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## **Nautical Research Platform for Water-Bound Experiments**

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## Nautical Research Platform for Water-Bound Experiments

### Abstract

Conducting research in lakes and rivers requires large crews and heavy-duty equipment, making even simple tests more costly and time consuming. Newer research methods are evolving constantly as new technology enables more precise and accessible experiments to be conducted. The need for simple execution of water-bound experiments exists and must be addressed to aid our understanding of these environments. We at the Microgravity Undergraduate Research Team have taken our previous research in autonomous Unmanned Surface Vehicles (USVs) and applied our efforts to relieving this problem. Our current research aims to provide a universal platform for research and experiments to be conducted in lakes and rivers, where we can then expand our efforts to more broad applications. The design allows for remote-control navigation by one user and easy portability. To address precision in experimentation, we have integrated autonomous GPS waypoint navigation which removes user error in sensitive measurements. The most important factor in its design is modularity; the ability to accommodate a wide range of equipment for research. Our platform succeeds in making water-bound experiments more accessible and more precise for a multitude of potential applications.

### Authors

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# Nautical Research Platform for Water-Bound Experiments



PRESENTED BY:  
**Microgravity Undergraduate Research Team**

## BACKGROUND:

Conducting research in lakes and rivers requires large crews and heavy-duty equipment, making even simple tests costly and time consuming (as seen in **Figure 1**). We have taken our previous research in autonomous Unmanned Surface Vehicles (USVs) for NASA and applied our efforts to relieving this problem.



**Figure 1\*:** USGS conducting a water-bound experiment.

## REQUIREMENTS

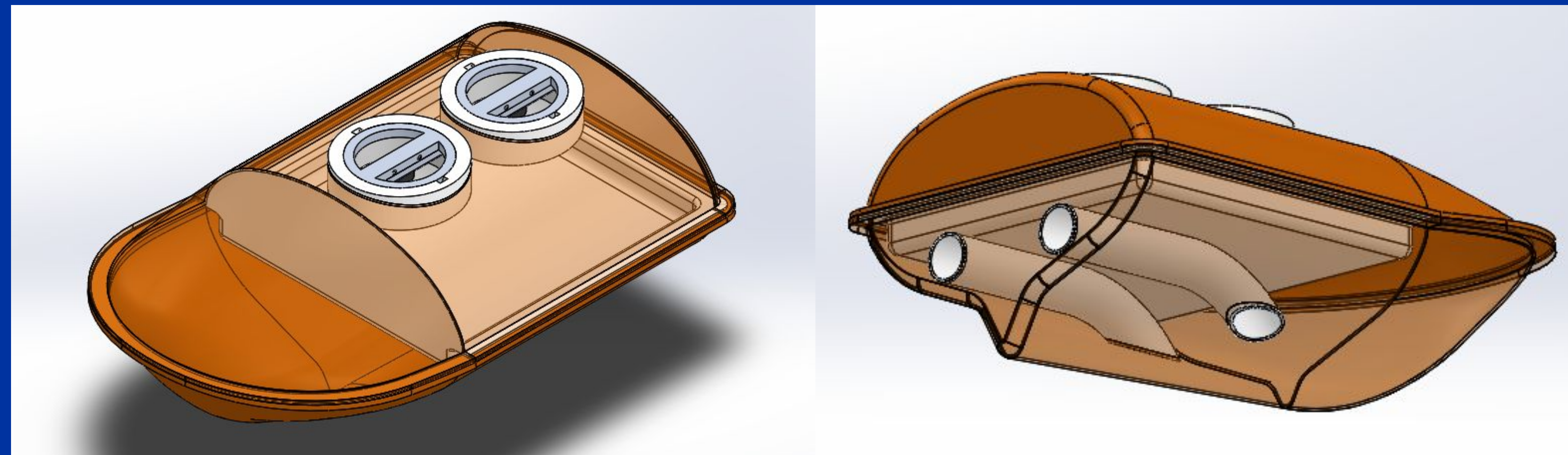
Our team developed requirements for the project to best guide our solution; the most important of which being basic safety guidelines during operation as to not harm the operator or the vessel itself. It must accommodate a variety of equipment and be modular during operation. In addition, the system must be operable by only one operator, or by means of autonomous GPS navigation.

## DESIGN

The vessel was conceptually modeled after conventional watercraft, giving it exceptional stability while affording portability and modularity. The figures to the right (**Figure 2, 3, and 4**) demonstrate these design goals with a single deep keel and easy dual-actuating hatches on top.

