2022 Design and Prototype Semi-Finalists

Solid Magnetic Boots

Students: Evan Coleman, Damion Thomas, Hayden Bate
Teacher: Steven Marcus
School: Cypress Springs, Texas

Students: Julio Garcia, Juan Chavez
Teacher: Steven Marcus
School: Cypress Springs, Texas

Students: Jacob Dreger, Cooper Gassman, Noah Felder, Daniel Wells, Matthew Heer
Teacher: Matt Heer
School: Platteville, Wisconsin

Students: Rose Thomas, Carter Garrison, Ryan Torlin
Teacher: Ben Nuebel
School: Cherokee Trail, Colorado

Students: Ben Miller, Tim Bowser
Teacher: Brett Jenkins
School: Kettering Fairmont, Ohio

Students: Gabriel Nelson, Joshua Goudy, Nicholas Morledge-Hampton
Teacher: Eric Anderson
School: Billings Career Center, Montana

Students: Shane Kuo, Damian Wilson, Kendall Meyers, Calvin Erickson
Teacher: Vince Stornello, Donna Himmelberg
School: Fairport, New York


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ENGINEERING DESIGN II
CYPRESS FAIRBANKS ISD
CYPRESS, TX

NASA HUNCH PROGRAM

TEAM NAME - STEEL WHEELS

TEAM MEMBERS -

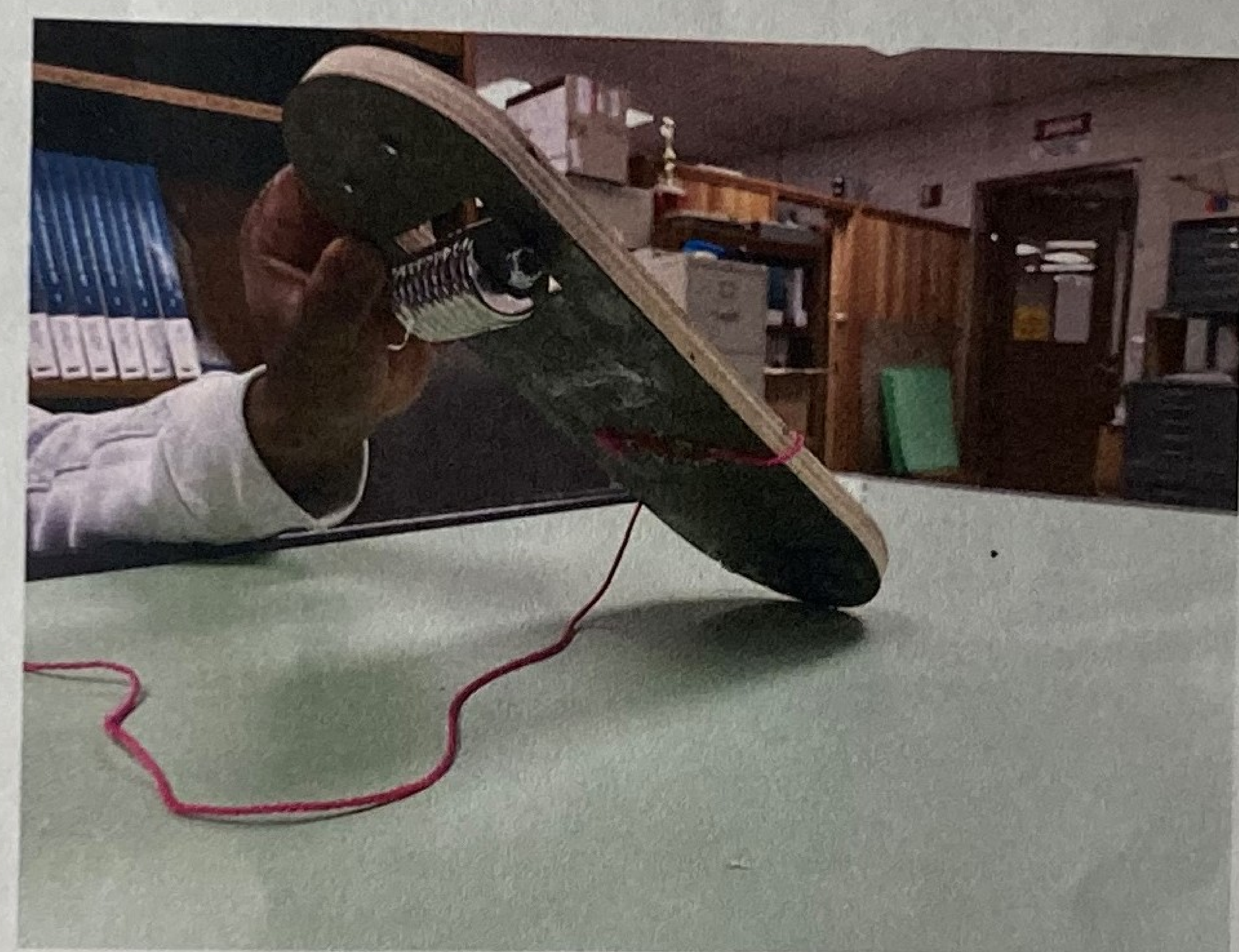
1. EVAN COLEMAN
2. DAMION THOMAS
3. HAYDEN BATE

INSTRUCTOR - STEVEN MARCUS

NASA HUNCH MENTOR - GLEN JOHNSON

Video-

CYPRESS SPRINGS
HIGH SCHOOL



-Slides

GENERAL INFO- ON ONE SHOE THERE IS A WHEEL IN THE SHOE, ON THE OTHER SHOE WE HAVE A MAGNET BELOW THE ASTRONAUTS TOES TO ACT AS IF SKATEBOARD WHERE ONE SIDE STAYS ON THE STEEL SHELL OF SPACECRAFT (SKATEBOARD) AND THE OTHER FOOT ON THE SHELL OF THE SPACECRAFT ACTING AS THE GROUND PROVIDING THE PROPULSION OF THE SKATE,

OBJECTIVE: TO ALLOW AN EASIER METHOD TO SPACE WALK INSTEAD OF FLOATING YOU CAN ROLL ON THE SURFACE OF THE SPACECRAFT

MATERIALS- WHEEL: CIRCULAR MAGNETS
BOTTOM OF SOLE: STEEL
TOP OF SOLE: WOOD

