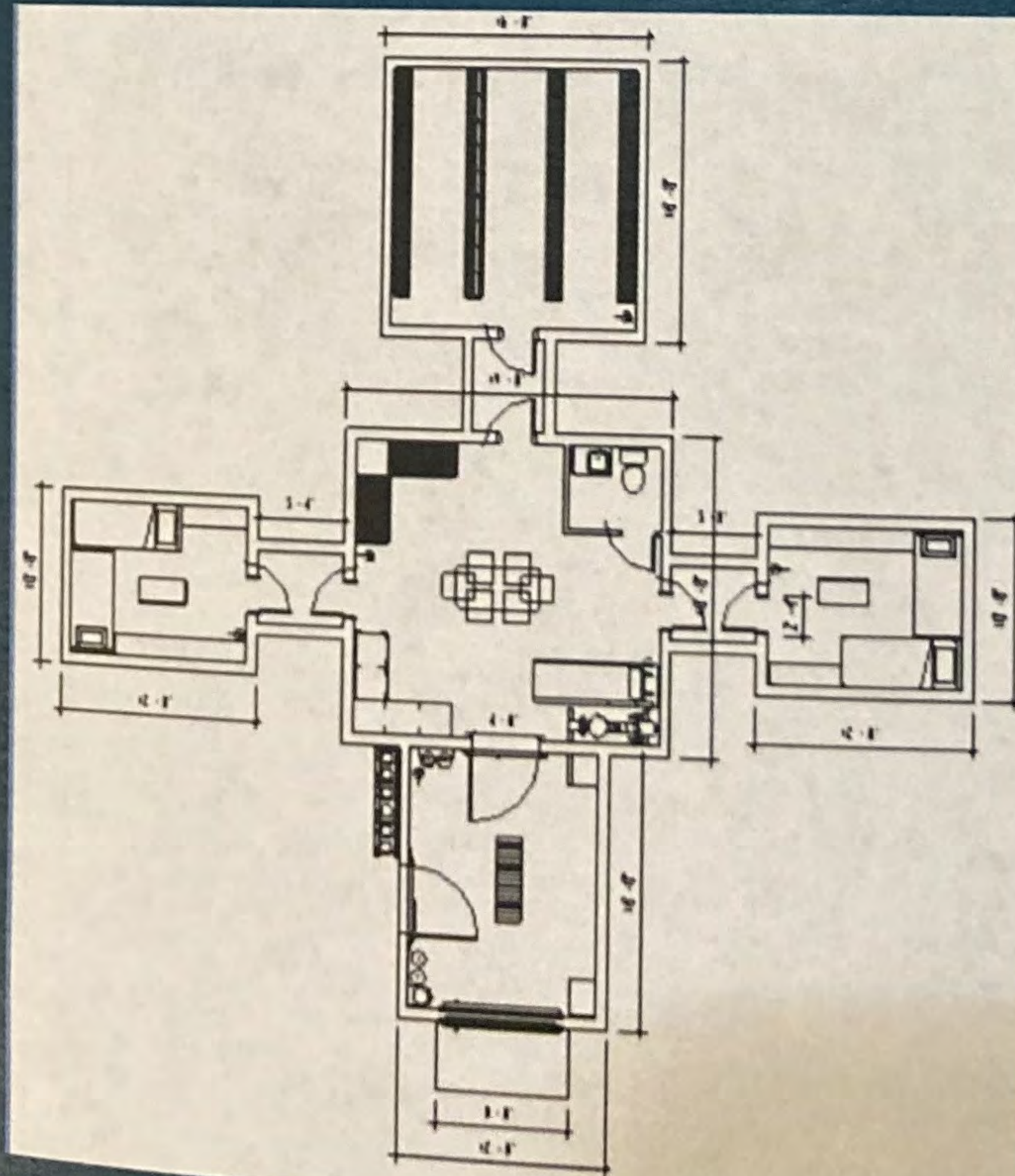
Outside Rendering



About Us

We are current students at Shakopee High School and are enrolled in the Center for Advanced Professional Studies (CAPS) Engineering & Manufacturing class. In this class, we are learning skills and working on projects that will help us prepare for future careers in engineering.

