

2022 Design and Prototype Semi-Finalists

Powered Zero-g Bulk transfer System

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School: Bridgeland, Texas

Students: Natasha Odafe
Teacher: Eric Canestorp
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School: Clear Creek, Texas

Students: Damian Hernandez, Andrew Smith
Teacher: Robin Merritt
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Students: xxxxx
Teacher: Rebecca Allen
School: Palm Bay Magnet, Florida

Students: Ella tucker, Brooke Street, John Christie
Teacher: Louis Reyes
School: Space Coast Jr/Sr, Florida

Students: Ryan Carriere
Teacher: Nate Olsen
School: Warren Tech Central, Colorado

Students: Vincent P., Ian C., Izzy M.
Teacher: Nate Olsen
School: Warren Tech Central, Colorado

Students: Josh Rhodes, Jackson Woodman, Evan Busse
Teacher: xxxx
School: Colorado



DREAM TEAM

COMPONENTS

Similar Products

TESTING & BUILDING

GIANT LEAP
HUMANITY

Construction

Team Members:
Julian Saldivia
Audrey Ashie
Rafael Irizarry

Purpose

To develop a system that will allow astronauts to transfer loose particulate from a bulk bag to a smaller container in a controlled fashion to help minimize the packaging and trash in the space program

Inspiration

We developed our design to address many problems that were addressed. Our original design was lying flat and as we are angled to the floor. We also developed a mechanism to prevent the parts in the

Material

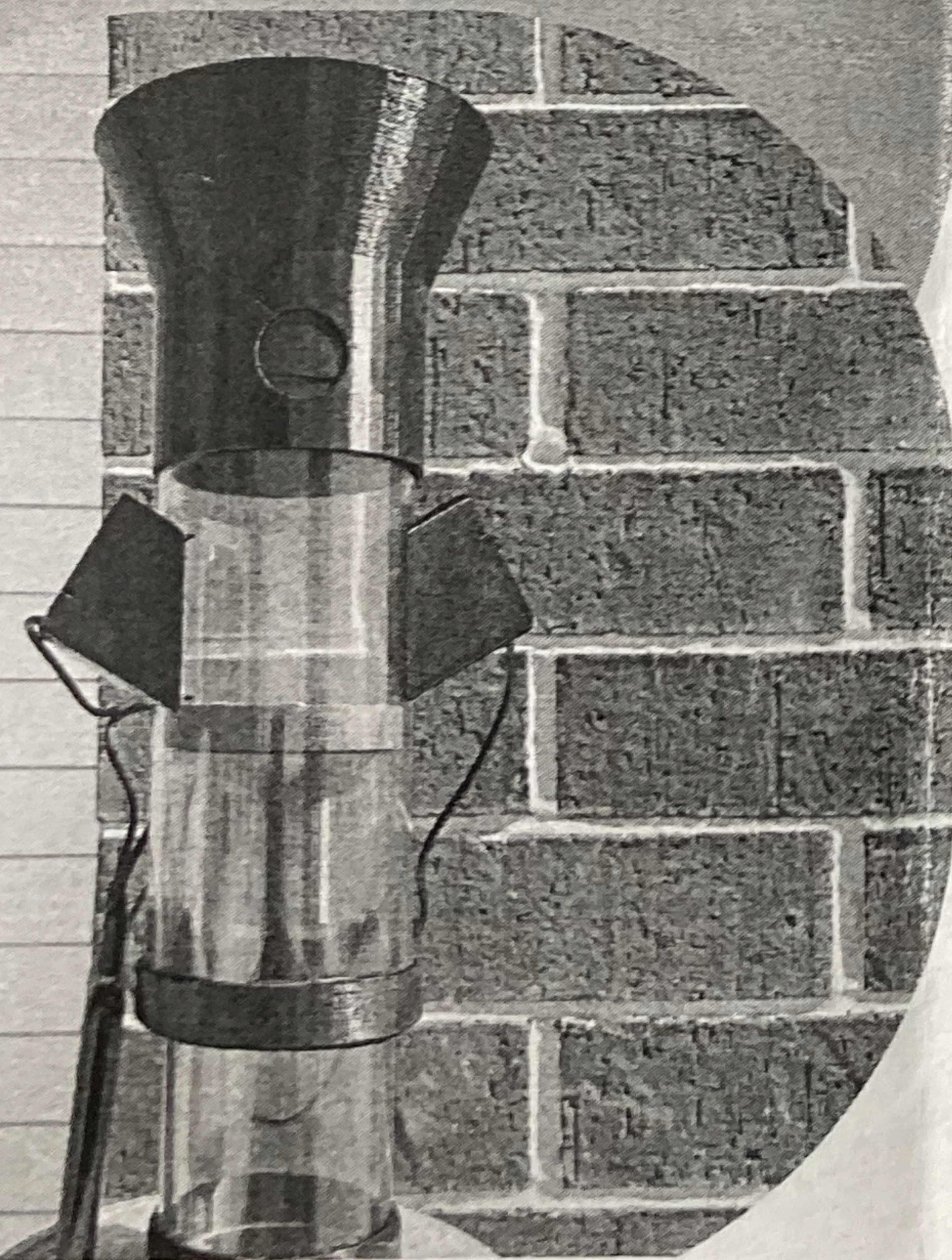
ASSEMBLY VIEW
SCALE: 75:1

Julian Saldivia
Audrey Ashie
Rafael Irizarry

J.A.R.

HOW TO USE

- connect container to tube by pushing uncovered end trough flap
- attach food bag over the funnel
- turn on fans using attached power bank
- massage food into the device and stop once desired amount has been put into device
- once all the food has been pushed into the container detach container (attach cover once pulled off) and turn off fans



SELLING POINTS

Our device is designed for easy use with an easily detachable container and cover. The angled fan spacers of our own design push the food in the desired direction towards the collection container. It also does not have many moving parts, once the food has been introduced to the device it's hands-off till your food is in the container! The flaps put in place on the main transfer tube and the container prevent food from flying out once the container is detached leaving little mess. The smaller funnel located inside the main transfer tube also blocks food from falling into the gaps on the sides of the smaller container preventing food from getting stuck. The placement of the fans across from each other creates opposing airflow which prevents food from blowing into the opposing blade

PARTS & MATERIALS

- funnel-ABS 3D printer material
- fan spacer -ABS 3D printer material
- flaps-silicone
- smaller funnel-silicone
- plastic tubes- clear polycarbonate
- screws used- M3X12
- container caps-bioplastic
- container ring-bioplastic
- fans- ANVISION 40mmx10mm DC 5V USB Brushless Cooling Fan Dual Ball Bearing



FOLLOW THE LINK ABOVE
TO A VIDEO OF OUR
TESTING!





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NAME: Natasha Odufe

Description

To solve the problem, this prototype consists of a transparent container, to hold the items, a usb powered fan surrounded by a 3d printed compartment, the fan is also connected to the container to provide airflow. This prototype also has a stack catcher for easy access to the items in the container and also for easy access for the items to be transferred in and out.

Materials intended to be used:

- 3D Printer for the container
- 3D Printer for the fan
- 3D Printer for the stack catcher
- 3D Printer for the fan

How it works

A tube is placed and inserted into the bulk bag and the container through the lid. The items in the bulk bag are given a little wiggle, up, down in the container and the grabbed. To transfer the items back into the bulk bag, the fan is used to blow the items back into the bulk bag.

Destiny Mockup

Carroe High School
Mr. Carstorp
Joshua Guardia, Gabriela Bonilla, Juan Fonseca

Problems solved while developing the prototype

- Accessibility to the exhibit
- Overall design of the model
- Solidworks Representation

Materials used in the final design

- Plastic - Interior
- Aluminum - Exterior
- Concrete and steel rods - support beams
- Wheelchair elevator
- Stairs
- Vault Hinges
- Touch screens and TVs

Testing - Cost & Questions

It will take 1 day and around 10-16 people for assembly

- 3 Flatbed trailers - \$2,000 - \$4,000
- Touch Screens - \$2,100
- Wheelchair Lift & Stairs - \$4,000 - \$20,000
- Hinges (12) - \$5,880

Next steps

- Show the prototype to experts and wait for an evaluation of the final design of the model

THE GIFT STATION

Red box, orange plate, and other items on the table.

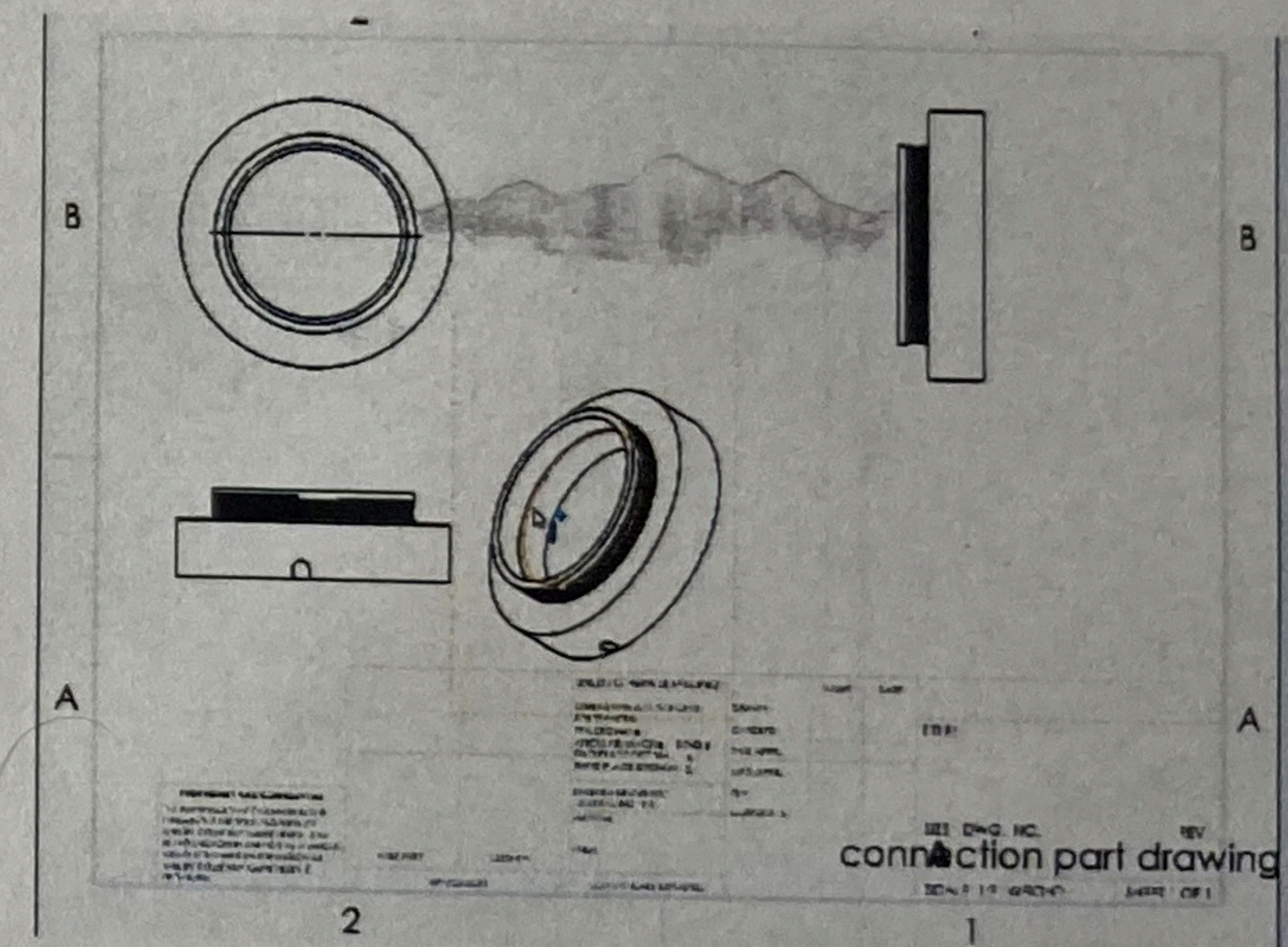
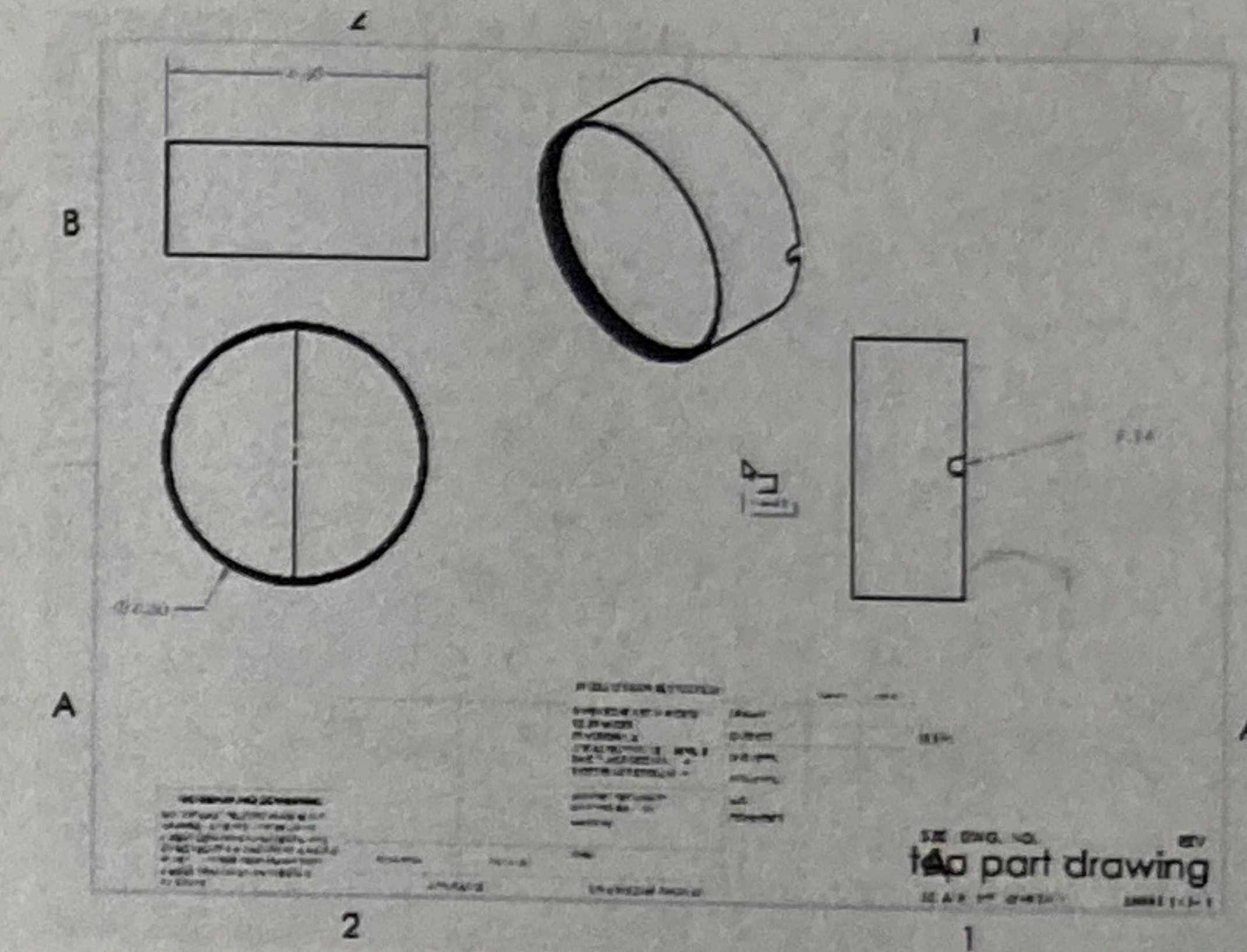
Zero G Bulk Tube Transfer System

