

Portable Emergency Device

Kiersten Opsahl, Joshua Easley, Grant Kilcup, Jesus Alvarado

Project Description

The product being developed aims to assist in remote or recent victims of natural disaster locations. People in disaster related/rugged situations do not generally have access to power or communications. The Portable Emergency Device will provide people with a device that is portable, can provide power, and allows communications and location services. If the user ended up in a rugged situation, they would be able to use the device for communications and display their location to a trusted individual, increasing the odds of survival.

Project Justification

Natural disasters can attribute to many injuries and even deaths. Natural disasters such as tornadoes, flash floods, and hurricanes cause thousands of injuries and hundreds of deaths per year. There does not need to be a natural disaster to put someone in a rugged situation, though. Hiking, a fun hobby for many, can quickly turn into a rugged situation if one goes off the trail and gets lost, or goes on a less traveled trail and gets injured. Further, unforeseen weather conditions, like extreme heat or cold, and limited access to food or water can be fatal if the hiker is not found in time. The portable emergency device would increase odds of survival in perilous situations.

Design Process

Project Planning

1. Define team roles and responsibilities
2. Update the project charter
3. Create a project timeline and work breakdown structure

Market Research

1. Obtain customer feedback to inform decision of product requirements

Product Design

1. Determine functional requirements with insight from market research and engineering standards
2. Create CAD drawings to model the product
3. Compile a bill of materials
4. Present information to mentors and target market to receive further feedback
5. Revise design to incorporate this feedback

Product Development

1. Create an alpha prototype
 - a. Assemble electronic and hardware components
 - b. Test, troubleshoot, and revise the prototype until it works as intended.
 - c. Present functionality to mentors to receive further feedback.
2. Create a beta prototype which incorporates this feedback.

Product Presentation

1. Test the beta prototype to ensure it works as intended.
2. Give a presentation of the product and its functionality

Functional Requirements

Portability	Weighs less than 15lbs
Communication	1 to 3 mile range
Location	Provide accurate GPS coordinates
Power	12 hour battery life, completely recharge within 8 hours
Durability	Water and impact resistant
Light Source	Has a rechargeable light source

Engineering Standards

GPS

- RoHS Directive compliance - ensures product is safe for consumers in chemical use
- FCC compliant with part 15 - does not cause harmful interference
- ISO/TS 16949 certified - tested for environmental safety

Battery

- 9 CFR § 173.185 - Lithium cells and batteries - battery is protected, under 100Wh, and ventilated

Walkie Talkies

- Title 47, CFR Part 2 - Radio frequency devices are required to be authorized by the FCC
- Title 47, CFR Part 95 - A license is required for General Mobile Radio Service and Multi-Use Radio Service communication types. Family Radio Service is licensed by rule.

Verification Testing

GPS

GPS functioned as desired, further testing that was unable to be complete would have included being powered through PED battery.

Solar Panels

Solar Panels output the desired voltage of almost 15 volts at 14.98 V. Battery Charging from this was not able to be fully tested.

PED Battery

Battery output the desired voltage yet was unable to be tested further as far as powering devices, discharge rate, as well as receiving charge via solar and our generator.

Flashlight

Flashlight worked as desired in testing although receiving charge via PED battery was not able to be tested.

Generator

The generator was only brought to preliminary testing stage. In that stage the generator was able to produce up to 20 Volt output with no load. The charging circuit only required 16 volts.

