

Safe Shower Solution for Below-the-Knee Amputee

Progress Report 5

October 2, 2026 – October 9, 2026

Client: Mike DeGrave

Advisor: Prof. Murphy

Team:n

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Claire Matthai - cematthai@wisc.edu (Communicator)
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Problem Statement

Below-the-knee amputees are unable to wear their prosthetic in the shower, as most prosthetic legs are not waterproof and are prone to corrosion and slippage. This forces individuals to either remove their prosthetic and shower while seated, or attempt to stand on one leg using unsafe workarounds - both of which carry significant fall risk. The objective of this project is to design a device that gives below-the-knee amputees the autonomy to safely enter, stand, and bathe in the shower without their prosthetic, restoring independence and reducing injury risk during a daily activity. This project is being developed in partnership with Mike DeGrave, a below-the-knee amputee whose personal experience with this challenge is the driving inspiration behind the work.

Brief Status Update

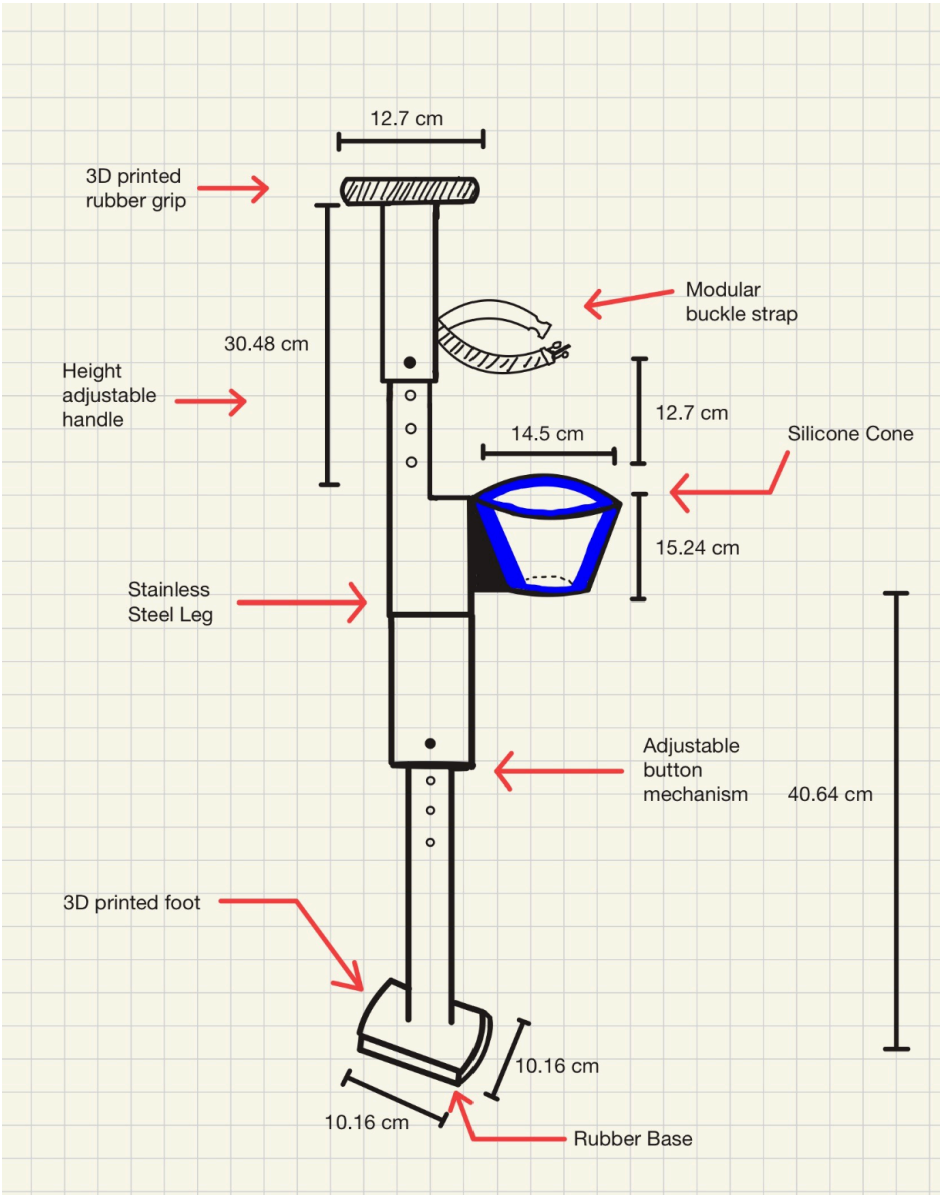
This week the team worked to select materials to better understand each segment of the Air Jordan design. The team split into 3 groups each researching their respective section and performed in depth analysis of the cone, base, and crutch portions. The team then met to discuss their findings and review an in person client meeting that Sam Dudek worked through over the weekend.

Difficulties / Advice Requests

N/A

Current Design

Modified Air Jordan:



Materials and Expenses

Item	Description	Manufac-turer	Mft Pt#	Vendor	Vendor Cat#	Date	#	Cost Each	Total	Link
Category 1										
									\$0.00	
									\$0.00	

Category 2									
								\$0.00	
								\$0.00	
							TOTAL:	\$0.00	

Goals

Major team goals for the next week

1. Meet as a team to discuss in person client meeting and what every individual should know about Mike DeGrave and his story, process, and overall thoughts
2. Implement research and brainstorming done by the team and put together an order report for initial testing.