Conroe High School
Mr Canesorp
Natasha Odafe

How it works

A tube is provided and inserted into the bulk bag and the container through the lid, the items in the bulk bag are giving a little wiggle, so they can move in through the tube and the cup. Items now in the container can be easily grabbed. To transfer the items back into the bulk bag, the fan is used, to induce the air flow and help carry the items back. Desired item is now transferred to a different bag or container while reducing trash.

Drawing layouts-



Goal: Design a system that would allow the transfer of the contents from a bulk bag to a smaller container in a controlled fashion in zero gravity.

Similar products-



Parts list

Adapter – Cut PVC pipe that guides the particles to the container efficiently

Filter – Screen mesh that filters out the particles with bigger sized pieces or crumbs.

Door – piece of wood we cut out to stop the flow of particles

Door frame – a 3D printed frame that has a opening in the top to slide the door through

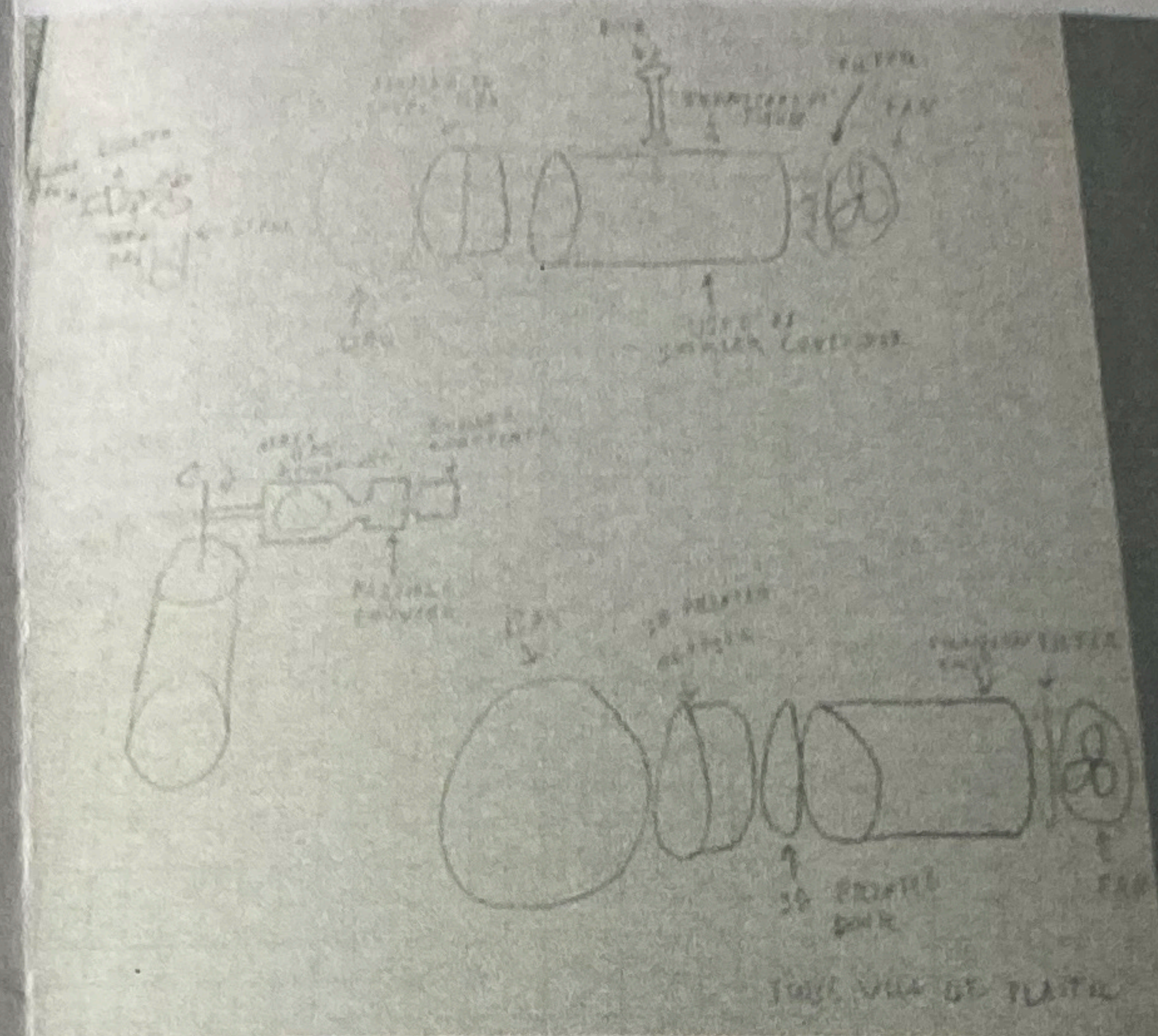
Container – 4 inch wide PVC pipe with a inside diameter of 3.5 inches

Battery – container for 8 AA battery's that can be replaced

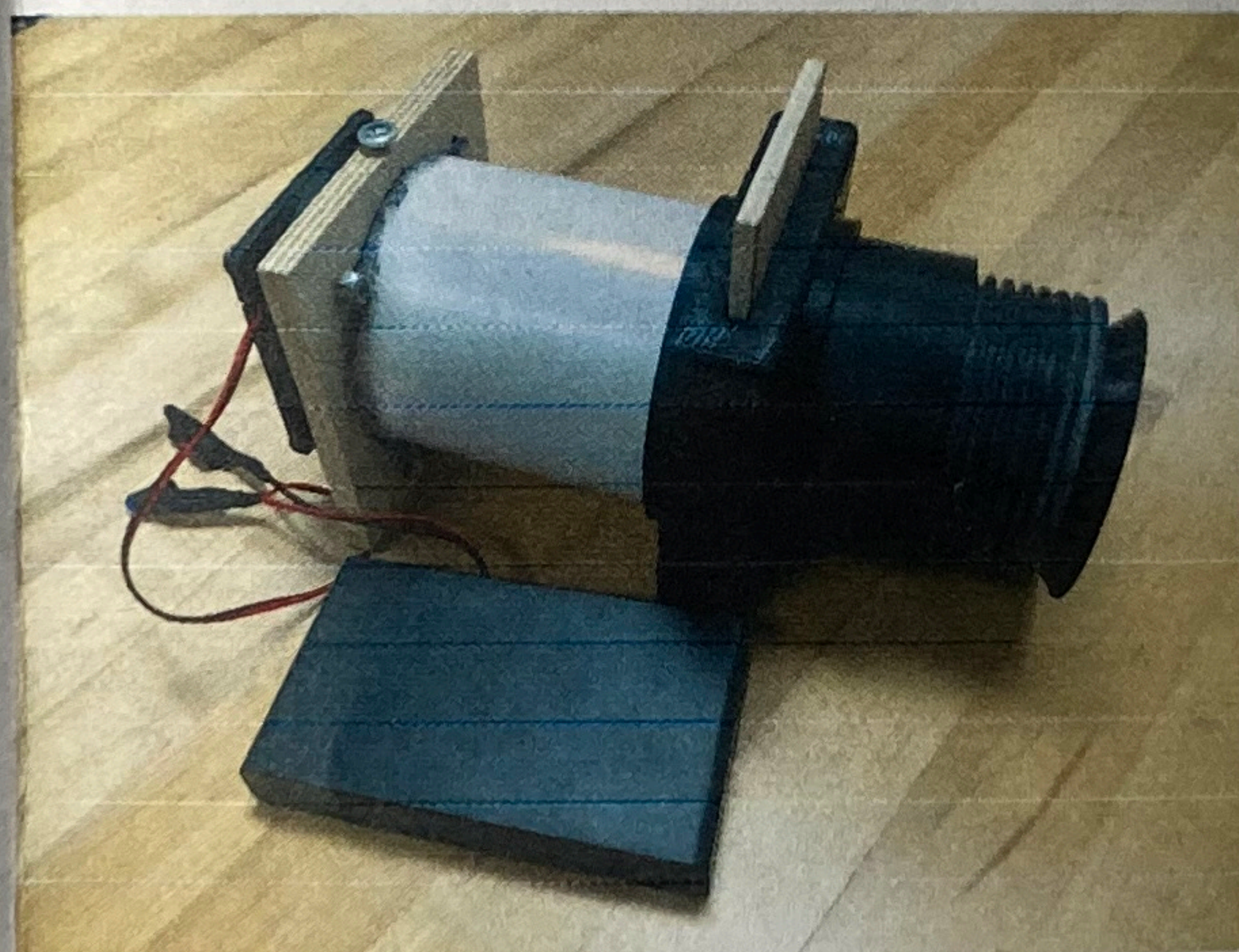
Fan – small fan that we found on amazon

Connector – three 3D printed pieces that screw together to connect the bag to the transfer system

Sketches



Initial Design



This is the initial prototype of the transfer system.

