

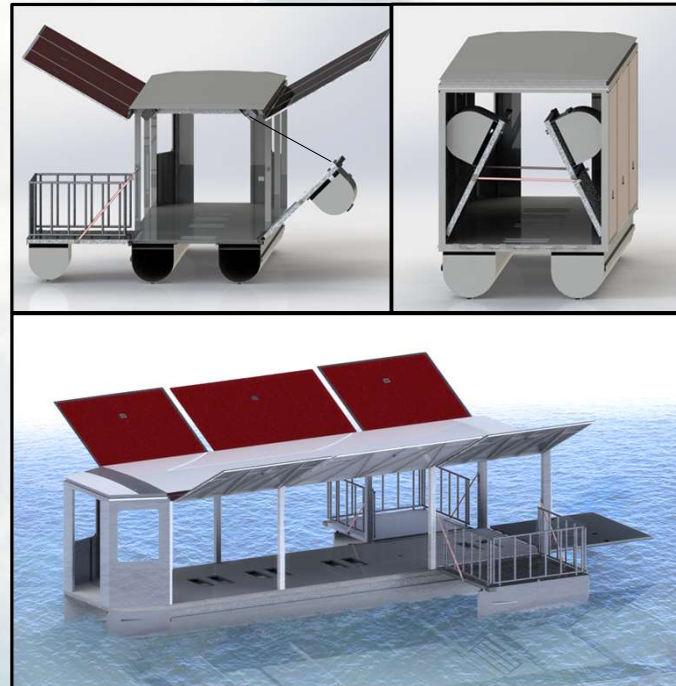
Project Introduction

The Portable Accessible Docking System (PADS) was designed and built for the TRAILS program at the University of Utah to facilitate a water sports program to promote and enable recreational therapy among individuals with complex spinal cord injuries. When patients are transferring to and from watercraft, the PADS lists more than desired and can become unstable during high winds. To provide a more stable platform and alleviate concerns our group designed stabilizing outriggers that store in the existing PADS and deploy with minimal modifications.

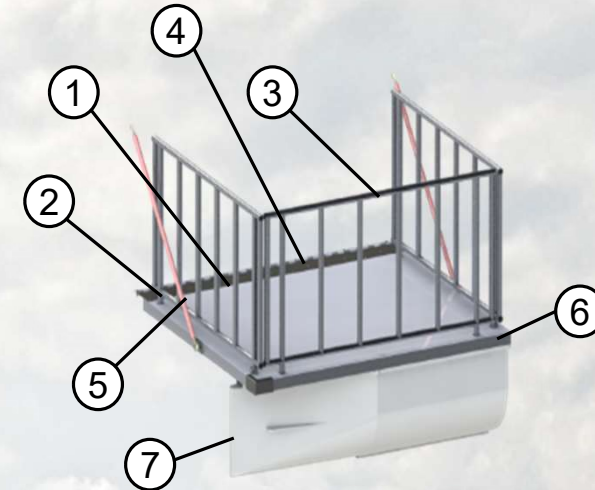


Each outrigger is composed of a pontoon and a deck attached to the current PADS. These outriggers will improve stability and provide extra deck space for the patients and their care teams, and increase the buoyancy of the PADS.

Functionality



Outrigger Part Description

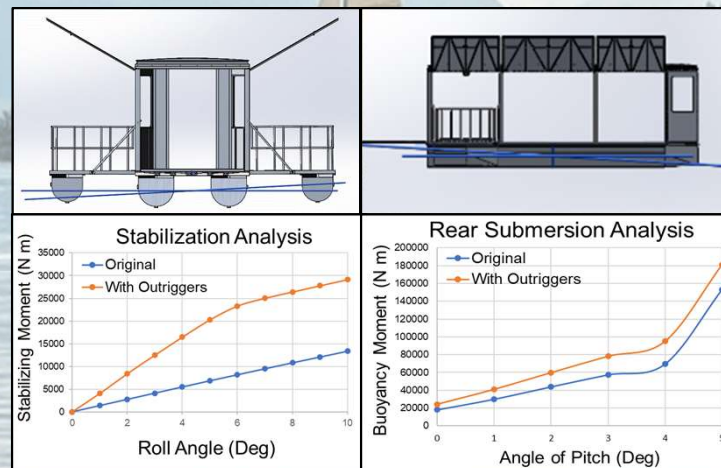


#	Part	Description
1	Threshold Plate	Attaches outrigger to piano hinge.
2	Mounting Bolts	Secures the piano hinge to the PADS.
3	Safety Railing	There for protection to keep passengers from falling in.
4	Piano Hinge	Pivot point and mounting mechanism for the outrigger.
5	Top Link and Attachment	Adds rigidity to the system.
6	Frame	Adds 7.8 m ² of additional deck space to PADS.
7	Pontoon	Adds 2,400 N of buoyancy force.

Design Objectives

Customer Need	Metric of Success	Result
Stabilization	Reduce Roll: 25% Reduce Rear Submersion: 30%	150% increase in roll moment 33% increase in rear buoyancy moment
Increased Deck space	Area > 6.5 m ²	7.8 m ²
Frame strength	Overall Frame Safety Factor > 2.5	3.91 Safety Factor
Safety Railing	890N Point load 730 N/m Distributed load	Safety Factor = 2 for both loading scenarios
Minimal impact on existing storage space	Remaining Storage Space > 2.84 m ³	Remaining Storage Space = 5.92 m ³

Stabilization Analysis



Stabilization analysis showing an average of 150% increase in stabilizing moment about the roll axis (left) and an average of 33% increase in stabilizing moment about the pitch axis (right) due to the addition of the outriggers

Conclusion

We successfully designed, simulated and analyzed the PADS outrigger system. We determined that these outriggers will accomplish the project goals by adding 150% more roll stability, 33% more rear buoyancy and 7.8 m² of deck space. Fabrication of the system is underway and will be installed prior to the events planned for Summer 2021.