Next week's individual goals

- Sam Dudek
 - Possible meet with Professor Peter Adamczyk to speak about Mike, his research, and get feedback on our current design and fabrication ideas
 - Brainstorm ideas for the cone and how to add it to the crutch in a safe, comfortable, and steady matter
- Ben Willihnganz
 - Work with client to purchase initial materials for prototyping
 - Meet with the team, professor, and design department to discuss the design thus far
- Claire Matthai
 - Schedule design consultation with Jesse and prepare questions about fabrication and material choice
 - Look into testing methods for the leg piece
- Katelyn Williams
 - Meet with Jesse to go over next steps in the fabrication process
 - Develop the final design with CAD
 - Continue to research and brainstorm how to attach the cone to the crutch
- Kimberly Jarrard
 - Receive feedback from the client about the aluminum crutch and purchase crutches if client agrees
 - Brainstorm other base options and nonslip material
 - Meet with Jesse to go over fabrication plans
- Marcus Wentzel
 - Propose the aluminum crutch with coating to out to our client and hear his thoughts on this design moving forward
 - Order the crutches from the website linked in labarchives

- Meet with Jesse to go over our design ideas and get his advice on if they are feasible and achievable given our budget and time constraints

Timeline

Task	September				October					November				Dec	
	4	11	18	25	2	9	16	23	30	6	13	20	27	4	11
Project R&D															
Brainstorm	X	X	X	X											
Research		X	X	X	X	X									
Prototyping & Fabrication															
Testing & Validation															
Deliverables															
Progress Reports		X	X	X	X	X									
PDS			X												
Design/Decision Matrix Criteria				X											
Prelim Presentation					X										
Show and Tell															
Final Poster															
Meetings															
Client			X	X	X										
Advisor	X	X	X			X									
Website															
Update	X	X	X	X	X	X									

Filled boxes = projected timeline

X = task was worked on or completed

Detailed Accomplishments

This week our team focused on individual research for different parts of the project. This included research on the foot, crutch, and cone part of the design. Most of the research was done on material selection. We also met to discuss those research results, as well as some ideas for the fabrication of our design.

Previous Week's Goals and Accomplishments

- Sam Dudek
 - Meet with Mike and Sharon to get measurements, pictures, and possibly a scan of his residual limb
 - Start researching prototyping methods and gather ideas for that process
 - Research materials that meet design requirements

- Ben Willihnganz
 - Research materials that meet design requirements
 - Look into materials alternative to aluminium that is still cheap specifically
 - Brainstorm ideas for testing and prototyping before materials arrive
- Claire Matthai
 - Work with team to create a list of materials for our first order
 - Schedule a design fabrication consultation with Jesse (Grainger Design Lab)
 - Communicate with client and family to find a date for them to travel to Madison in November
- Katelyn Williams
 - Utilize measurements from in-person meeting to develop more precise dimensions of the handle and cone
 - Research materials for the cone portion that are biocompatible and resilient
 - Brainstorm fabrication plans for integration of modular pieces
- Kimberly Jarrard
 - Use measurements obtained from the client to adjust our design
 - Look into materials that are suitable and start our fabrication plan
 - Continue brainstorming ideas and improve our preliminary design
- Marcus Wentzel
 - Determine the optimal diameter of the cone based on the dimensions of our client's leg
 - Compare the possible materials for the leg of the prosthetic and determine the most cost effective and practical material
 - Look into ordering material and determine our plan to 3D print

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Sam Dudek		Meet with Mike and Sharon at his home to discuss our progress and gather measurements to help aid in design and fabrication	1	4	23
		Met with the team to discuss the in person meeting, our research, and future plans regarding fabrication.	1		
		Research FEA of residual limbs as well as 3D scanning for residual limbs to understand the scan that was sent to us.	2		
Ben Willihnganz	10/15	Performed materials research in order	2	3	22

		to best determine the base material for the official prototype			
	10/14	Met with team to discuss in person client meeting and materials choices	1		
Claire Matthai	10/13	Researched potential materials for the leg portion of the design (raw materials vs existing products)	2	3	21.5
	10/14	Met with the team to compare our individual research for each part. Looked into a design consultation with Jesse for next week.	1		
Katelyn Williams	10/13	Researched pre-made silicone sleeves for transtibial amputees that could be used to line the cone.	1	3	18.5
	10/14	Researched silicone mixes to pour into a mold and the molding process.	1		
	10/14	Met with the team to discuss current progress in material research and next steps with materials.	1		
Kimberly Jarrard	10/13	Researched potential nonslip materials to place underneath the base	2	2.75	15
	10/14	Met with the team to share our research and our plans moving forward	0.75		
Marcus Wentzel	10/13	Research existing designs for the leg portion of the design	0.5	1.75	17.25
	10/14	Research potential testing for the leg portion of the design	0.5		
	10/14	Met with team to share findings on each designated section of the prosthetic	0.75		