2022 Design and Prototype Semi-Finalists

Combination Electro and Solid Magnetic Boots

Students: Aaron Dallarosa, Johah Briscoe
Teacher: Robin Merritt
School: Clear Creek, Texas

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School: Warren Tech Central, Colorado

Students: Tyson Watters, Cameron Vanderloos, Nolan Leonard
Teacher: Eric Anderson
School: Billings Career Center

Students: XXXXX
Teacher: Shaun Cuaron
School: Sanger, California

Students: Glenn Sawyer, Will Wedeke, Collin McEvoy, Ben Maxfield
Teacher: Kristen Magas
School: Tri County Regional Vocational, Massachusetts

ISSION CONTROL

APOLLO 11 MILESTONES

MISSION CONTROL:

HISTORIC LANDMARK

CAD FILES:

ELECTROMAGNETIC BOOTS

AARON DALLAROSA AND JONAH BRISCOE

CONTSTRUCTION:

PROBLEM STATEMENT:

OVERVIEW:

OUR MAGNETS:

SPACE

MAGNETIC B

SKETCHE

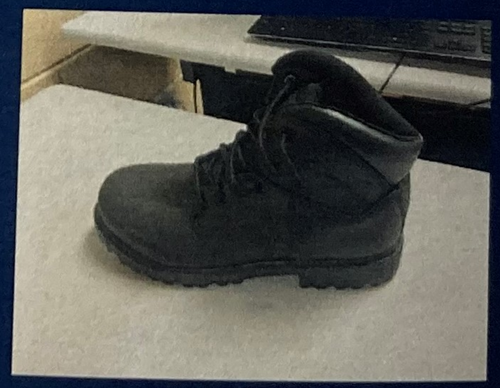
MODEL

Magnets

Due to the zero gravitational acceleration, the magnetic field doesn't need to be strong enough to perform on earth. Despite this, we still used 2 17.5 lbs. magnets. These magnets allow for the astronaut to stay attracted to the rocket while also having the ability to shuffle or walk across the station while working. On the other hand, these magnets do not provide anchoring capabilities, which is necessary for the safety of the astronaut. Solving this problem, we constructed an electromagnet from a microwave transformer. The electromagnet is powered by 4 AA batteries, resulting in 6 Volts, 12 Amps, which have the potential to withstand more than 200 lbs. During our testing We were able to pull 35 lbs. while the boot was powered off and 79+ lbs. on. We decided not to overpower the boot to protect it, but it is possible that when both magnets are functioning, and the maximum strength could withstand 250lbs for each shoe.

Construction

First, we flattened out the bottom of the shoe by using a band saw and a sander, allowing the parts to fit onto the bottom of the shoe. Next, we traced the layout of the bottom of the shoe and used wooden blocks to create stabilizers. We made one for the back and one for the front. Then, we used a drill press to make a hole for the solid magnets to fit inside the stabilizers. Next, we acquired a microwave electromagnet and used a hacksaw to remove the steel from the top part of the transformer. Then, we removed the secondary coil from the transformer to complete the electromagnet. Finally, after we built all the parts, we used epoxy and Gorilla Glue to attach the stabilizers to the base of the shoe. We also used to belt sander to remove the excess material from the shoe and the stabilizers for increased fitment.



Boot prior to Modifications

Walking

For our design we decided to create a simple boot that creates a familiarity to walking normally and with the capability to anchor. Because of the precise modification of the boot and wooden supports, the user can walk similarly to a normal shoe. When attaching the magnets, we only glued the roof of each part to the bottom of the shoe so the sides of each part can move freely. This allows the top of the shoe to bend when the user leans forward and the back to go backward. Unfortunately, the parts are blocky to they cannot flex to adapt to the users walking pattern. In order to maximize safety, the blocks must be solid to always apply a constant magnetic field when walking.

Front magnet stays connected for support while walker disconnects the rear.

Rear support disconnects when applying force on the shoe shoe.

