

# **Safe Shower Solution for Below-the-Knee Amputee**

## **Progress Report 7**

October 18, 2026 – October 25, 2026

Client: Mike DeGrave

Advisor: Prof. Murphy

Team:n

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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**

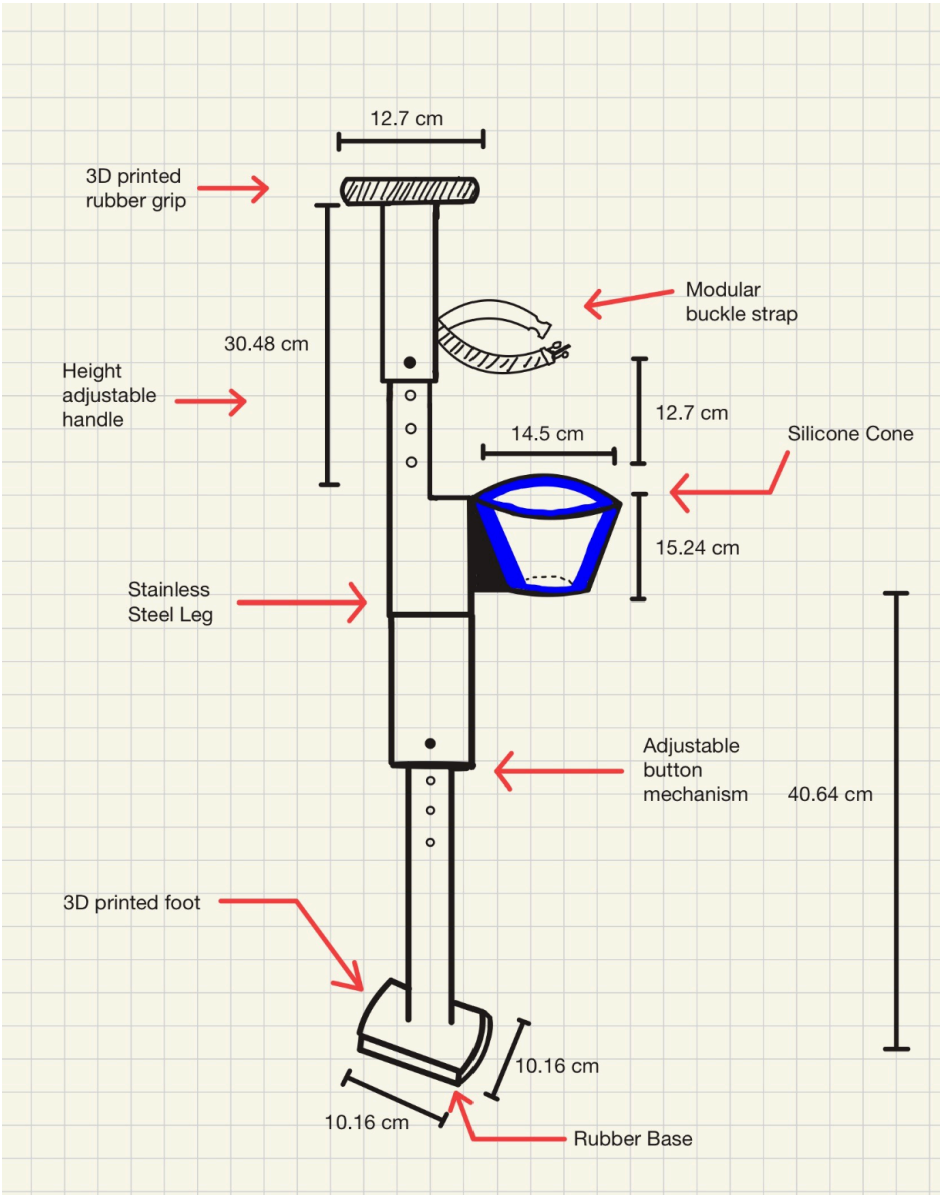
This week the team met with the Design Innovation Lab team to discuss project difficulties. The team was struggling to understand certain fabrication methods and the DI Lab helped to achieve this. Using bolts and washers and other methods the device can be properly assembled in agreement with device standards

### **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                     |
|--------------------------|----------------------------|----------------------------|-------------|-----------------|-------------|-------------|---|-----------|----------|--------------------------|
| Preliminary              |                            |                            |             |                 |             |             |   |           |          |                          |
| Drive Air-Crutche s with | Anodized Aluminum Crutches | Drive DeVilbiss Healthcare | MD1 0300 BK | DME Superst ore | MD103 00BK  | 10/19/ 2026 | 1 | \$109.99  | \$109.99 | <a href="#">Crutches</a> |

|                                     |  |  |  |  |  |  |  |               |                 |  |
|-------------------------------------|--|--|--|--|--|--|--|---------------|-----------------|--|
| Airgonomic Underarm Cushions - Onyx |  |  |  |  |  |  |  |               |                 |  |
|                                     |  |  |  |  |  |  |  |               | \$0.00          |  |
| <b>Category 2</b>                   |  |  |  |  |  |  |  |               |                 |  |
|                                     |  |  |  |  |  |  |  |               | \$0.00          |  |
|                                     |  |  |  |  |  |  |  |               | \$0.00          |  |
|                                     |  |  |  |  |  |  |  | <b>TOTAL:</b> | <b>\$109.99</b> |  |

## Goals

### *Major team goals for the next week*

1. Meet with Professor Adamczyk to discuss assistive devices and considerations the team should take in order to make the device as successful as possible.
2. Implement recommendations from the design lab and begin the fabrication process.