Walkie Talkies

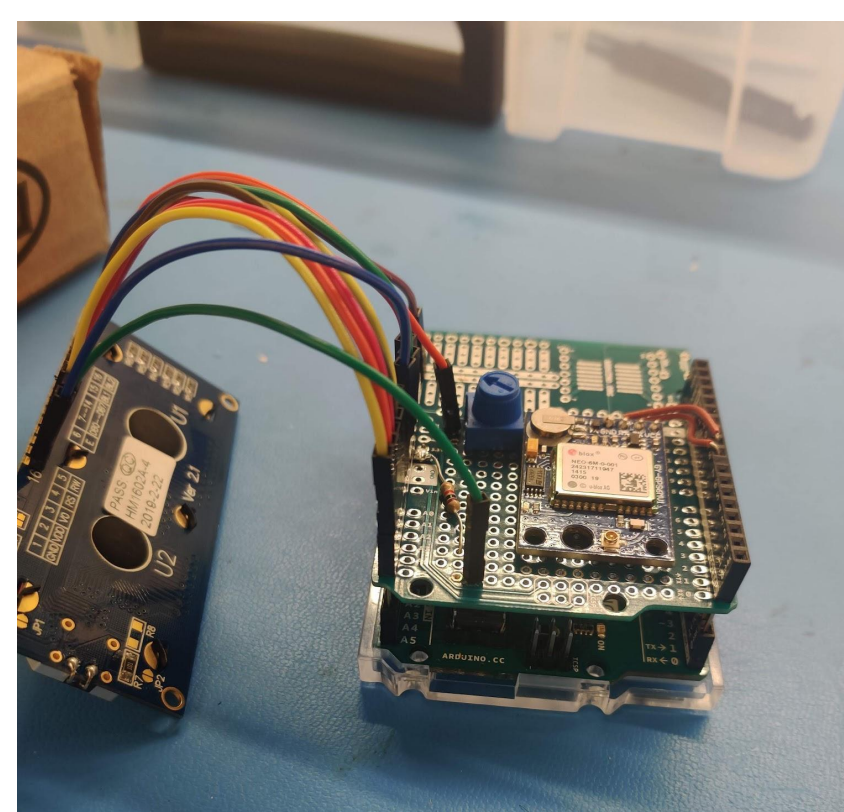
A communication range test confirmed that the walkie talkies were able to communicate in the required 1-3 mile range. In a forest type setting, they passed the test with a communication range of 2.5 miles. In a mountainous area, they passed with a communication of 4 miles. It is thought that this range was larger due to less obstruction of sight. Testing on campus was not completed.

Backpack

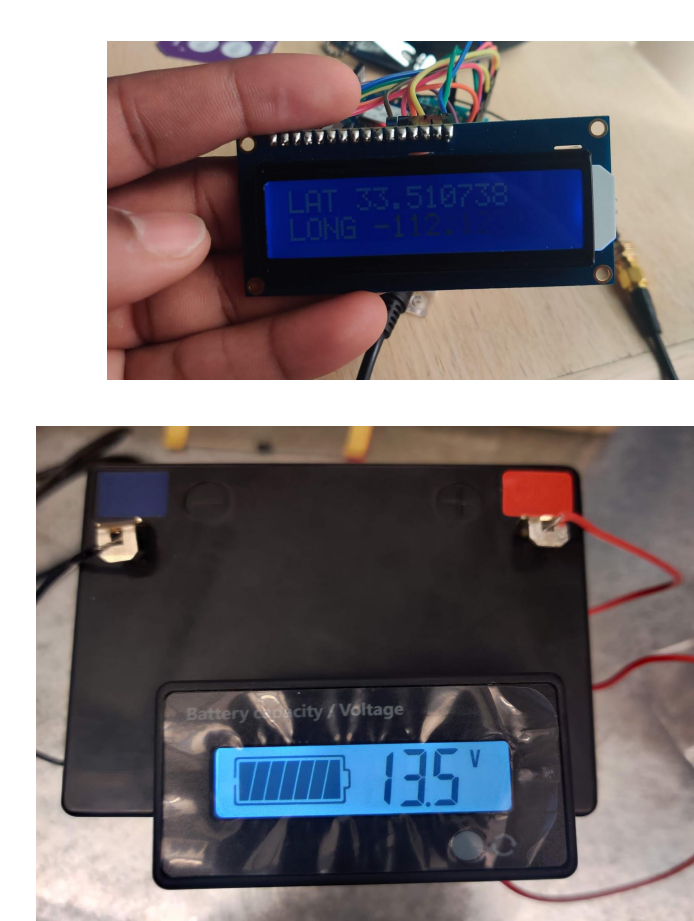
The fit testing was successful it can be considered a universal fit bag. The reflective part of the backpack is very visible at night and the glow strips also assisted in its visibility in the dark for 6 hours until recharge. It passed as a water resistant backpack, though the chance to test it underwater to see if the bag would be waterproof at 6 ft below water capabilities never arose.

Protective Case

Although the case was not tested being fully complete, it was dropped in the building phase from hip level and no damage done.



