

## ABSTRACT

BMHJ Engineering has undertaken the task of designing, building, and testing a device that records force applied to a patient's foot during rehabilitation and sends the data to a website via wireless transmission. The device has been designed to promote patient compliance in ankle rehabilitation by detecting unwanted stress on the ankle through a pressure sensing insole.

## BACKGROUND

Sprains and fractures are among the most prevalent ankle injuries that necessitate restricted mobility. An estimated 5 million Americans experience these injuries annually, with at least a third classified as high-level sprains or fractures, requiring a period of non-weight bearing rest. A member of the BMHJ Engineering team underwent such an experience, grappling with a Talur Neck Fracture that mandated 12 weeks of non-weight bearing and subsequent months of physical therapy for mobility restoration. This project emerged from the challenges faced by this team member and their ongoing communication with the medical professionals at Methodist Hospital. With their help, BMHJ Engineering gained insight into the impact of this project on the community they aimed to serve. Here are the statistics provided by Methodist Hospital and the orthopedic specialists that work there:

- 30%-40% of ankle injuries require at least 3 days non-weight bearing
- 15% of injuries require over three weeks non-weight bearing
- Up to 50% of patients experience extended recovery times due to non-compliance
- 10% of patients suffer from some form of chronic immobility or pain after non-weight bearing injury

## PURPOSE

Our goal is to introduce a new Controlled Ankle Motion (CAM) boot that aims to improve the rehabilitation process for ankle injuries. Ankle injuries are common and can be difficult to heal, often requiring significant lifestyle changes to rest the affected joint properly. Traditional methods rely on patients to rest their ankle and avoid activities that may cause further stress, but this can be a guessing game with many potential pitfalls. The new integrated CAM boot eliminates the guesswork by providing data and feedback that ensures the ankle is being rested properly, improving the overall healing process and reducing the risk of re-injury.