ISSUES: THE MAGNET HAS A STRONG HOLD SO IT MIGHT BE HARD TO ROLL THE WHEEL

TECHNIQUES: ON ONE SHOE YOU USE MAGNET TO GET ENOUGH POWER TO ROLL ON THE OTHER YOU USE THE WHEEL TO ROLL

SOLUTIONS: SINCE THE HOLD IS STRONG THE MAGNETIC WHEEL ALLOWS THE ASTRONAUT TO SLIDE ON SPACECRAFT

PROBLEMS: THE SPACE WALK IS DANGEROUS AND IT USES A JETPACK TO GET TO PLACES AROUND THE SPACECRAFT, THE SHOES WILL ELIMINATE THE USE OF FUEL DURING SPACEWALKS AND INSTEAD IT USES HUMAN MECHANICS TO GET AROUND CHALLENGES


FOOD LAB
MARKET & E
SHOE
MAGNET
MAGNETO
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Proto

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INDUSTRIAL TECHNOLOGY

ENGINEERING DESIGN II

CYPRESS FAIRBANKS ISD

CYPRESS, TEXAS

NASA HUNCH PROGRAM

PROJECT NAME: MAGNETO

TEAM MEMBERS:

- JULIO GARCIA
- JUAN CHAVEZ

INSTRUCTOR

STEVEN MARCUS

HUNCH ADVISOR/ MENTOR

GLENN JOHNSON

INFORMATION

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SHOES TEST

OBJECTIVES:

THE MAGNETIC BOOTS ARE SUPPOSED TO HELP THE ASTRONAUTS WITH A WAY OF SUSTAINABILITY WHEN BEING OUTSIDE THE SHUTTLE TRYING TO FIX PROBLEMS.

MATERIAL:

- RUBBER
- SHEET METAL
- SHOES GLUE
- MAGNETS
- BOOT

ISSUES:

OUR ISSUE WOULD BE THE MAGNETS FITTING ON THE SOLE. MAKING SURE THE MEASUREMENTS ARE CORRECT AND HAVE THE RIGHT AMOUNT OF MAGNET FORCE DISTRIBUTION.

TECHNIQUES:

WE ENVISIONED OUR PROJECT IN OUR HEADS AND WE SKETCHED IT. WE DREW IT IN INVENTOR AND AUTOCAD.

SOLUTIONS:

WE USED THE EXACT DIMENSIONS, USED CARDBOARD AS OUR PROTOTYPE, AND FIGURED OUT HOW TO PLACE THE MAGNETS BY EXPERIMENTING IN DIFFERENT POSITIONS USING THE PROTOTYPE.

PROBLEMS:

MAKING SURE THE MAGNETS HAD ENOUGH FORCE TO WITHSTAND 20 POUNDS.

CHALLENGES:

BEING ABLE TO GET THE MAGNETS. CUT OUT THE SOLE AND HOLES WHERE THE MAGNETS ARE PLACED.