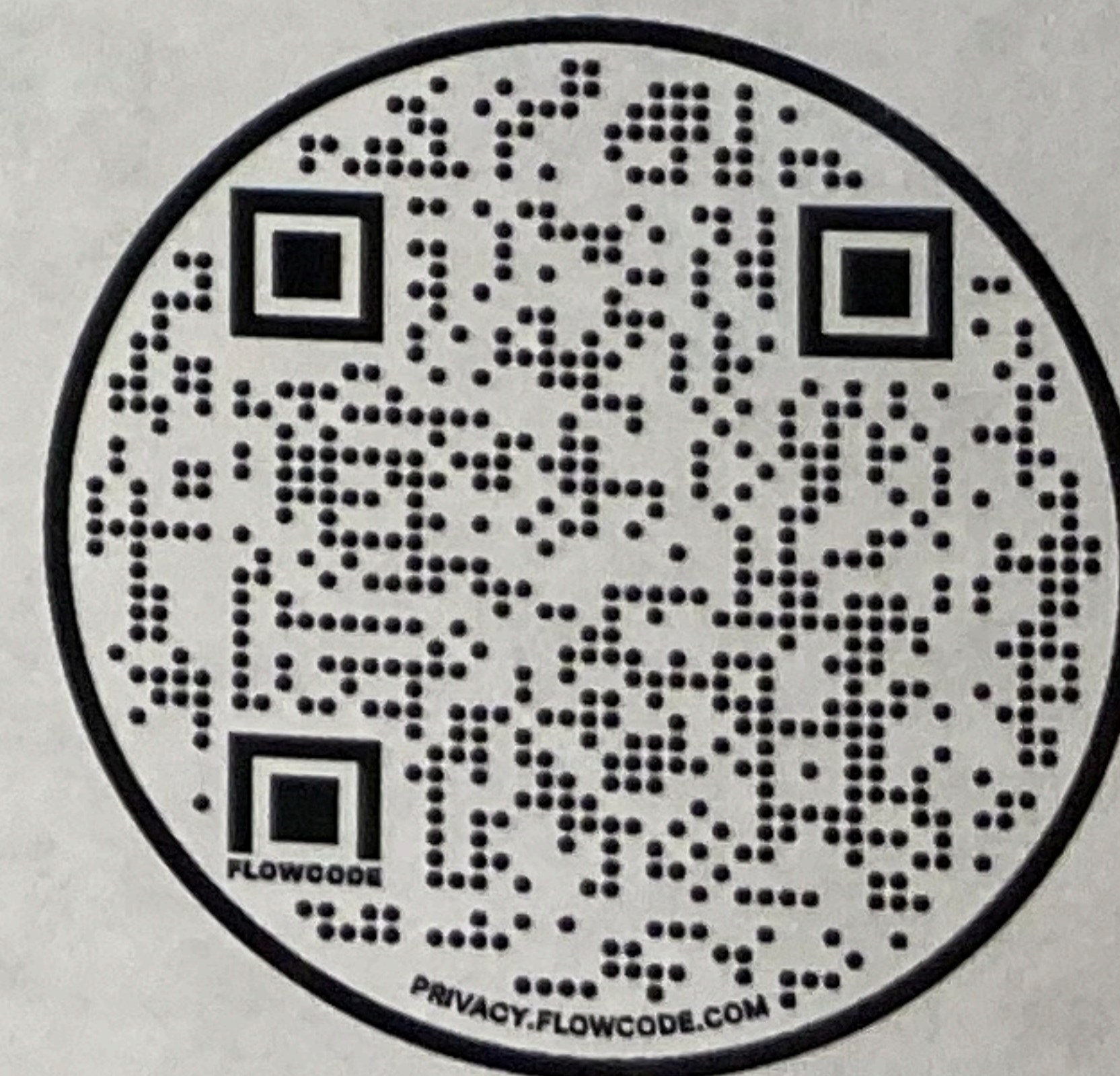
The use of 3d printing, plywood, and the mechanical fan that we ordered online provided us a prototype the worked as intended.

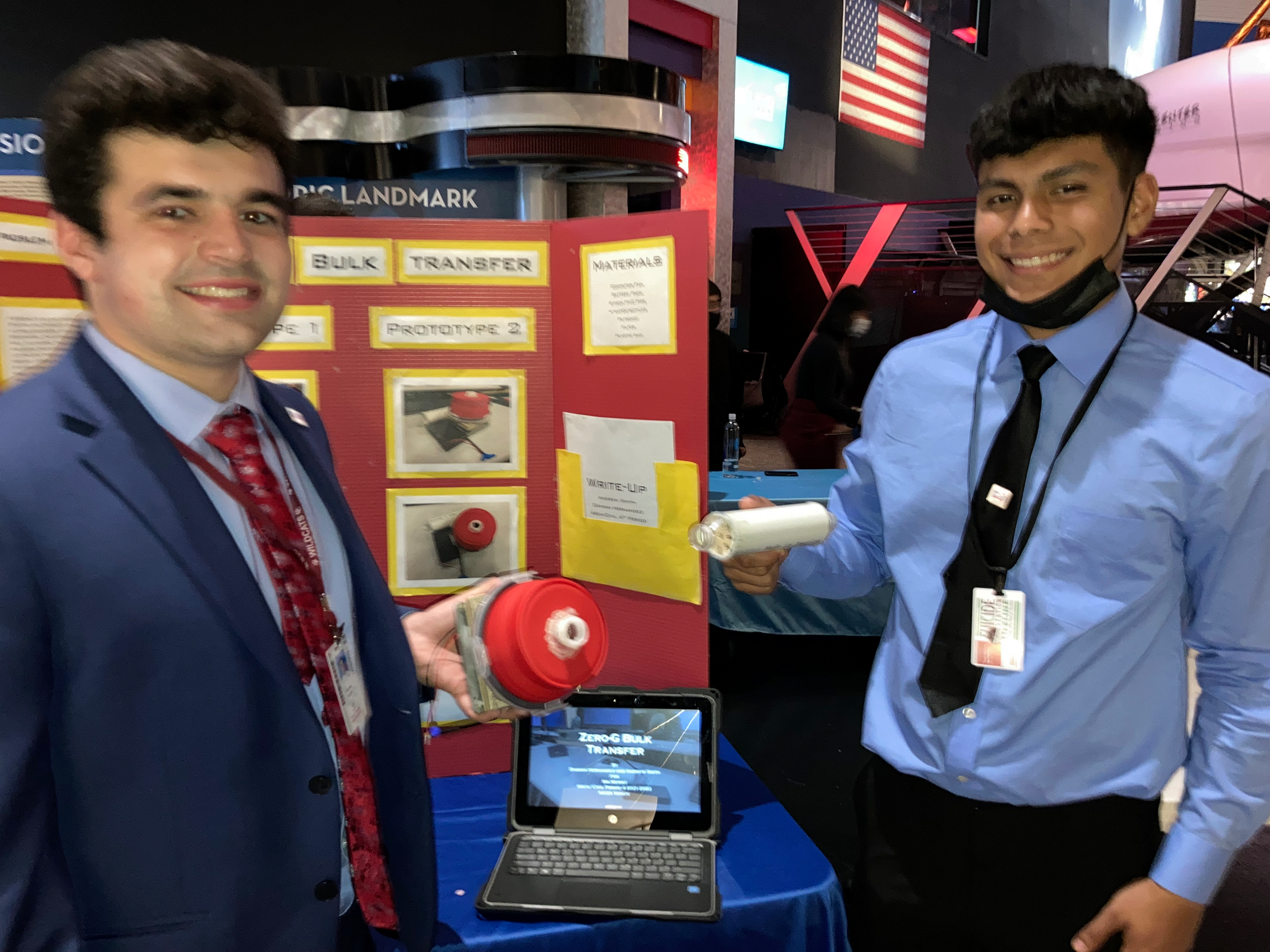
Objective

We are trying to design a system that would allow the transfer of contents of a large flexible bag like almonds or screws to a smaller container in a controlled fashion in zero gravity.

It also needs to be easy to use and clean while providing ideal working conditions.

The easier it is to operate, the more help it will provide the astronauts in the space station.





PIG LANDMARK

BULK

TRANSFER

MATERIALS

CONCRETE
REINFORCING
STEEL
FIBER
FIBERGLASS
FIBER
FIBERGLASS
FIBER

PE 1

PROTOTYPE 2

WRITE-UP

ANDREW SMITH
DANIEL HERNANDEZ
ARCH/CIVIL 4TH PERIOD

ZERO-G BULK
TRANSFER

BY
ANDREW SMITH
DANIEL HERNANDEZ
ARCH/CIVIL 4TH PERIOD

The Premise

The Zero-G-Bulk transfer is a project that basically transports small objects such as food or nuts and bolts without making a mess and having small particles floating everywhere. We have a mechanism that can prevent that by using a P.C fan and a PVC pipe to suck up the objects. The objective of our prototype, is to transfer items without the possibility of excess debris and other particles escaping, and possible causing malfunctions in the International Space Station, like electronic malfunctions and other dangers that could prove hazardous to the astronauts up there.

Zero-G Bulk Transfer

Clear Creek Highschool

League City, Texas

Period 4

Created by:

Damian Hernandez

Andrew Smith

Zero-G Bulk Transfer

BY: Damian Hernandez and Andrew Smith

Mr. Merrit
Arch and Civil
Engineering



Telephone

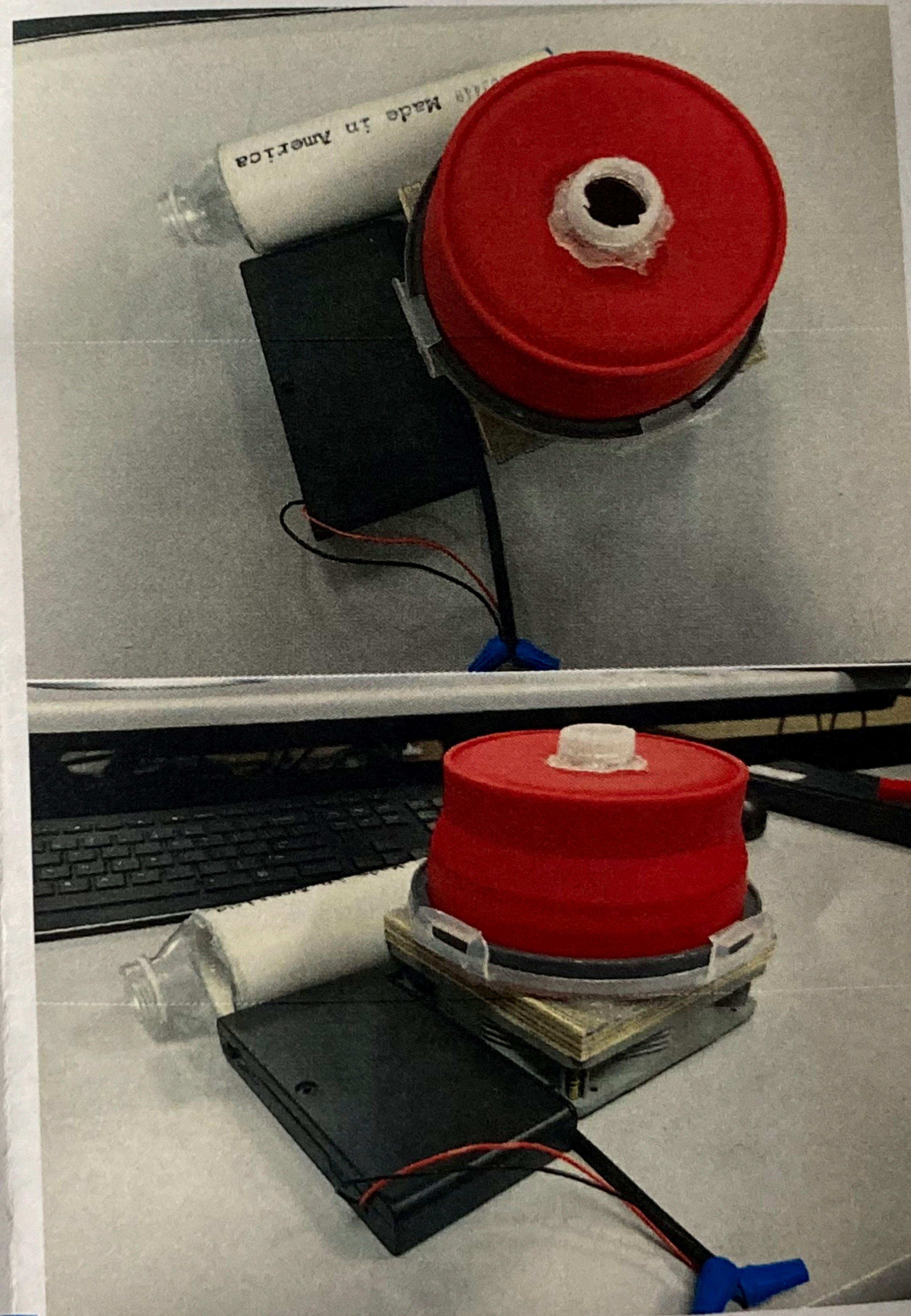
Prototype 1

This prototype was the first one we made. It contained 1 cylinder plastic container, a P.C fan (12 Volts), one 12-volt battery pack with on and off switch, 6-inch PBC pipe, circular filter that was used on the inside of the pipe that was 3D printed, top of a water bottle and a lot of hot glue. This prototype was good, but it had its flaws. The engineer at NASA told us that the only changes needed to be made were that it needed to be more convenient, easier to use and collapsible. By collapsible she was referring to the changing the plastic container to an object that can do the same thing but get smaller to reserve storage.