Problem Statement

NASA astronauts want to be able to maneuver across spacecraft easily without having to float uncontrollably off the ground. To solve this problem NASA wanted to implement shoes that attract to the exterior of the spacecraft, allowing better mobility and increase the magnificence time and quality. Also, the International Space Station is made from aluminum which is not a ferromagnetic material. Could it be possible to use electronegativity on the ISS or would it only be useable on a steel rocket like the SpaceX Lunar Lander.

Our Project

We attached a makeshift magnet to the base of the shoe and added wood stabilizers with magnets inside, allowing astronauts the ability walk on the exterior of the Space X rocket. The type 301 stainless steel used to create the rocket, is non-magnetic so they must cold work the steel to allow our boots to work. However, the 304/304L alloy is slightly magnetic and will work with our design. The magnet was strong enough to firmly grasp to aluminum which is a non-magnetic material.

CONTACT INFORMATION

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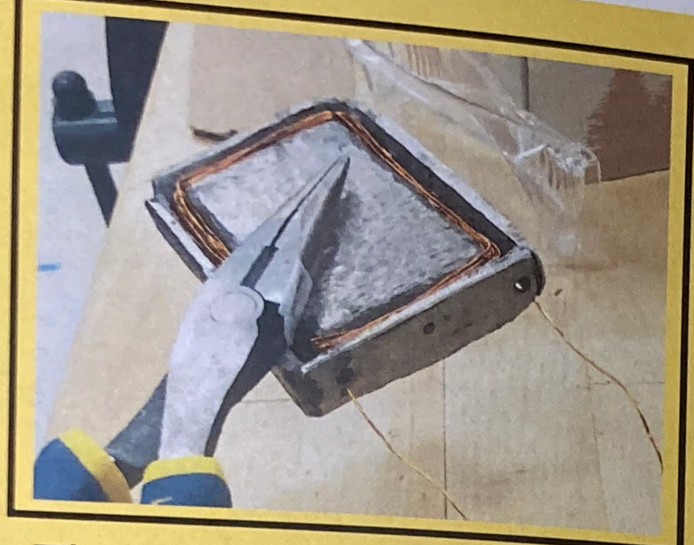
QR Code for Demonstration

ELECTROMAGNETIC BOOTS

AARON DALLAROSA
JONAH BRISCOE

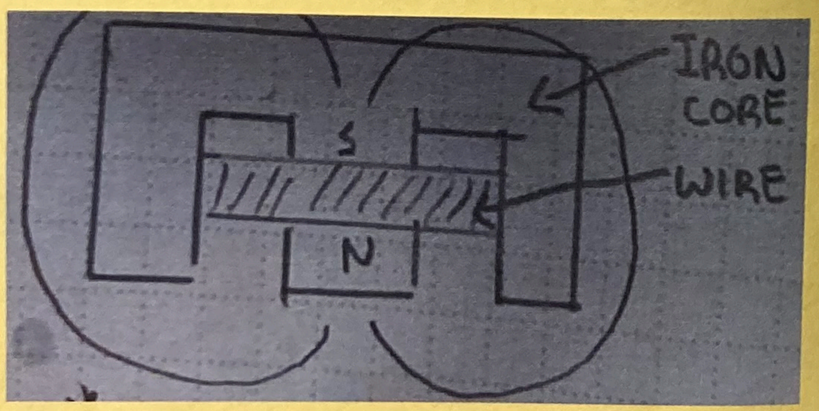
ENGINEERING DESIGN & DEVELOPMENT
2021-2022
MR. MERRIT
CLEAR CREEK HIGH SCHOOL
CLEAR CREEK ISD
LEAGUE CITY TEXAS


Tri-Fold Presentation Board
Tríptico para presentaciones
Panneau d'affichage à trois battants
3-D PRINTS
MAGNETIC
SANDALS
Jacob Humanic
Andrew Asaad
ELECTOMAGNET
MANUFACTURING
SKETCHES
VOICE CON
SKECHERS
SUICIDE
PREVENTION
LIFELINE
TOURNAMENTS