### *Next week's individual goals*

- Sam Dudek
  - Begin fabrication process of the cone and foot portion and cutting the crutch to size
  - Continue to research and look into fabrication methods for our foot and cone while making sure to document these well
  - Prepare a show and tell script with questions for other groups regarding our project
- Ben Willihnganz
  - Begin the fabrication process by cutting the crutch down to size
  - Prepare for Show and Tell by fabricating and creating an elevator pitch for problems thus far
  - Look into design considerations from Jesse and the DI Lab
- Claire Matthai
  - Assist team with any initial fabrication steps (e.g. machining the crutch, sourcing materials, etc.)
  - Lock in cone attachment and foot piece concepts based on the meeting with Jesse
  - Prepare for Show and Tell by creating a list of specific parts of the project we would like peer input on
  - Complete human subjects training
- Katelyn Williams
  - Utilize CAD to make a 3D model of the cone to crutch interface
  - Continue to research filaments and materials for the cone to crutch interface that meet design requirements
  - Work with team to develop an initial prototype for Show and Tell and list of challenges
- Kimberly Jarrard

- Test ideas discussed with Jesse on the crutch we just bought
- Prepare for Show and Tell by fabricating a preliminary model and a short speech
- Get 3D printing parts ready to start printing
- Marcus Wentzel
  - Begin the fabrication of the prosthetic by cutting the crutch to eliminate the top handle portion
  - Finalize the materials using the information Jesse provided us with and the information Professor Adamczyk will provide to us
  - Determine the initial prototype we will be able to construct for the Show and Tell on Friday.

## Timeline

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

Filled boxes = projected timeline

X = task was worked on or completed

## Detailed Accomplishments

This week the team met with the DI Lab and discussed prototyping with Jesse. The team was struggling with connective measures for the device while ensuring structural integrity was met. Implementing these ideas into research, prototyping, and purchasing will aid the team in critical design decisions.

## ***Previous Week's Goals and Accomplishments***

- 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

## ***Activities***

| Name      | Date | Activity                                                                                        | Time (h) | Week Total (h) | Sem. Total (h) |
|-----------|------|-------------------------------------------------------------------------------------------------|----------|----------------|----------------|
| Sam Dudek |      | Meet in the DI Lab with Jesse to discuss our project and go over our design                     | 1        | 3              | 26             |
|           |      | Create a standard for testing of our anti slip material using standards that I have researched. | 1.5      |                |                |
|           |      | Made preliminary design to bring to Jesse for the meeting                                       | .5       |                |                |

|                  |       |                                                                                                                                                                          |     |     |       |
|------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|
| Ben Willihnganz  | 10/21 | Met with the DI Lab to discuss prototype and further understanding of the fabrication process                                                                            | 1   | 3   | 25    |
|                  | 10/22 | Research the 3 3D materials recommended to the team by Jesse to ensure they are safe for the client to interact with in the shower                                       | 2   |     |       |
| Claire Matthai   | 10/20 | Brainstormed and sketched an idea for an attachment method for the cone to the crutch. Prepared a list of questions to ask Jesse during our design consultation meeting. | 2   | 3   | 24.5  |
|                  | 10/21 | Met with Jesse and the team to discuss the prototype and received some ideas for material choice and fabrication methods.                                                | 1   |     |       |
| Katelyn Williams | 10/19 | Took the scan from our client and created an offset cone of the same shape of the scan.                                                                                  | 0.5 | 2.5 | 21    |
|                  | 10/21 | Met with Jesse to discuss our current design and challenges we are facing to get recommendations on next steps.                                                          | 1   |     |       |
|                  | 10/21 | Researched materials recommended by Jesse for the cone to crutch interface.                                                                                              | 1   |     |       |
| Kimberly Jarrard | 10/19 | Created a google sheet for logging expenses and documented our purchase of aluminum crutches.                                                                            | 0.5 | 2.5 | 17.5  |
|                  | 10/21 | Met with Jesse and the team to discuss our current design and potential materials suitable as well as our next step moving forward.                                      | 1   |     |       |
|                  | 10/21 | Researched materials recommended by Jesse.                                                                                                                               | 1   |     |       |
| Marcus Wentzel   | 10/19 | Sketched 2 ideas on how to connect the leg to the cone.                                                                                                                  | 1.5 | 3   | 20.25 |
|                  | 10/21 | Met with Jesse to discuss our design ideas and get his feedback                                                                                                          | 1   |     |       |

|  |       |                                                                             |     |  |  |
|--|-------|-----------------------------------------------------------------------------|-----|--|--|
|  | 10/21 | Used Jesse's feedback to research the materials of the new proposed design. | 0.5 |  |  |
|--|-------|-----------------------------------------------------------------------------|-----|--|--|