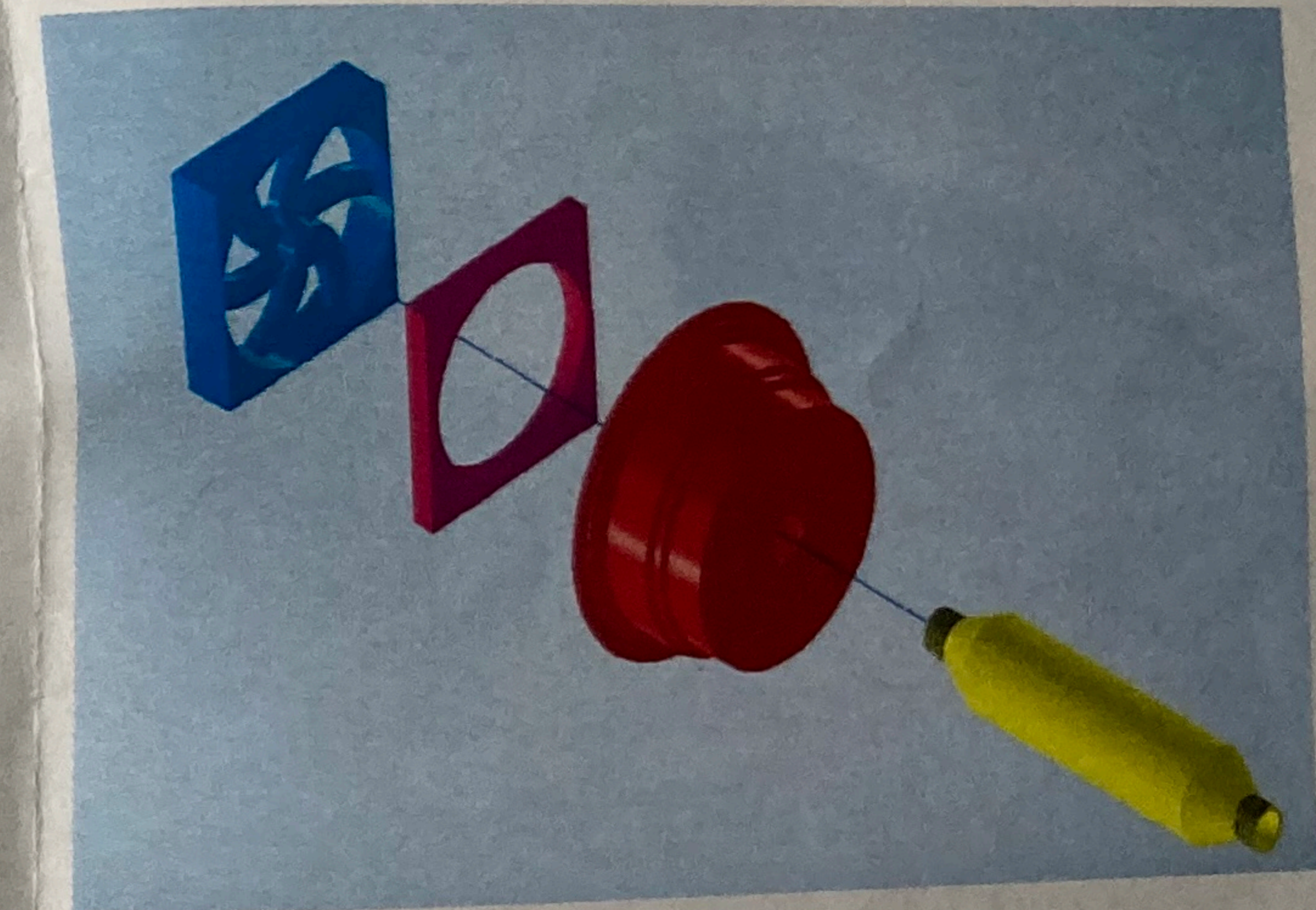
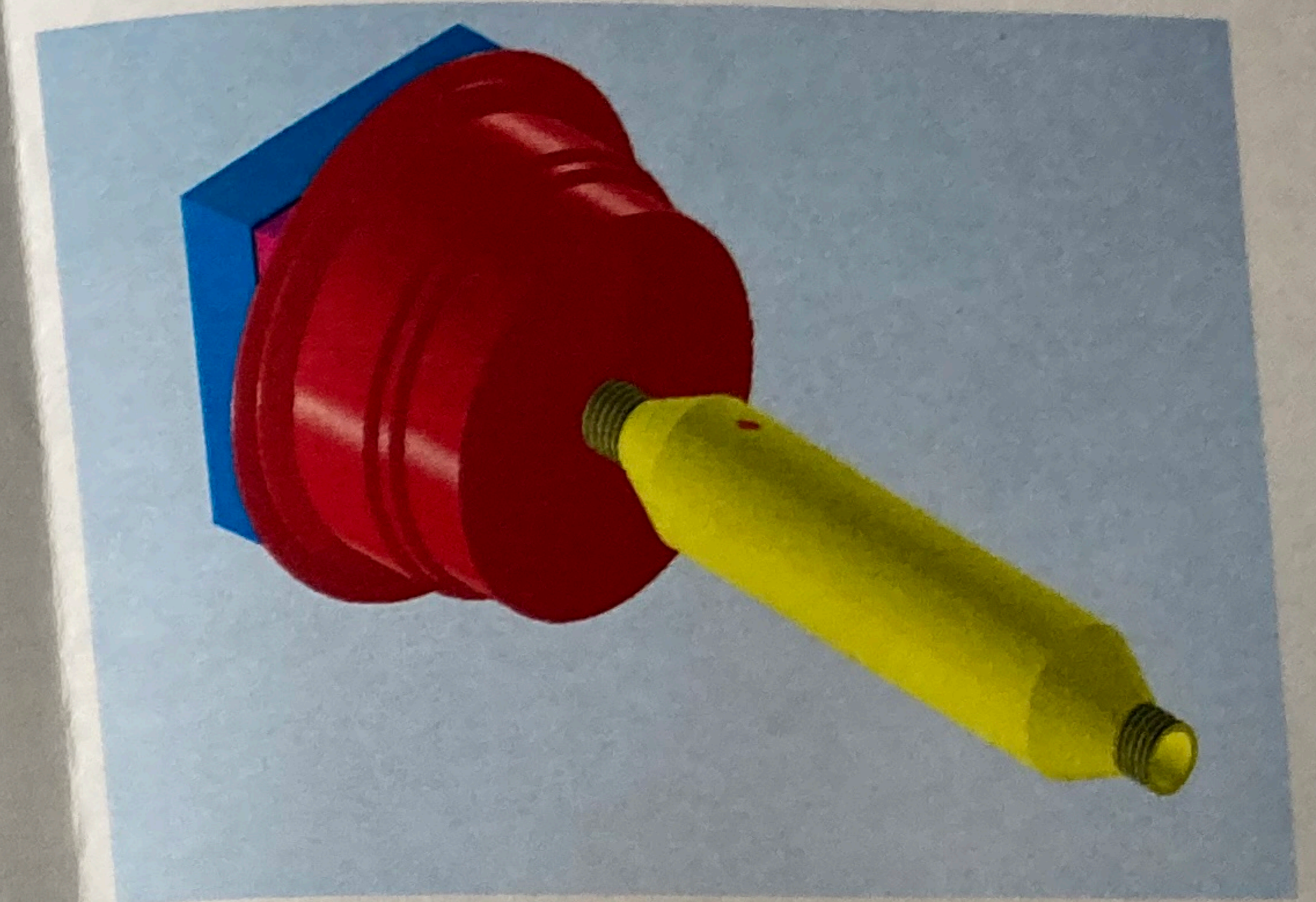


Prototype 2

In this model we designed it to be just as the engineers at NASA told us. It is a collapsible container which is what they specified because in the space station space and storage is what they stress most. we also made it to where the PBC pipe is detachable, and it can't act as a container for the object such as tiny food or nuts and bolts. We Used the same fan we used in prototype one.



Assembly



yellow- PVC Pipe

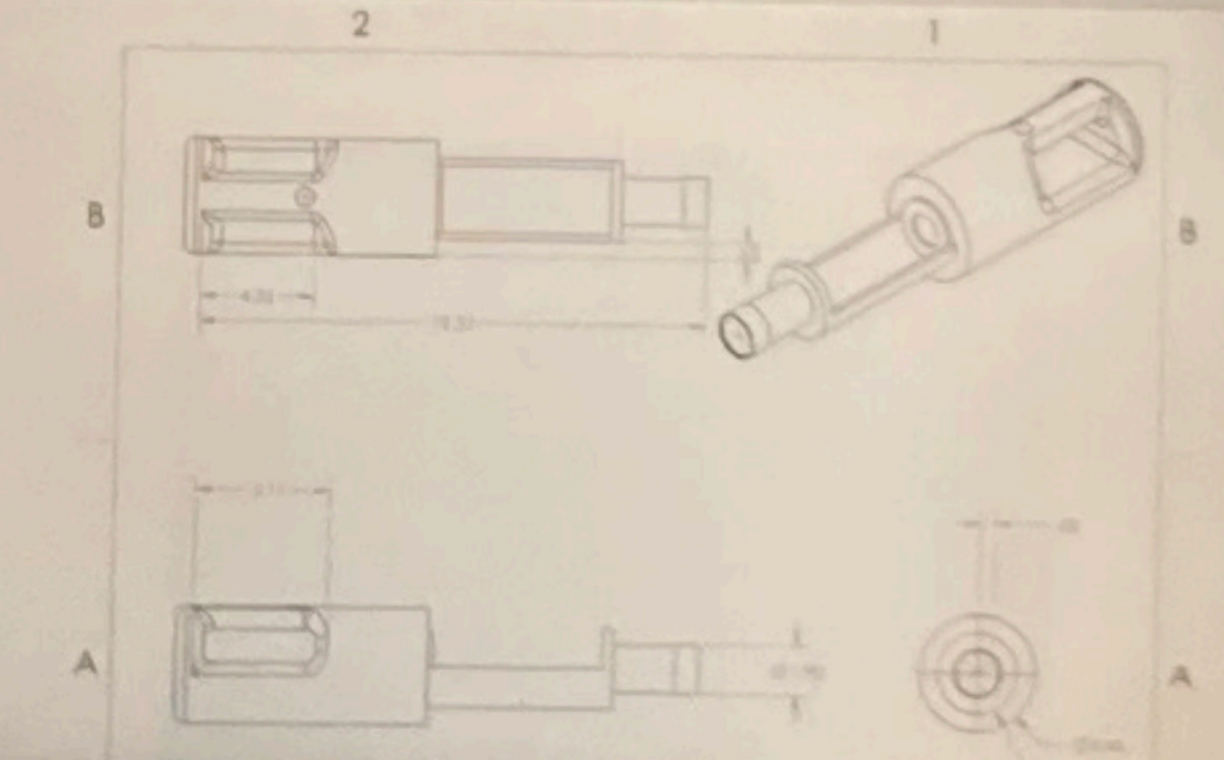
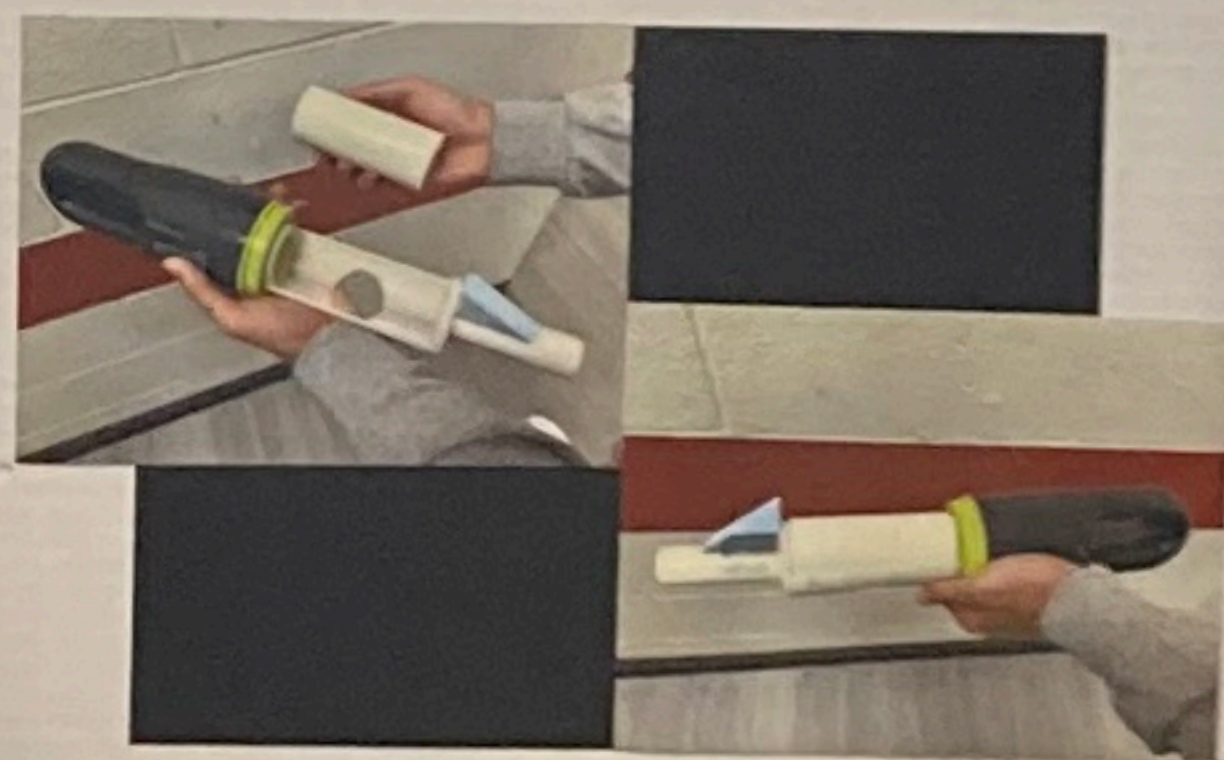
Red- Collapsible container