Floor Plan



What Makes Us Stand Out

We decided to build our lunar habitat under the moon's surface in a lunar cave to protect it from fluctuating temperatures that it would encounter if it were above the surface. Lunar caves can also protect it from meteorites and radiation.

Key Elements:

The main 'Hab' features: Exercise equipment, integrated storage, bathroom connected to ECLSS, dedicated "attic" space, soft comforting lighting.

Where are the space suits?

The lunar space suits are actually attached to the exterior and accessed from inside.



Design Process:

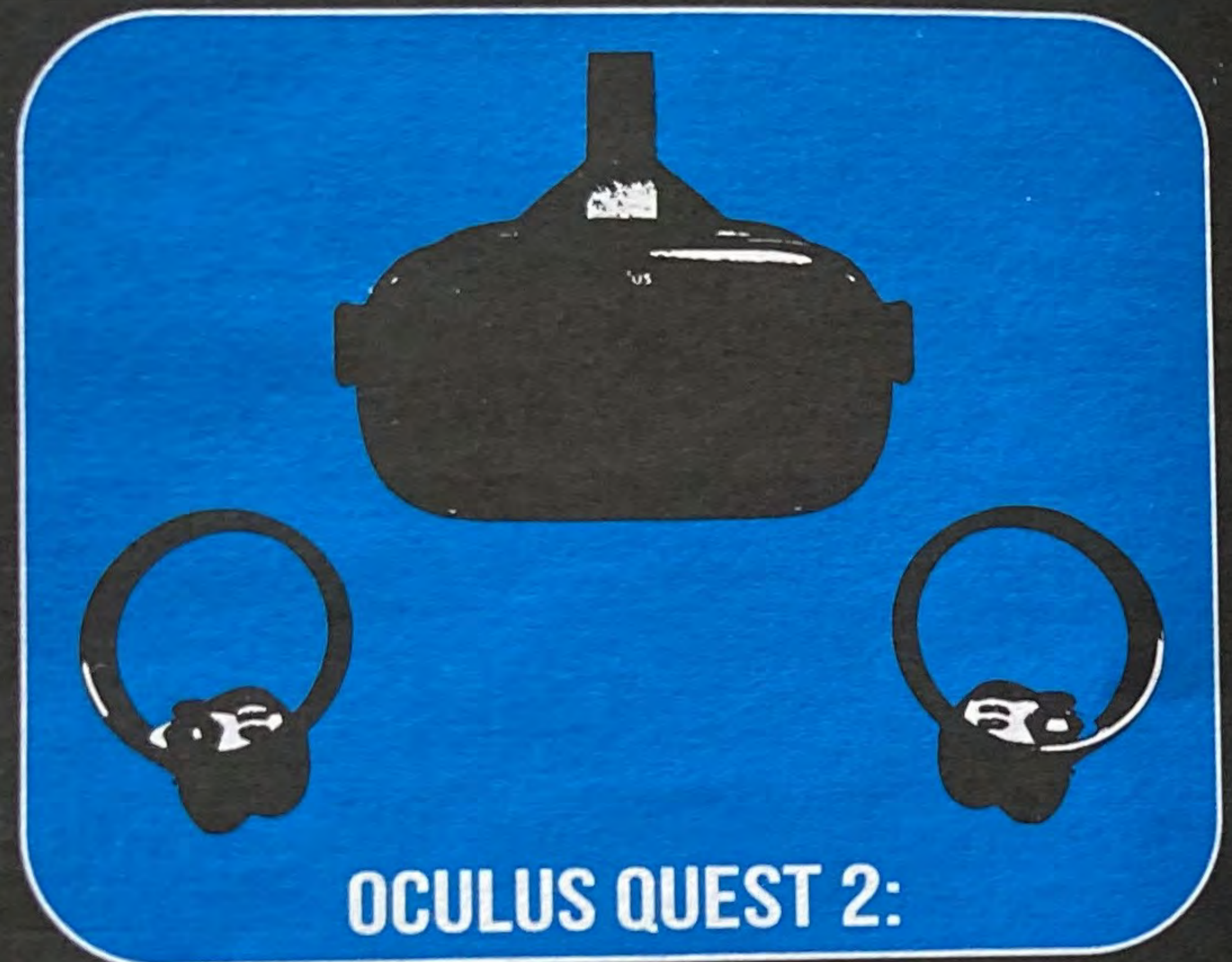
Thanks to our VR experience with HUNCH last year, we were able to streamline our software development. We hit the ground running and got the VR aspect of the project done in less than two weeks. We used the empty virtual stage as our springboard for adding all the models that represent the VR habitat. Each object was modeled (Or virtually 'sculpted') by hand, then imported into UNITY where Cameron programmed the physics interactions between each object.