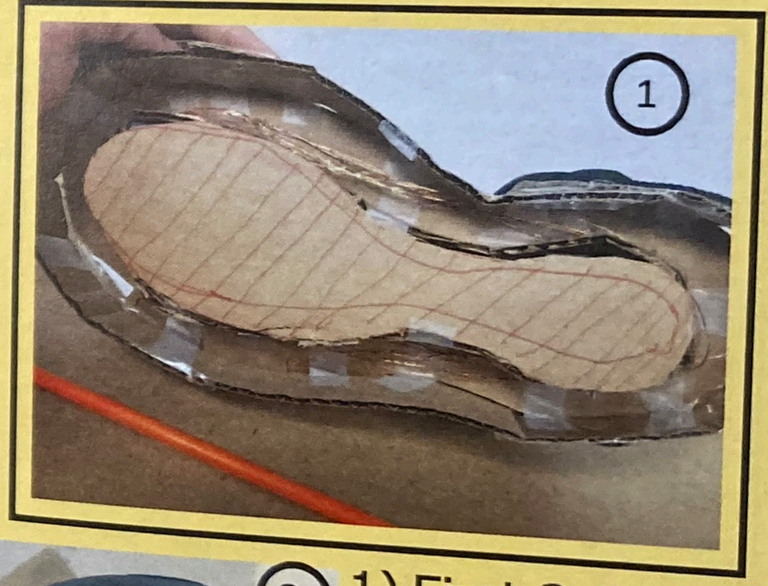
The electromagnet is a block of iron that we welded into shape and wound tightly with copper. With an external battery, we connect it to alligator clips and it creates a magnetic field.

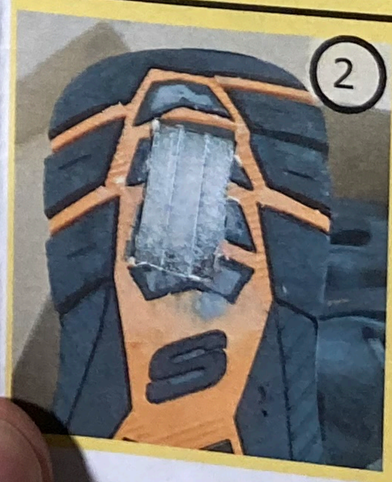
This is a visual representation of how the magnet functions



The complete design comes with a sandal, two magnets, and a battery. The basic concept of assembly is to walk on a flat magnetic surface. With the electro magnet in the front, and a static in the back, an astronaut can comfortably walk in space. The static has enough pull to stick, but still weak enough to pull off when wanted, while the toggleable one can provide secure force when on.

MANUFACTURING





1) First 3-D model of project (cardboard).
2) Static magnets installed in the bottom of the sandal.

PROBLEM STATEMENT

Astronauts are currently using abstract ways of movement during spacewalks similar to swimming. With the introduction of SpaceX using Stainless Steel 301 in their spacecraft construction as opposed to Aluminum, it is now possible to use magnetic boots allowing for easier movement.

OUR DESIGN

Instead of redesigning a boot, we took the accessory approach. The sandal doesn't function as a replacement, rather piece of equipment that can be taken on and off when needed.

DEMO QR CODE

CONTACT INFORMATION

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Jacob Humanic

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MAGNETIC SANDAL

INFORMATION

Materials:

- Electromagnet (12VDC 200N)
- Stationary/Permanent Magnets
- Lithium-Ion Battery (12V)
- Button
- Shoe
- Potentiometer
- Breadboard
- Wires

light Status Checklist:

sulation
t Diffusion
Magnets/Screws

Design is Unique:

e
scaling Voltage and
sm
ight
pairable
aptable
ability

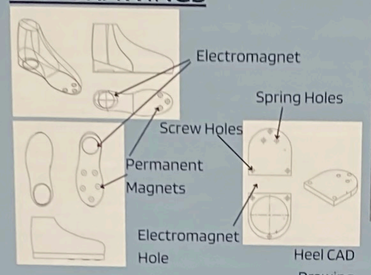
Check me out!