Blue- P.C Fan

Purple- Block of a wood

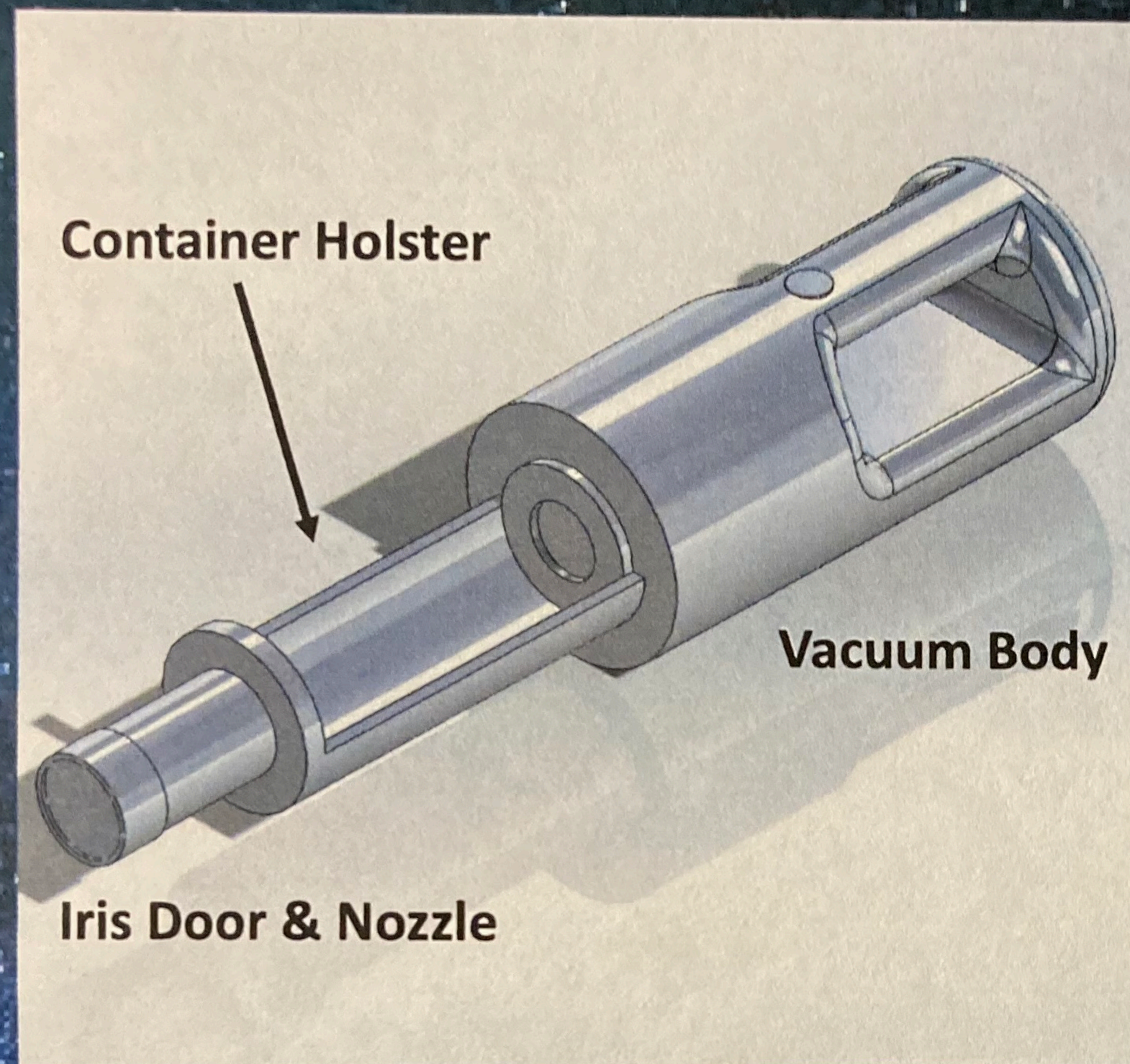


Zero G Bulk Transfer
System

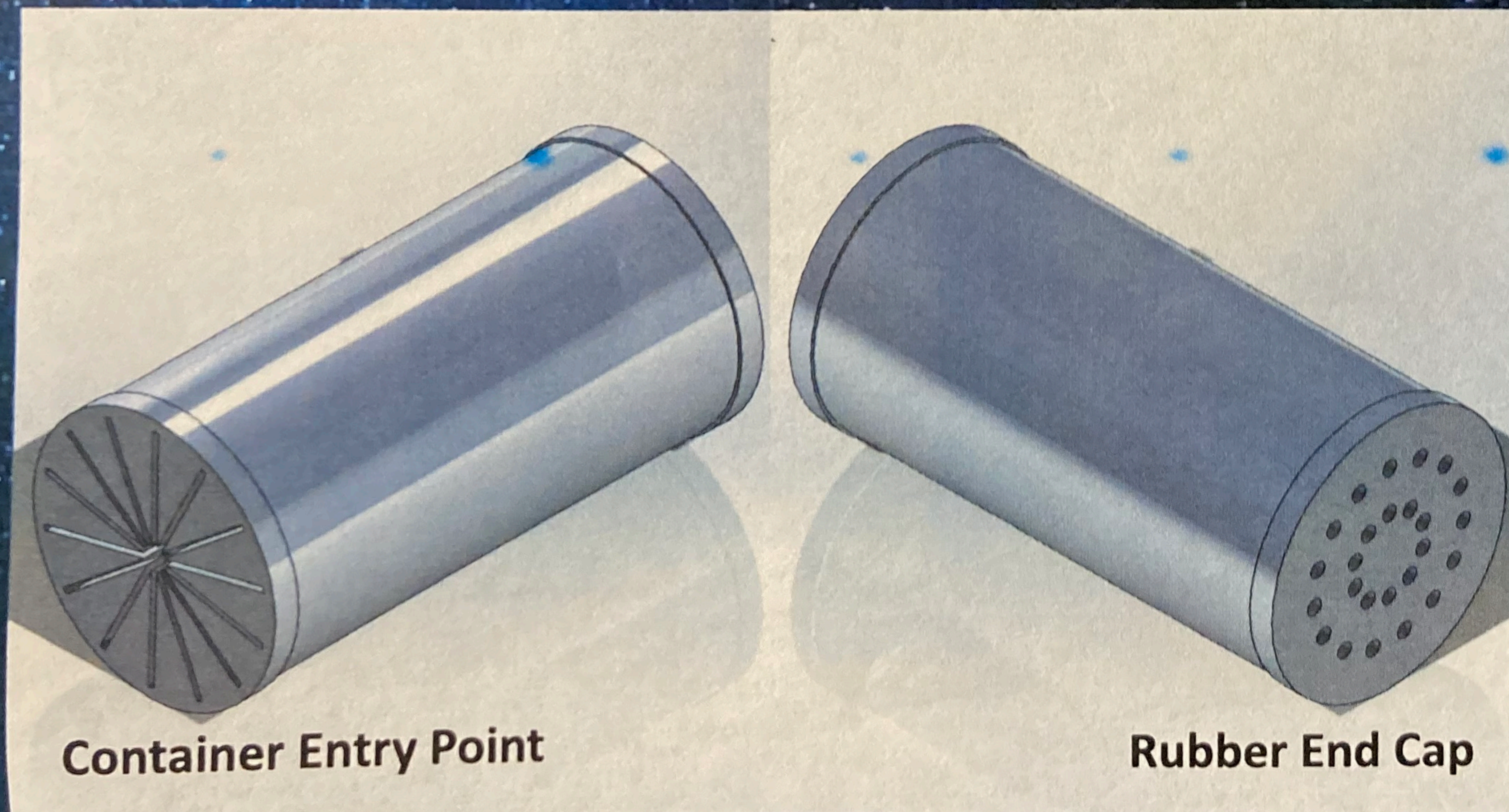


NASA HUNCH ZERO-G BULK TRANSFER SYSTEM

Vacuum Model



Container Models



Group Picture



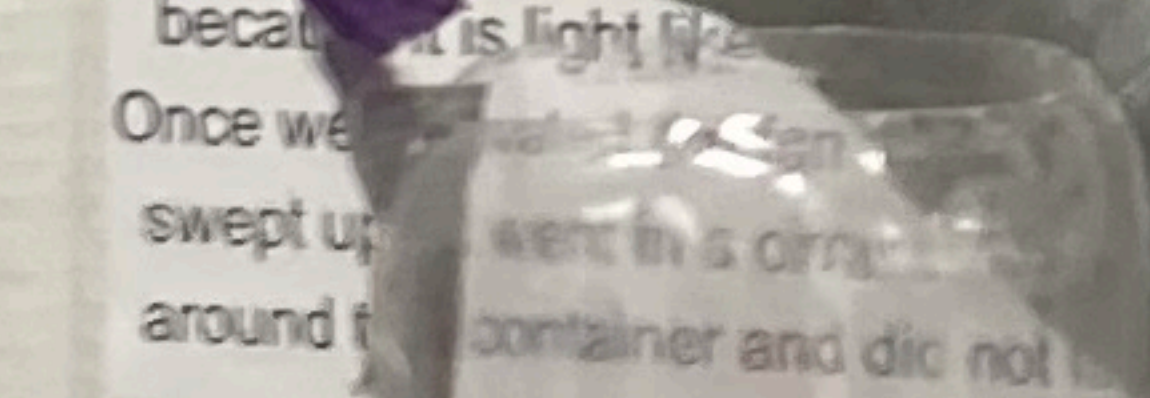
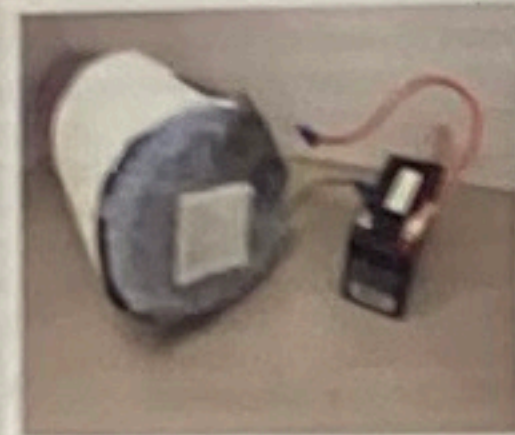
Space Coast Jr/Sr high school
Mr. Reyes
Ella Tucker, Brooke Street, John Christie

A photograph of two female students standing side-by-side in front of a NASA-themed display. The student on the left is wearing a light blue t-shirt and blue jeans with a tear at the knee. The student on the right is wearing a black long-sleeved shirt and red and black plaid pants. The display behind them features the NASA logo and the text "NASA" and "Space Shuttle".