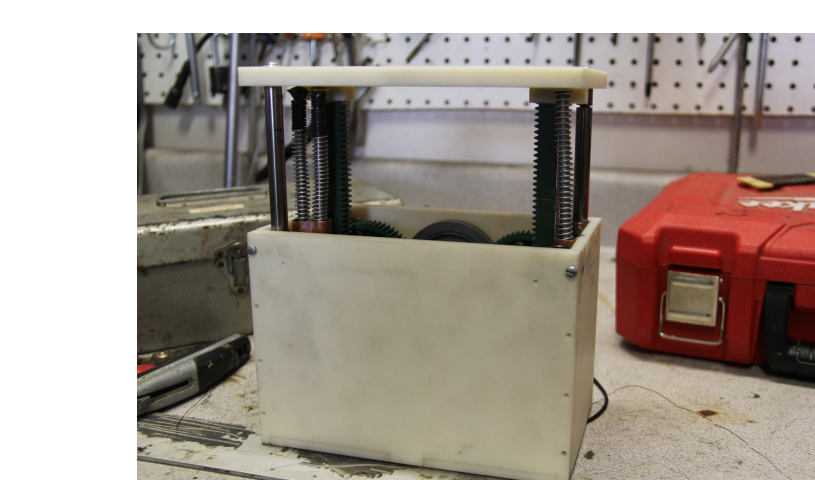
GPS System



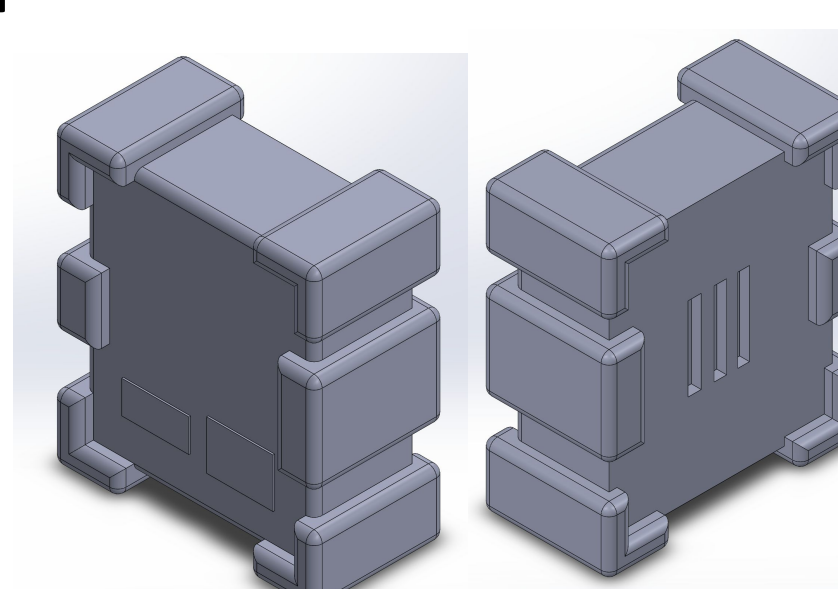
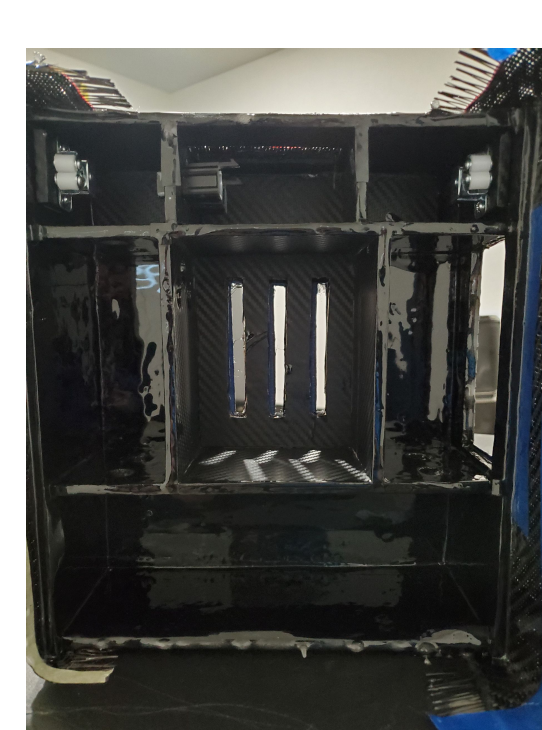
Battery Monitor



Solar panels



Stomp Generator



Protective Case