Future Steps:

Ideally, the bland colors are replaced with realistic textures. As it stands the grey colored objects represent 'static' (unmoving) assets and the blue objects are interactable and dynamic.

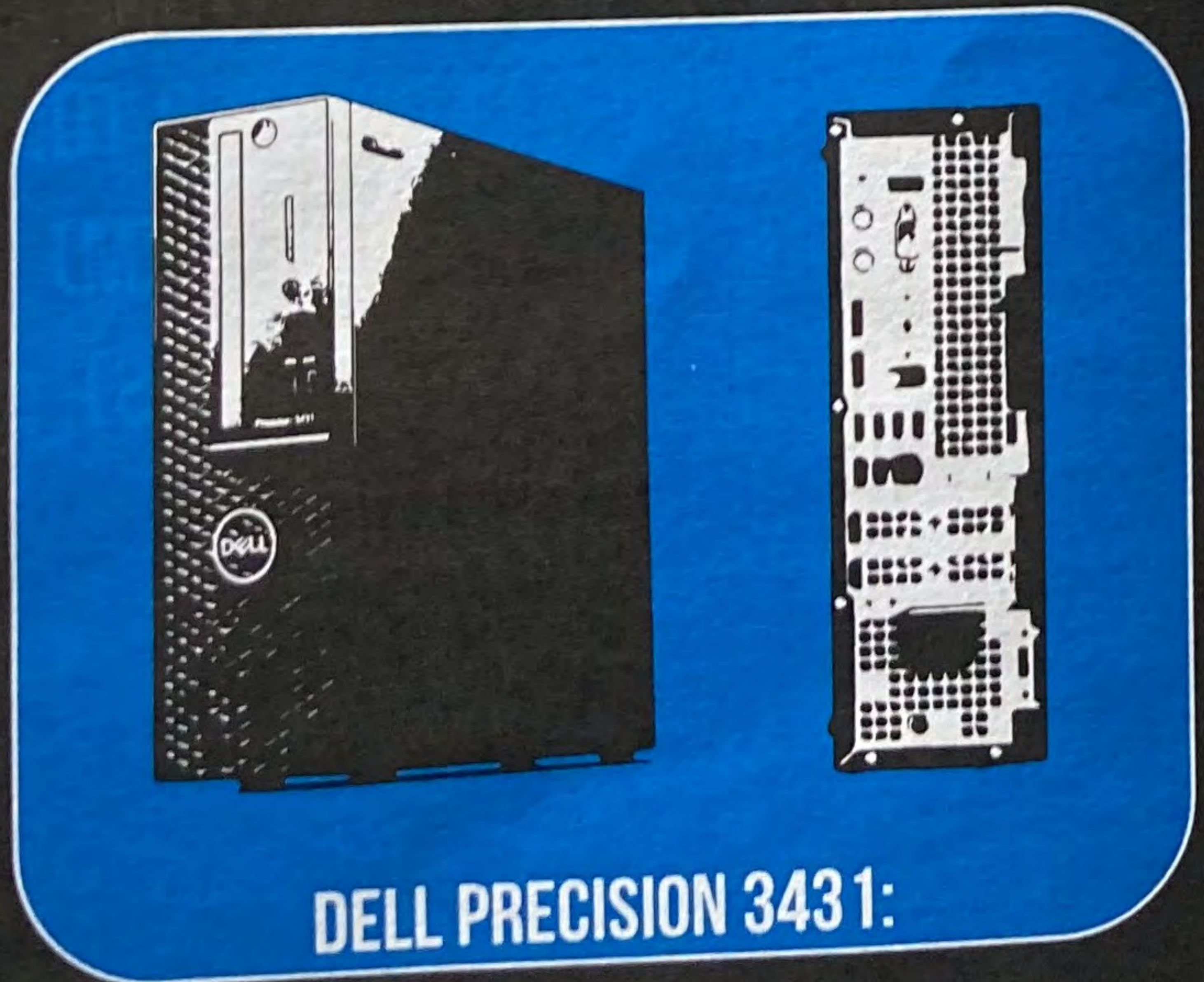
The second major step is post-processing--or making it look good. Anti-Aliasing represents the biggest obstacle to a good user-experience. Beyond that simply filling out the space with detail, interactable objects and other features that complete the space.