The main features of our prototype is a baby cup lid for easy access and spill prevention. Our prototype also includes a fan to suck in particles and a strainer above the fan to prevent any of the particles from getting into the fan. There will be an attachment for the bottom of the prototype that will add a piece of velcro which will enable the prototype to stick to various surfaces.

On the inside of our prototype there will be a sliding compartment with belt clips that will aid in the process of getting the bag into the prototype. The compartment will have belt clips for the bag to attach to and a tiny cut out for the bag to slide out of once the lid is put back on after the fan is turned off.

A close-up photograph showing a person's hand holding a purple plastic pipette, dispensing a small amount of liquid into a clear glass beaker. The beaker already contains some liquid. The background is slightly blurred, showing a person wearing a grey hoodie.



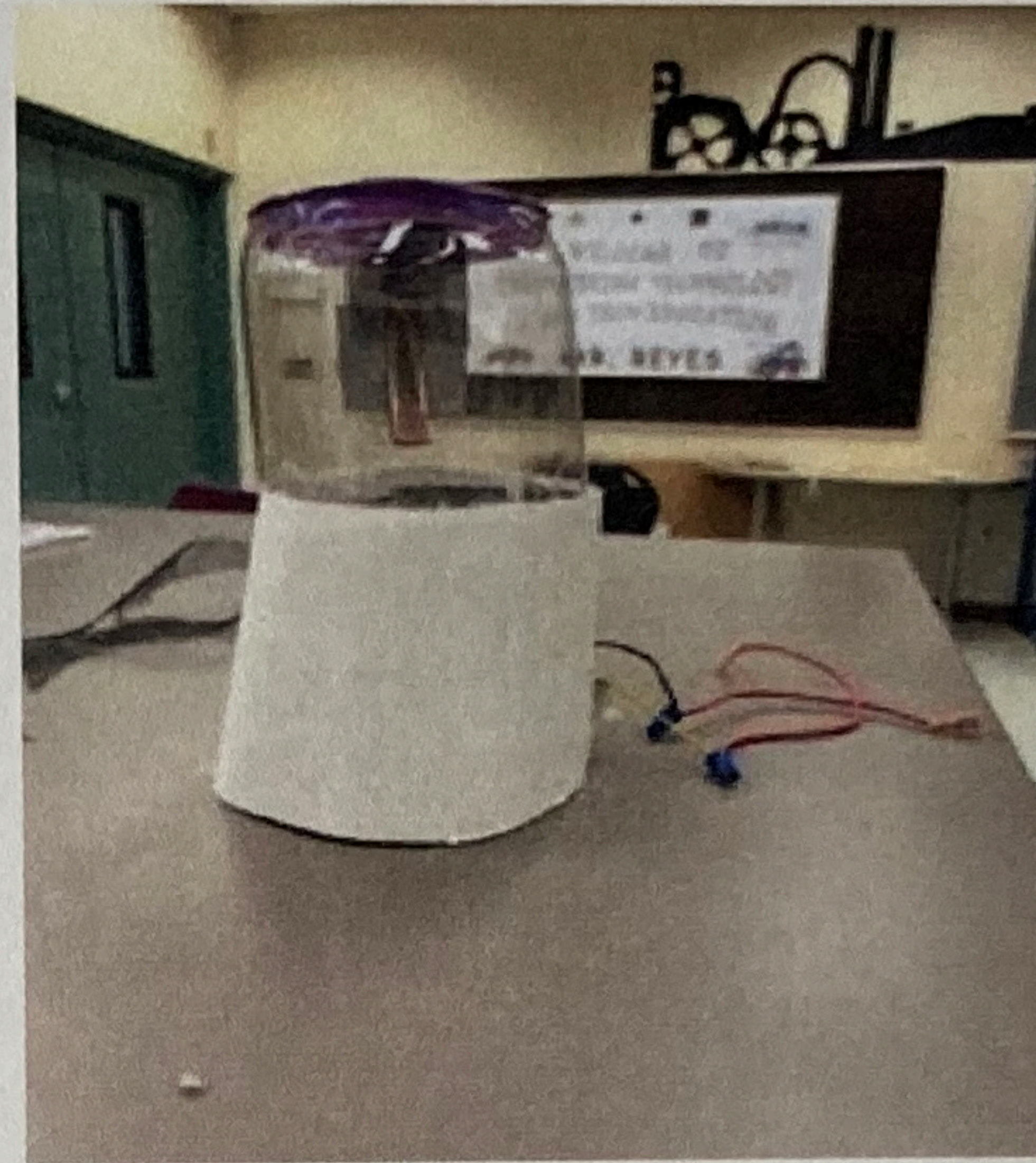
Zero-g Bulk

Space Coast Jr/Sr High School

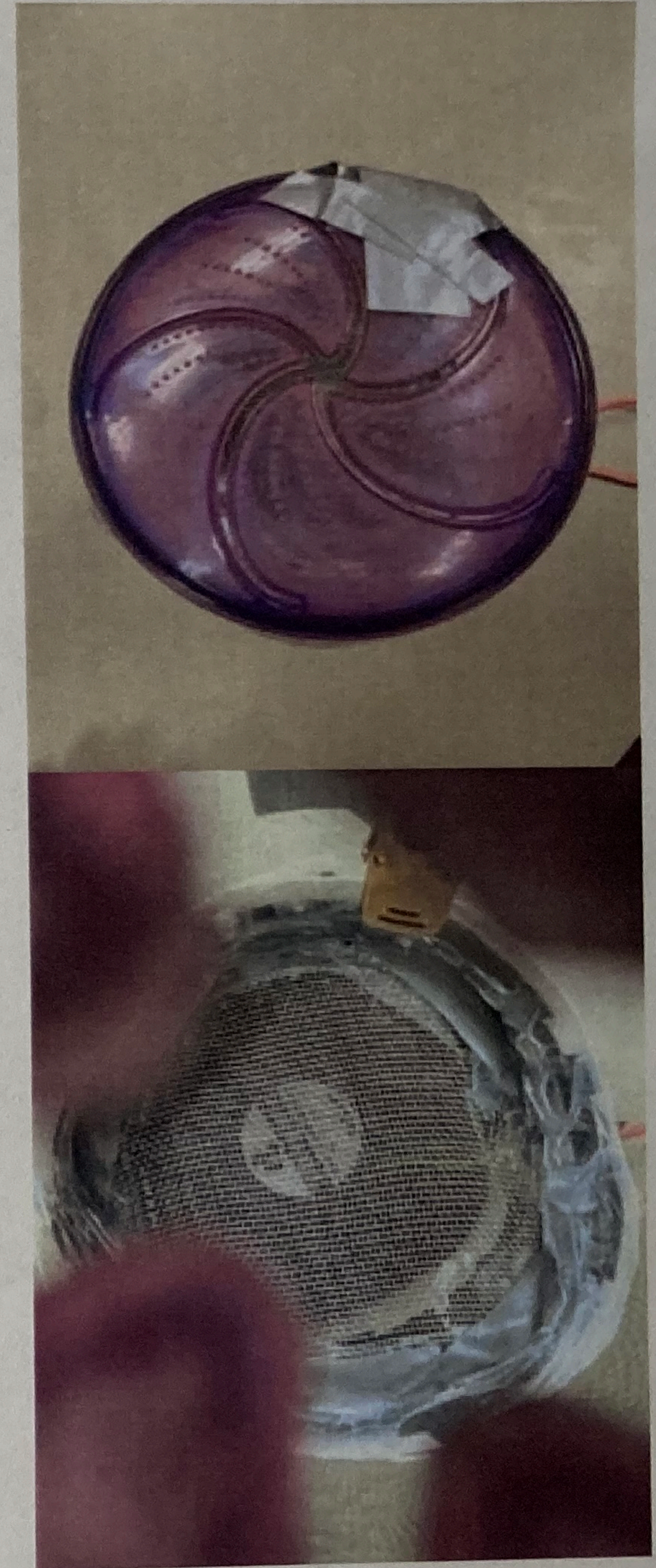
Mr. Reyes

Ella Tucker, Brooke Street, John
Christie

The main features of our Zero-g Bulk is that it's an easy operating container. Our prototype has been designed to transfer and hold the particles in a simple way. We have thought over how we are going to deal with the microgravity environment. We chose to create a container on the smaller side so that it wouldn't take up too much space and would be easy to operate. Our design has an attachable bottom on the container with velcro on it so that the container can be sat down and attached to another piece of velcro when not in use.



In our prototype, we chose to use a variety of materials. We have a flexible baby cup lid that allows one to access the materials in the container. The body of our container is made of plastic and has a paper bridge connecting the body to the fan. This will create a way to have the fan suck the particles downwards once the bag is attached. Inside of the container, there will be belt clips that will be used to help transfer particles into the container. You will put the bag through the lid and clip it to the belt buckle, this will hold the bag in place while the fan sucks all the materials inside downwards.

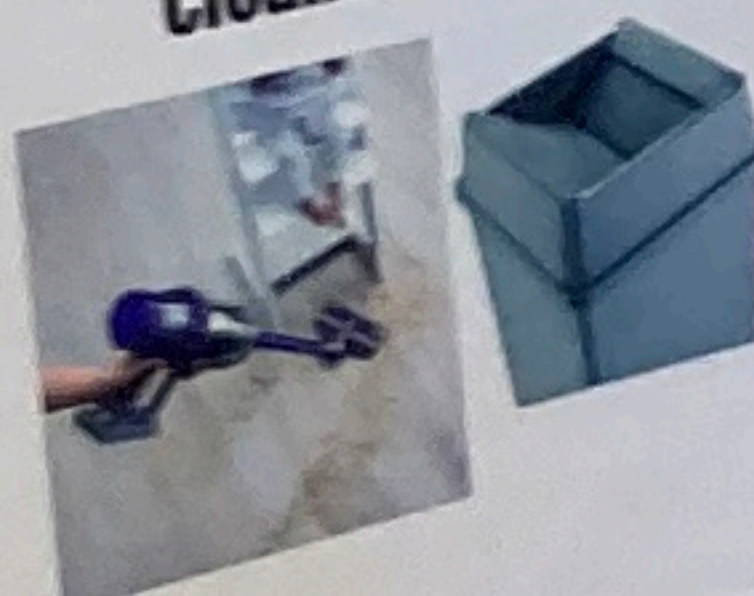


Problem I am solving

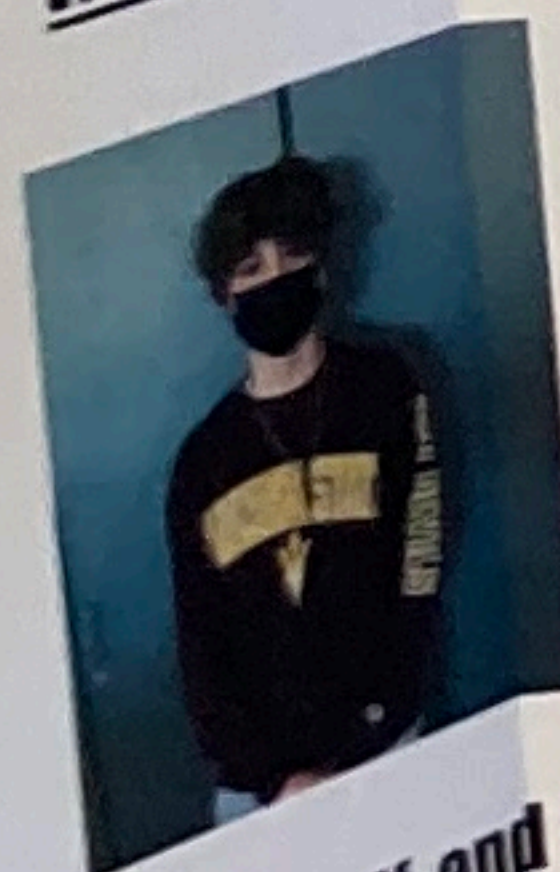
To come up with a system that would allow the transfer of small particulates from a large, flexible, bulk bag to a smaller container. This would hopefully save NASA from sending up a lot of packing material, and reduce trash.