Magnetic Boots for SpaceX Human Landing System

Jacob Dreger, Cooper Gassman, Noah Felder, Daniel Wells

Matthew Heer

Platteville High School

- **Criteria**
  - The ability to turn the boots on and off
  - Should hold at least 20 pounds on 301 stainless
  - Easy to put on and easy to turn on and off
  - Simple, easy to replicate

- **Constraints**
  - Can't be easy to take off
  - No electronics

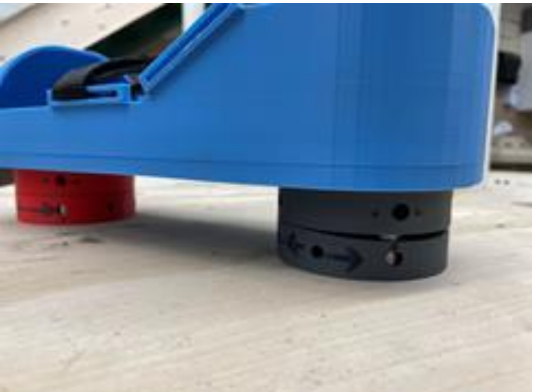
Mag-switch		**Spacer**	
Pros	Cons	Pros	Cons
• Simple • Less force	• Rotate instead of lever	• Simple • Lever design	• More effort • May be inconsistent • Fabric required in design

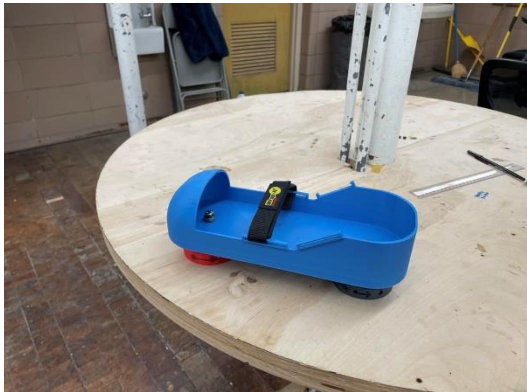

Magnetic Boo
By: Rose Thomas, Carter Garrison, & Ryan Torlin
Mr. Nuebel
NASA

AstroMag
(Switchable Magnet Boot/Slipper for Space Walks)

Kettering Fairmont High School
Brett Jenkins
By: Ben Miller and Tim Bowser

We have created a non-powered switchable magnet system on a boot/slipper allowing astronauts to go on space walks on a magnetic side of a space shuttle.





Billings Career Center

Magnet Boots

Eric Anderson

Selling Points:

- Very Simple
- Very Lightweight
- Hands Free
- Deliberate Movement
- Configurable
- No Wiring/Battery Necessary

Left: Gabriel Nelson

Middle: Joshua Goudy

Right: Nicholas Morledge-Hampton

Demonstration Videos

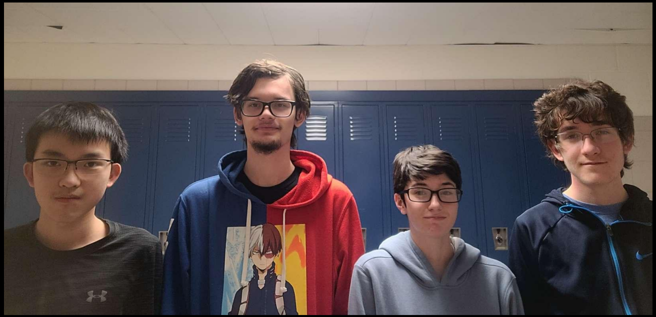
https://youtube.com/shorts/92O1PvbZ2DY?feature=share

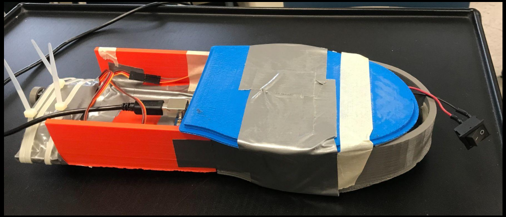
https://youtube.com/shorts/4SmWiPX4CT4?feature=share

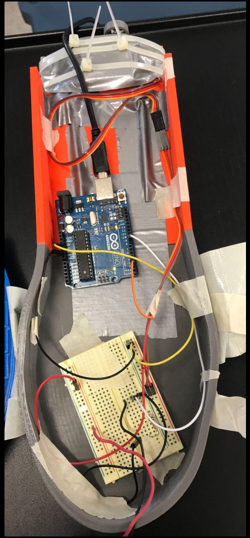
Magnetic Boots

Mr. Stornello's Class
Shane Kuo, Damian Wilson, Kendall Meyers, Calvin Erickson

The boot attachment uses one motor that moves an egg-shaped protrusions 90° downwards to separate the boot from the magnetic surface. Two smaller magnets reside close to the back, providing attraction. As of the presentation of our shoe the design uses one switch to control when the egg raises and lowers the shoe, facilitating transportation and storage. The big toe will be able to interact with the switch on the roof of the inside of the boot. After the CDR, we plan to add a separate power switch to allow for locking in place to prevent accidental disengagement from surfaces.







Why is our design useful?

The main advantages of our magnetic boot attachment design are:

1. Simple but feasible with manageable components;
2. Scaleable with potential for customization;
3. Energy efficient with no need for a large power supply.