**Gage Brown**



**Juan Jeffers**

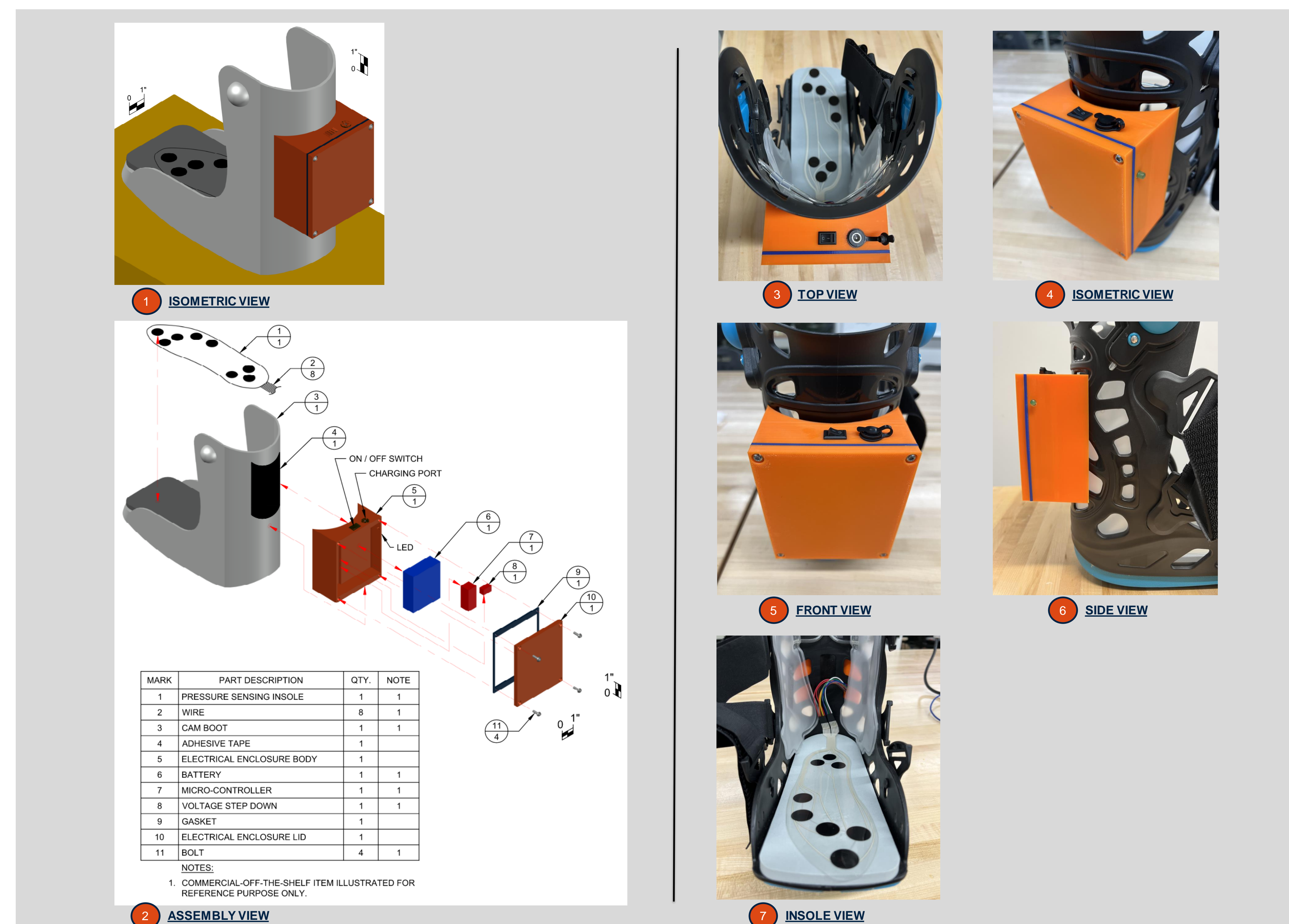


**Patrick Mochen**

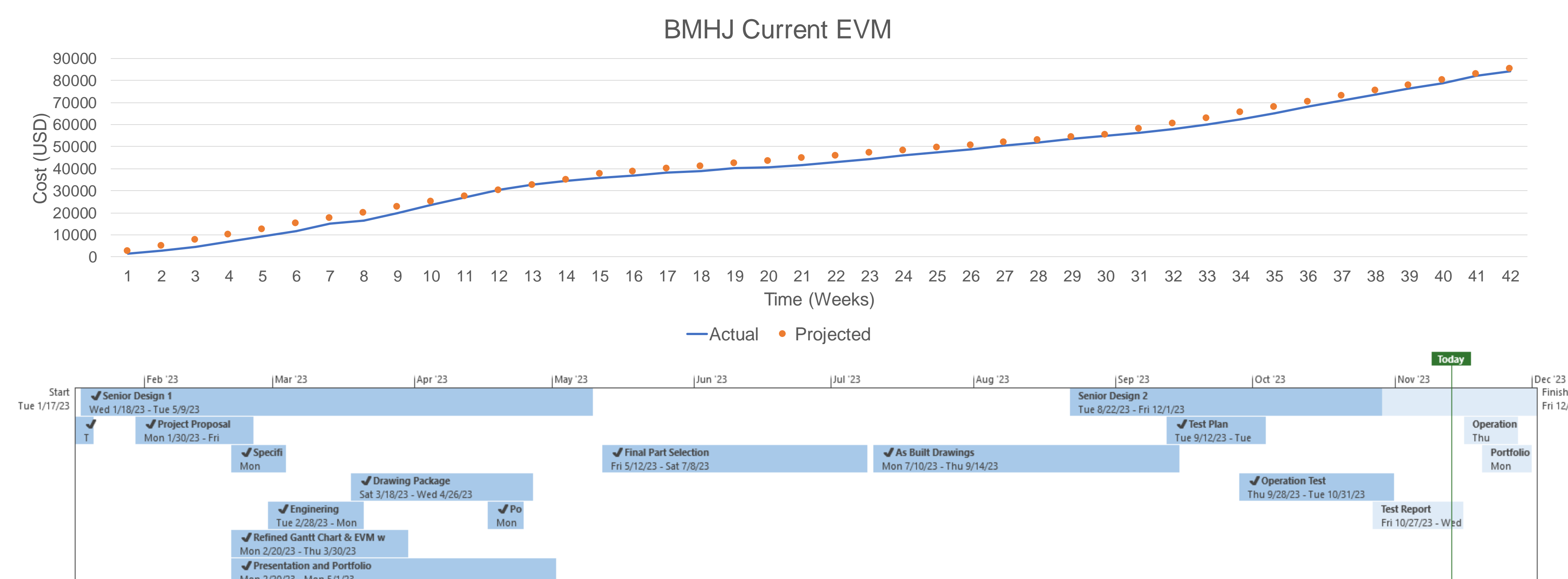


**Michael Hernandez**

## DESIGN FEATURES



## GANTT CHART AND EVM CHART



## PERFORMANCE SPECIFICATIONS

- Supports 180 lbs.
- Water and dust resistance and proper sealing of electrical enclosures
- Electrical housings made of lightweight material for comfortability

## Testing

Item No.	Features to be Tested	Compliance Status (Pass/Fail)
1	Dust/Water Test	Pass
2	Drop Test	Pass
3	Adhesive test	Pass
4	Pressure Readings	Pass
5	Connectivity Test	Pass

## MANUFACTURING COSTS

The cost of design and manufacture for this project is self-funded and mentored by Dr. Robert Lyle Hood. The overall expense stands at \$238. The cost to manufacture a single unit amounts to \$45.78.

## CONCLUSION

The Pressure Sensitive Ankle Brace addresses the prevalent challenges of ankle injuries. Our innovative CAM boot, leveraging real-time data and feedback, aims to revolutionize ankle injury rehabilitation, ensuring proper rest and reducing the risk of re-injury. This project represents a significant step towards improving the quality of life for individuals facing ankle injuries, offering a practical and effective solution.

## FURTHER WORK

Moving forward, enhancing the Pressure Sensitive Ankle Brace with an integrated application can offer seamless outcomes for both healthcare providers and patients. Additionally, incorporating onboard storage will enable the collection of more data even when the user is out of Wi-Fi range. This advancement could significantly improve the functionality and effectiveness of the ankle brace.

## ACKNOWLEDGEMENTS

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