Inspiration

I took a good amount of inspiration from these two simple objects. Looking at the folding flaps of the trash can I was thinking I could add something like that to my contraption. When I thought about how to transfer particles from a bulk bag into the contraption, I first thought of a vacuum cleaner, but eventually changed my mind to a small fan. It is still possible that I will do some tests with a vacuum cleaner just to see differences



My group



Me, Myself, and I.

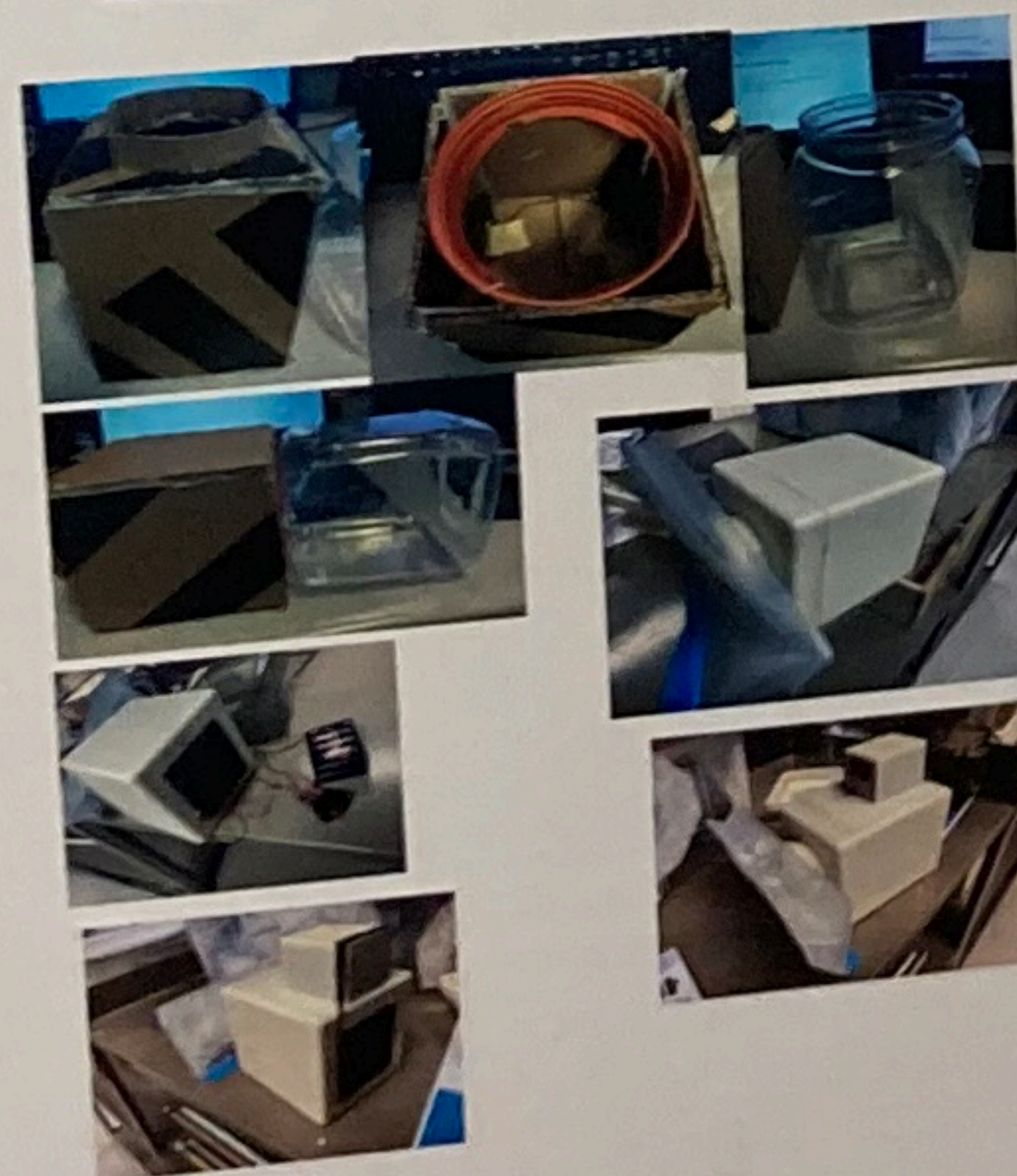
Zero-G Bulk Transportation system

Warren Tech Central
Mr. Olsen
Ryan Carriere

Problems

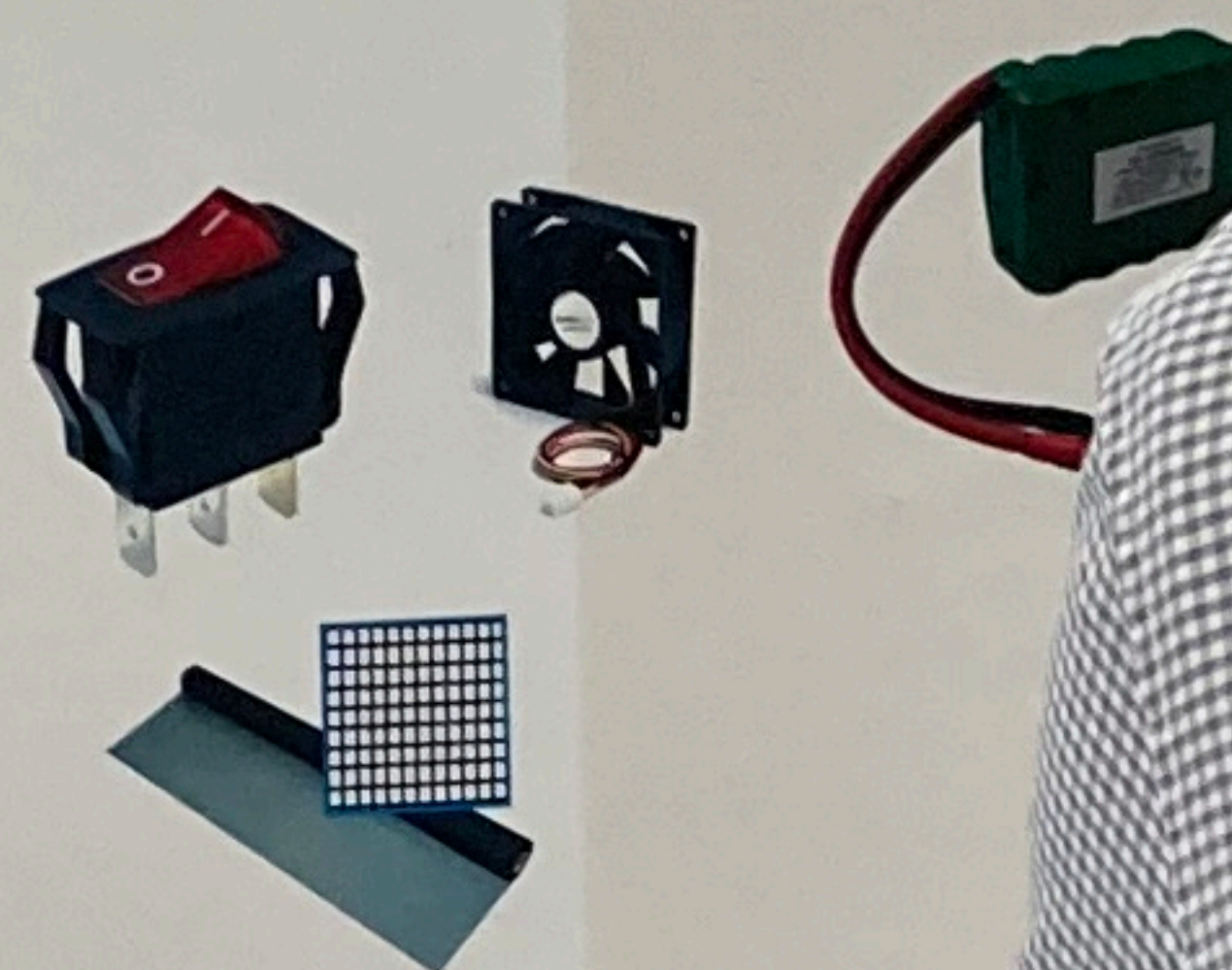
When printing the final design, there were many challenges that occurred. In printing the separate parts for the final product, threading was very difficult to print so it would work efficiently. This required me to entirely rework the threading of my prototype and re print it, in the end it worked efficiently. One other problem was figuring out how to wire the fan and the switch.

Progression of Prototype



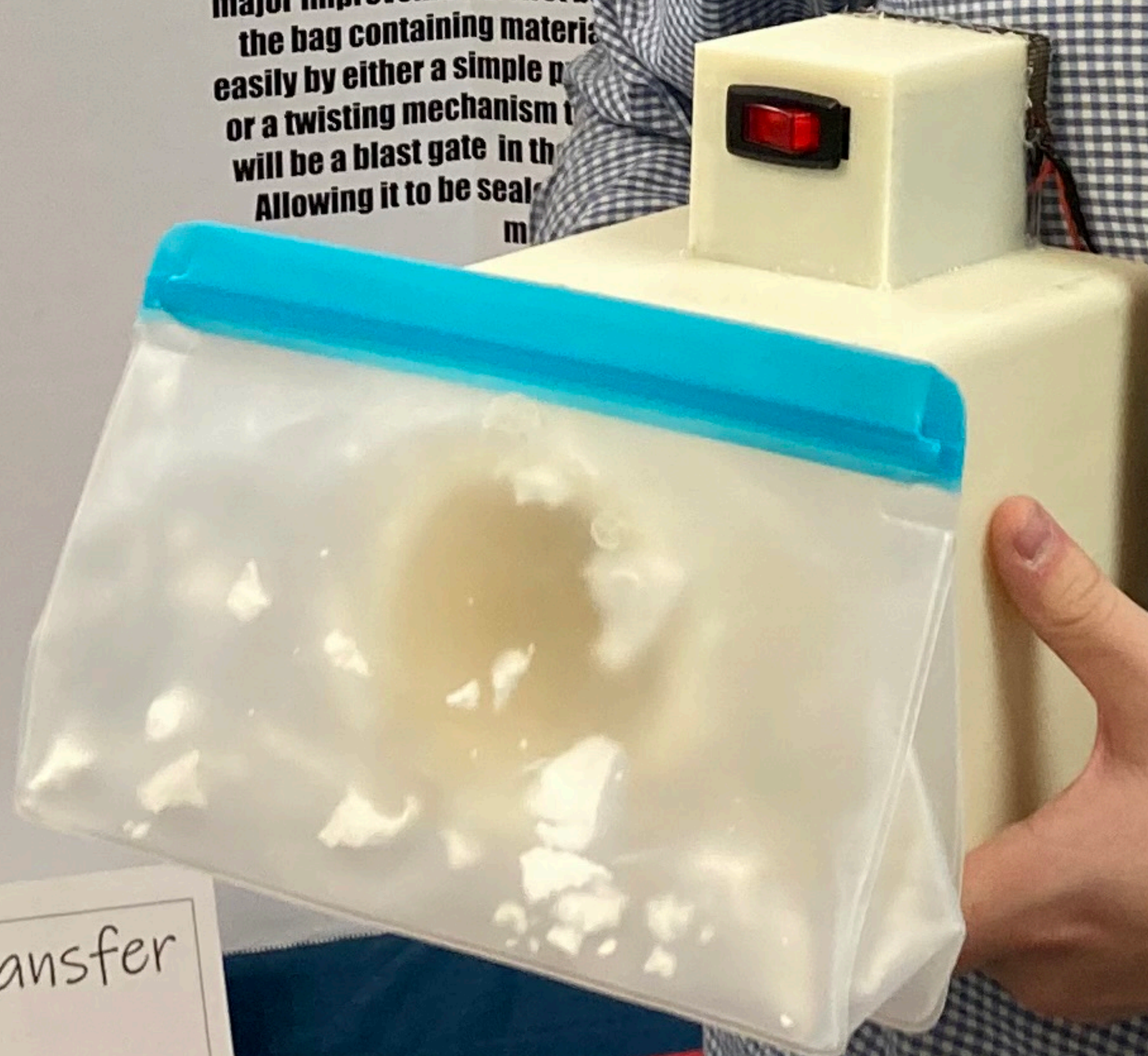
Materials used in the final design

The final design was 3d printed using basic 3D print plastic material. Materials used in the final design include, a small 12V battery, 80 mm computer fan, 3 prong rocker switch, and a small section of window screen to protect the fan.