WARREN TECH. NATHAN OLSEN. MOUMINA MADHOUN. COLE BICKELL

MAGNETIC BOOTS

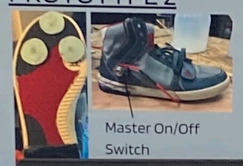
DESIGN

CAD DRAWINGS

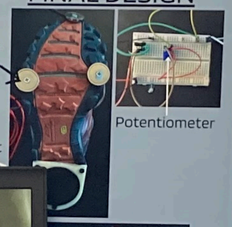


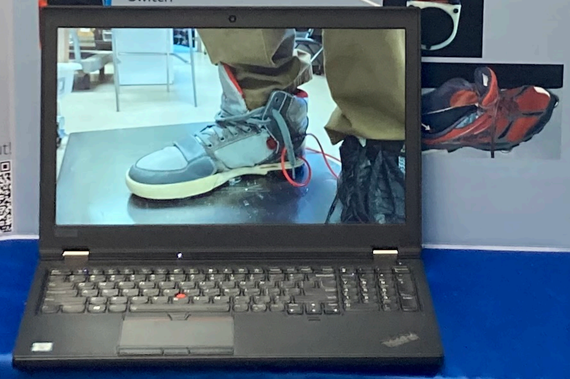
PROTOTYPE 1

PROTOTYPE 2



FINAL DESIGN

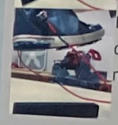




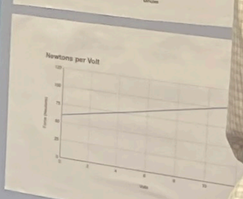
DATA

Button in heel being clicked, magnet picked up the metal block.

Pressure on button was removed, static magnets held metal block.



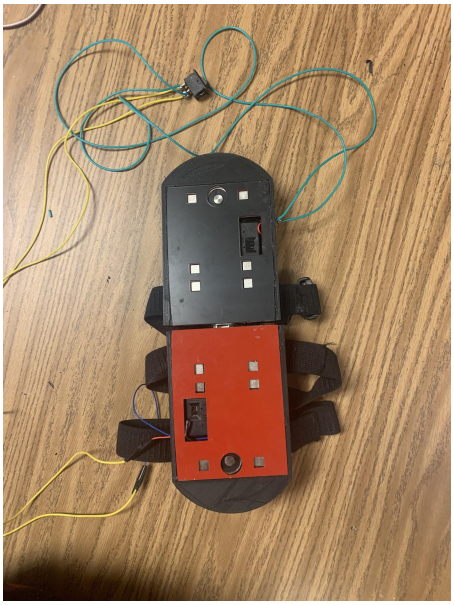
Button in heel not being clicked, metal block was not picked up.

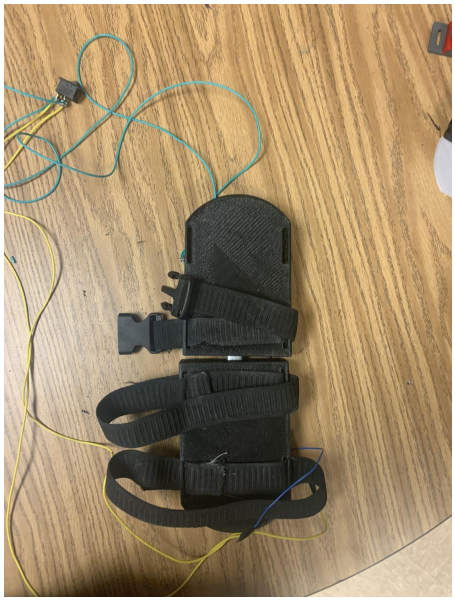


Magnetic Boots
Billings Career Center

Teacher-Eric Anderson
Team- Tyson Watters, Cameron Vanderloos, Nolan Leonard
Video- https://youtu.be/dS1eIw9ZV78

