Tech Expo, Spring/Fall 2026 – Team 23

Undersea Aid Module

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Problem Statement

Our team aims to design and develop Undersea Aid Modules (UAMs) to house critical supplies offshore ready to be released within the critical window of 24-48 hours after a natural disaster and provide aid to island nations impacted by those natural disasters.

Customer Background

UNHRD is a humanitarian platform, enabling emergency and preparedness response efforts. As part of the UN's World Food Program, UNHRD is uniquely placed to support the international humanitarian community, with areas of focus including:

Supporting effective delivery of relief efforts, including through supply chain solutions delivered via its five hubs, facilitating better co-ordination and providing specialized training

Fostering partnerships that strengthen the humanitarian community, including between UN agencies, NGOs, governmental organizations and universities

Facilitating research and development into innovative solutions and products for efficient operations

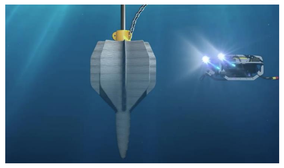
December 2004 Sri Lanka tsunami

Requirements

Our team aims to design and develop underwater aid modules (UAMs) to house critical supplies offshore to be released within the critical window and provide aid to island nations impacted by natural disasters

- Hold UAM in "loaded" position on ocean floor for up to 3 years
- Release the anchor via an ultrasonic signal that detects a specific frequency

Experimentation and Concepts



Torpedo Anchor

Sonar Sending/Receiving Components

SeaCatch Release Mechanism

Throughout this project our team researched existing solutions to see what would work best in our design. Some of these existing solutions include:

- Anchors: **Torpedo**, Drop, Driven Piles, etc.
- Communications: **Sonar**, ELF, Cable Connection, etc.
- Release System: **SeaCatch**, Burn Wire, Marine Snap shackles, etc.

Each existing solution was then ranked out of ten based on what would fill the design requirement the best for future design concepts.

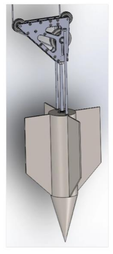
Final Design

The total final design is shown above with the three-stage release system. It includes the capsule from team 25 and release-able anchor design from team 23. The installation of the anchor is as follows:

3 Phase Deployment/Release

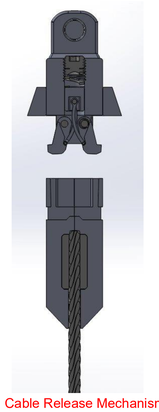
- **Phase 1**: torpedo anchor drops to ocean floor
- **Phase 2**: capsule is pulled down to anchor
- **Phase 3**: Capsule is released via signal to return to the surface

Phase 1:

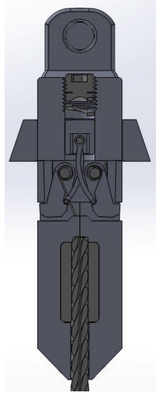


Phase 2:

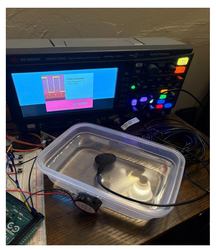
Phase 3:

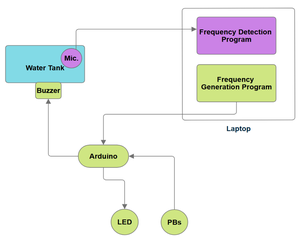


Cable Release Mechanism



1. The torpedo anchor is dropped and embedded into the ocean floor. There is a cable snaking through the pulley that goes up to a ship operated winch.
2. The cable then pulls the center stage and capsule down to the anchor where the cable causes it to latch onto the anchor.
3. This is the steady state position until the release signal is received. When this occurs, the capsule is released and it free-floats up to the ocean surface and then into shore.





Testing and Results

Our teams testing was on the Cable Release subsystem of the design. For the testing itself, the Cable Release was hung on a bar, while 45lb weights were incrementally added onto the release system.

The first test was an instant release of 180 lbs., which the system failed to withstand due to the shock load put onto the system.

The next test was slowly raising the bar that the system was on, to prevent the weights from suddenly shocking the system. This resulted in a successful 225 lbs. load. Ultimately, the Cable Release failed at 270 lbs.

What could be learned from this test was that the mechanism was not the weak point. The female half of the cable release failed along the layer line of the 3D print, which was an inherently weak section of the print due to the orientation.

Weight	Application	Pass/Fail
185 lb	Sudden	Fail
185 lb	Slow Lift	Pass
225 lb	Slow Lift	Pass
270 lb	Slow Lift	Fail