How will I improve the

While my design is currently in progress, I am chosen to take it further with major improvements. First by the bag containing material easily by either a simple pump or a twisting mechanism. It will be a blast gate in the end. Allowing it to be sealed.



Zero -G Bulk Transfer System

Zero -G Bulk Transfer System



Problem We are Solving:
- We're mainly trying to reduce plastic trash on the ISS by successfully transferring particulates into a container from a bulk bag.

Similar Products We Have Examined:



They Don't Fit Our
- Container needs to have
- our design.
- taken out of
- ncture

Zero-G Bulk Transfer System

Warren Tech Central
Mr. Olsen(STEM Program)
Vincent P., Ian C., Izzy M.

Problems We Solved While Developing Our Prototype:

- attachment system to bulk bag
- puncture system for successfully opening bag
- filtration system(fan)
- lid design for container

Final Prototype



Components



Materials We're Using for the final prototype:

- collapsible silicone container
- mini utility blades
- flexible plastic sheet placed around rubber band on puncture system(LDPE sheet)
- high fidelity rubber band
- computer circuit fans for vacuum
- 3D-printed holder clip
- magnets

Testing

Data	
Iteration	
1	
2	
3	
4	
5	

Next Steps:
- In order to make it more efficient we would have to refine our design, mainly just the attachment system and fan, the power source and sturdiness of the fan.

Hardware that we got chosen:
- Collapsible container
- Different attachment systems
- Rather than full gaskets
- Puncture 3D-printed blade cover eliminate any chance of injury from using system
- Some glove compartment holder
- Internally efficient cooling system
- Systematic, top-down blades with an reflective cover rather than open utility blades

Problem Solving

These two would allow the... a large, flexible... This would... a lot of... produce trash.

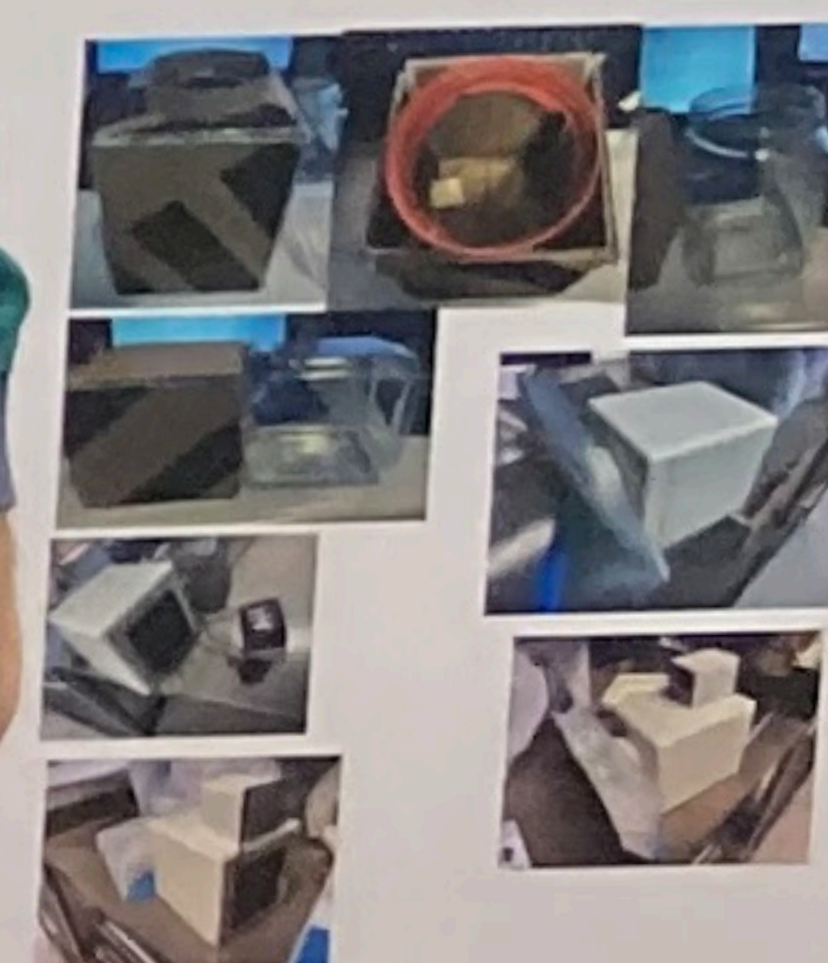
Zero-G Bulk Transportation system

Warren Tech Central
Mr. Olsen
Ryan Carriere

Problems

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Progression of Prototype



Zero-G Bulk Transfer System

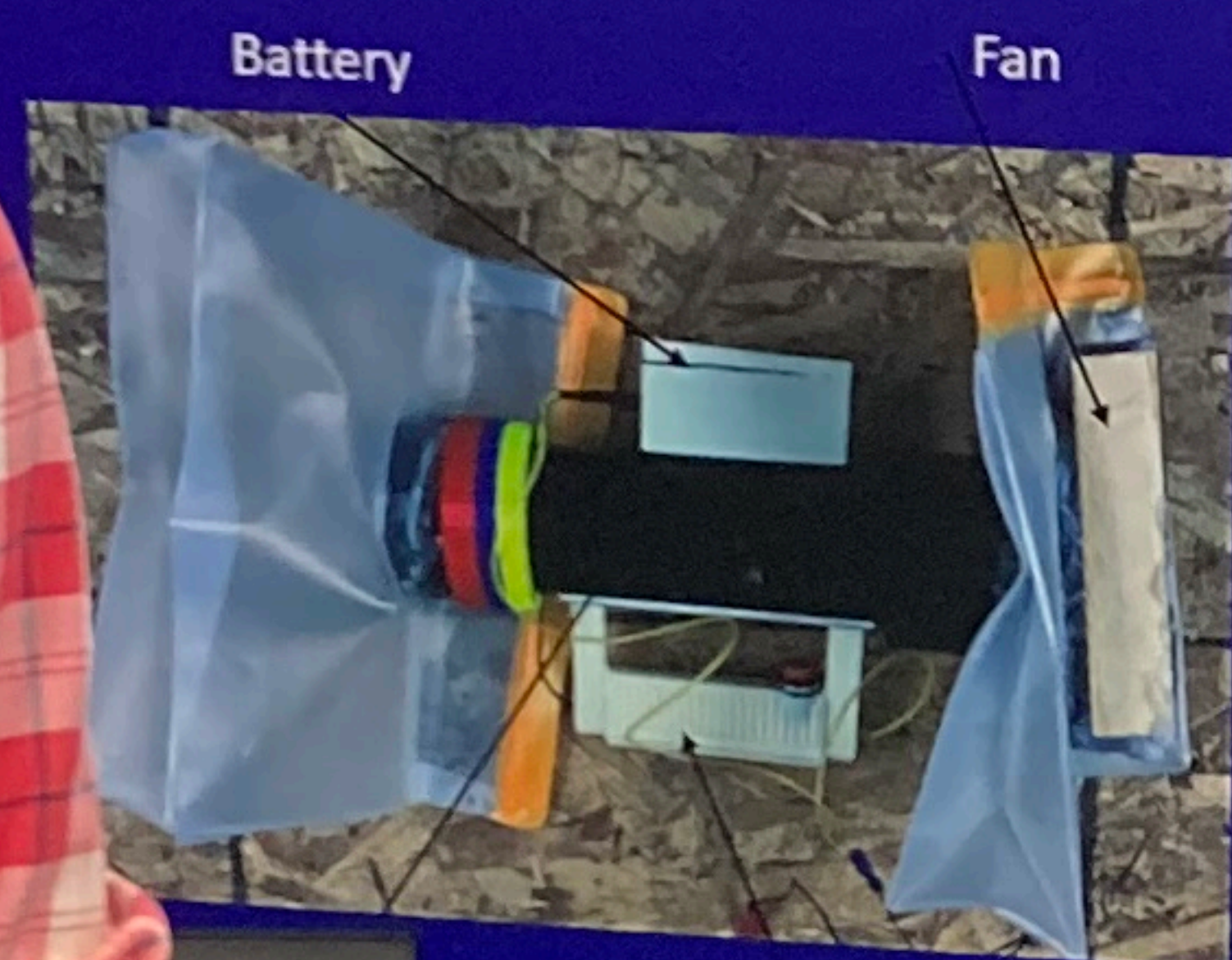
Bulk Transfer System

HU
High school students United

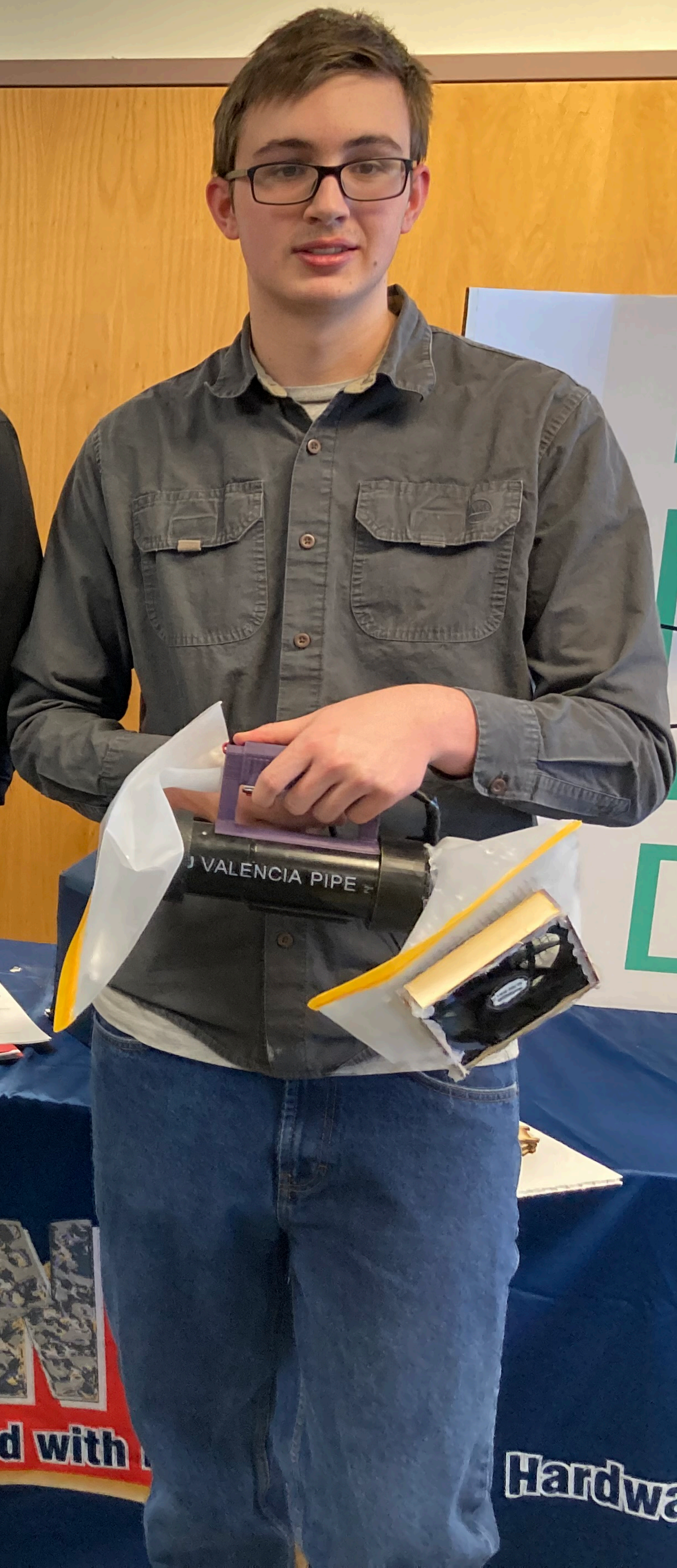


ZERO G BULK TRANSFER

Josh Rhodes, Jackson Woodman, Evan Busse



- Parts List:
- Reusable battery
 - Wire Mesh
 - Button
 - 12V Battery
 - Various 3d printed parts



Lunar Surface



War
Br



Possible Next

- Minimize unused
- Make plan for

High S

student

ted with

Hardware