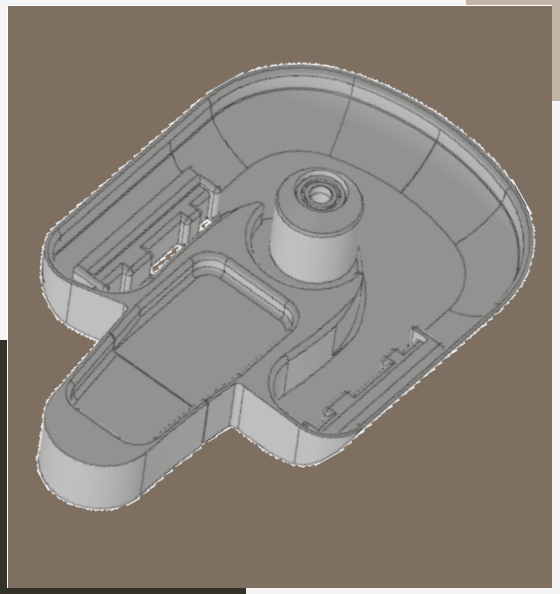
Description- Our prototype uses a combination of electromagnets and neodymium magnets in order to ensure the stability and hold strength of the boots. It also uses an adjustable slide system to fit multiple astronaut's boots. It is held to the boot with a strap system and a rigid top to secure the astronaut's stability.





THE MES

Hello, we are The MES. Our team name is actually an acronym for all of our names- Matthew, Ella and Gursimar. We are student at Sanger High School and are a part of the PLTW pathway there for four years. Our teacher is Mr. Cuaron.



ABOUT OUR DESIGN

The goal of our design is to create an electromagnetic boot with an emphasis on mobility. Our shoes are more spread out to help with mobility. Since the purpose of our design is to rotate, a small design would have to have more height and be more likely to wobble.

Furthermore, The weight of the shoe and the astronaut is able to be distributed across a slightly larger surface. Our goal is to also eventually have our design to be able to connect to any shoe. Our current 3D model has felt on the bottom to demonstrate the lack of friction our final design will support.

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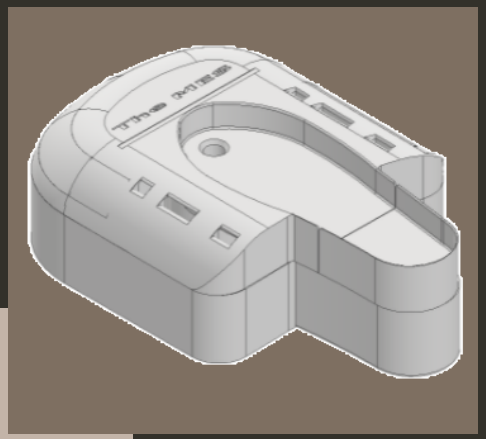

- one pro about our design is that there is more degrees of rotation/ more freedom of movement
- As well, a more durable base will lead to a sturdier design. Since it is lower to the floor, our design is less likely to wobble.

01.

The entire shoe will be made of aluminum 6061 t6 since it is the least resistant to corrosion while being sturdy

02.

a rotating base with large bearings to support the astronaut's weight

03.

A torsion spring will snap the shoe back into place so that astronauts will be able to use less energy

04.

4 Earth Magnets with one big electromagnet. There will also be buttons turning on or off the design

Magnetic Boots

S.W.M.M. Magnetic Boots

Tri County RVTHS
Mrs. Magas
Glenn Sawyer, Will Wedeke, Collin McEvoy, Ben Maxfield

Our magnetic boots have walking and locking capabilities. They utilize a combination of permanent and electromagnets that make it easy for the user to walk to the worksite and have the capabilities to lock in place. The electromagnets are able to be turned on and off at any time with our easy-to-use controller. Along with the on/off capabilities, the strength of the electromagnets can be adjusted using a potentiometer also on the controller.

[Link to testing video]