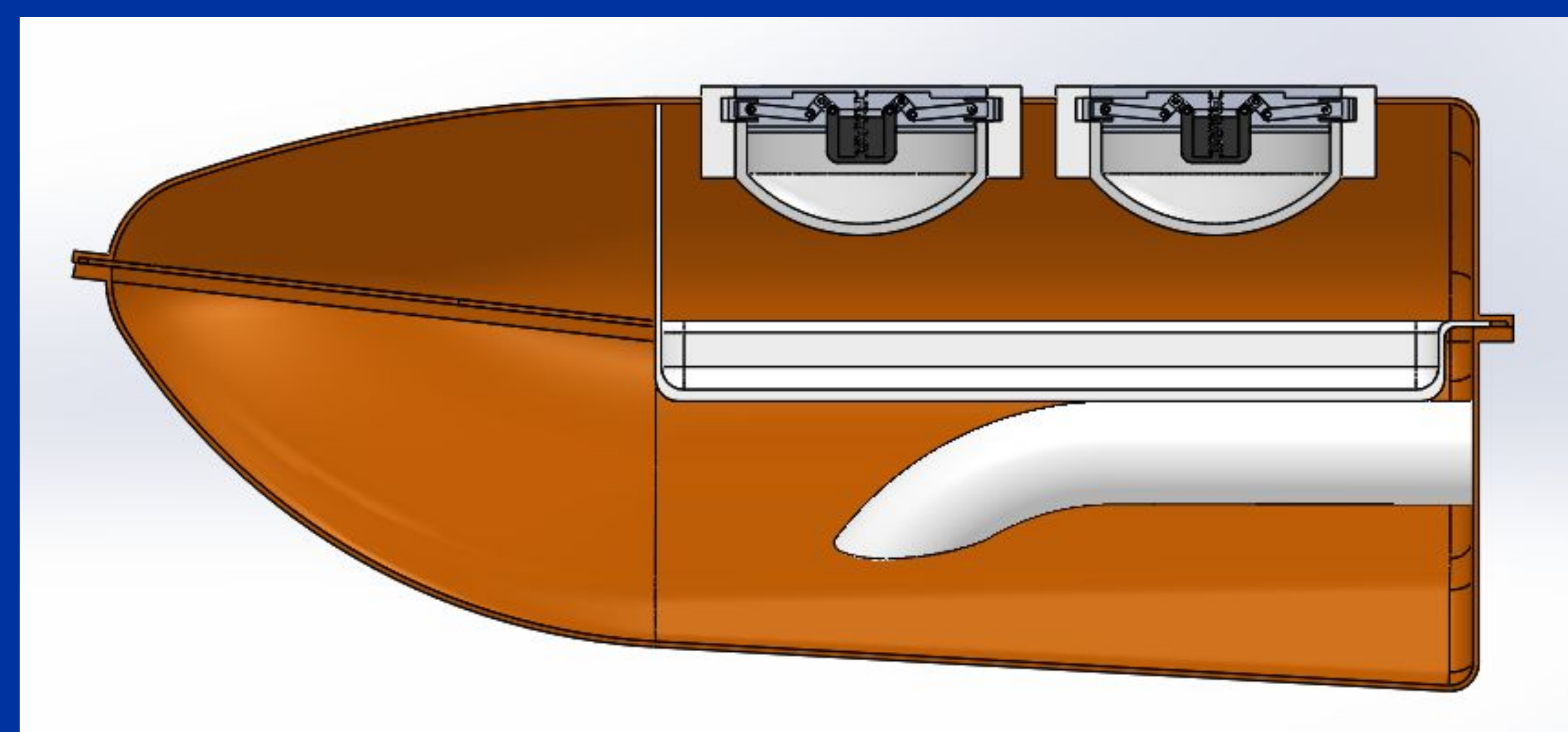
**Figure 1\*:** Image taken from the USGS Website, 2015.  
<https://www.usgs.gov/news/cape-cod-susceptible-potential-effects-sea-level-rise>

# Making water-bound experiments fast and modular



**Figure 2:** Isometric view showing the storage compartment inside.

**Figure 3:** Bottom view showing the deep single keel of the conceptual design.



**Figure 4:** A side view showing the dual-actuating latches on top of the vessel.

## STATUS

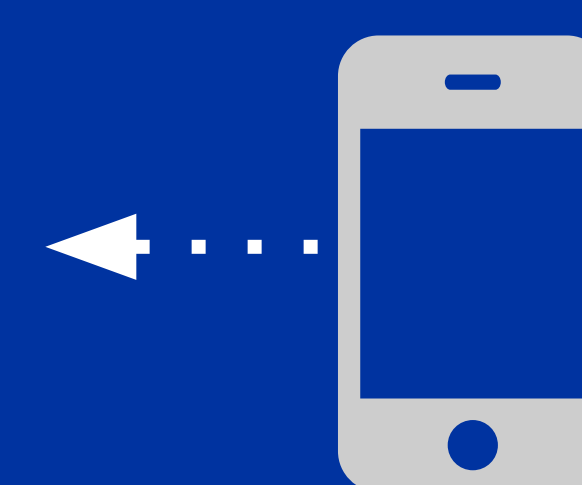
Currently, we were preparing our first prototype utilizing mostly off the shelf components. The Pixhawk flight system has been chosen to handle navigation and remote control while a small kayak is being used for the vessel's hull. The project's progress has halted to comply with university research procedures during this pandemic, with plans to resume as soon as possible. An updated photograph can be seen in **Figure 5**.



**Figure 5:** Top down image of our current prototype ready for assembly.

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Feel free to send us an email with further inquiries!