RESOURCES



OCULUS QUEST 2:

- SNAPDRAGON XR2 PROCESSOR (2.8 GHZ)
- RAM (6 GB)
- RESOLUTION (1832×1920 PER EYE)
- PERFORMANCE: ACCEPTABLE (DIFFICULT TO SET UP)



DELL PRECISION 3431:

- INTEL I5 9TH GEN PROCESSOR (3 GHZ)
- RAM (32 GB)
- NVIDIA QUADRO P1000 (4 GB)
- PERFORMANCE: GOOD (MEETS SOFTWARE REQUIRMENTS)

RESEARCH



UNREAL ENGINE

WHEN WE STARTED THIS PROJECT WE SET ON CREATING NOTHING LESS THAN A FULLY FUNCTIONAL VR EXPERIENCE.

WITH OUR GOAL SET WE RESEARCHED VARIOUS 3D SIMULATION SOFTWARES FOR THE HIGHEST POSSIBLE QUALITY, IN THE END DECIDING ON UNREAL ENGINE.

A HIGH QUALITY GAME ENGINE WITH THOUSANDS OF FREE ASSETS AND TEMPLATES FOR VR ENVIRONMENTS IT PROVED IDEAL FOR OUR PROJECT.

THOUGH IT TOOK A SUBSTANTAIL AMOUNT OF STUDY TO LEARN HOW SIMULATE EACH ASPECT OF OUR HABITAT AND THE MOON'S ENVIROMENT (LOW GRAVITY AND OXYGEN).

GALLATIN HIGH BOZEMAN MT.



**VR LUNAR GROUP (LEFT TO RIGHT): COBY CONGER, EVAN VAN HORDEN, CHAD FAIRCLOTH, SAM STORY
INSTRUCTOR: GLENN BRADBURY**



TEAM INFO

School

Palm Bay Magnet High School

Teacher

Mrs. Rebecca Allen

(allen.rebecca@share.brevardschools.org)

TEAM

Adoni Florival

(2211478@share.brevardschools.org)

Role: Putting all our Solid Works Models and Textures into unity

Jacob Hines

(1407464@share.brevardschools.org)

Role: Modeling and Texturing

Matthew Rodriguez

(1112274@share.brevardschools.org)

Modeling and Texturing

Software

Unity is a cross platform game engine that came out in 2005. It is used to create games and make production for what you need. Unity will be used to make the simulator for this project. I learned that Unity has many components to it such as creating applications, accomplishing different task, and game development. The main use of unity is 2D and 3D development for games, and vr applications.

Unity has its own coding language that is used to create projects and simulators. When creating the project, unity coding will have to be learnt to proceed into testing with a vr headset. When creating a vr project on Unity, you have to know the basics of how a vr headset works, through the lenses and focal points. Learning C++ is a very big part of this project that will have to be worked on.

HUNCH

VR LUNAR HABITAT

2023-2024

The task of this project is to create a Model of a Lunar Habitat that will have everything necessary for inhabitants to survive and have the means to do whatever they need.



Solid Works Models

Solid works is the application we used to create the models that will be in put in the Lunar Habitat

Examples:



Shelf



Hatch Door



ELCSS Rack

What We Have So Far

