The Safe Hands Innovation

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Automatic Cardiopulmonary Resuscitation Device with Ventilation

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Motivation

- Every year there are over 350,000 out-of-hospital cardiac arrests (OHCA) in the US
- Only 10% of these cases survive to hospital discharge after being treated
- Treatment is necessary as soon as possible
  - Chances of survival drop 7-10% every minute treatment is not provided

Current Treatment Methods

- Cardiopulmonary Resuscitation (CPR) is the recommended treatment
  - Manual CPR requires multiple people and is very demanding
  - Automated CPR (aCPR) is an option if it is available

The LUCAS v3.1

The Gap in the Market

- Current aCPR machines are extremely expensive ($15,000 for the LUCAS) and are only typically seen in hospitals or ambulances
  - 70% of OHCA occur in residences and almost 19% in a public space
- aCPR machines have no automated ventilation requiring unnecessary human intervention

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Needs Statement

During cardiac arrest, emergency intervention to restore normal cardiopulmonary function is crucial to prevent loss of life. The efficacy of these life saving techniques can be improved to increase the survival rates of in hospital and out of hospital cardiac arrest patients.

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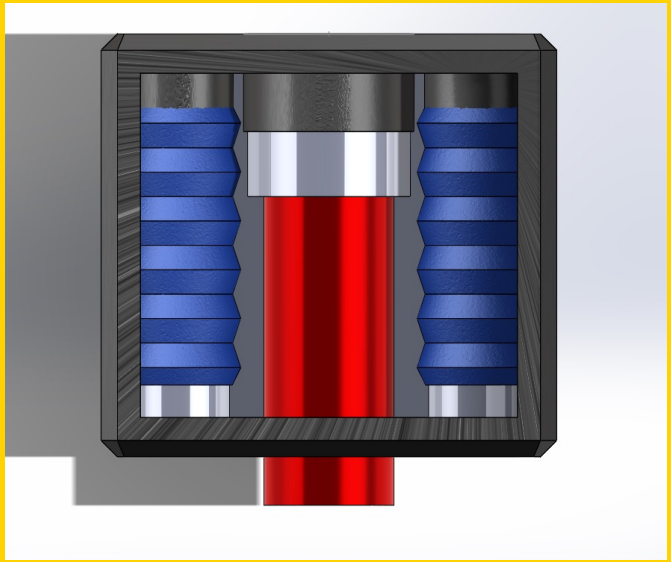
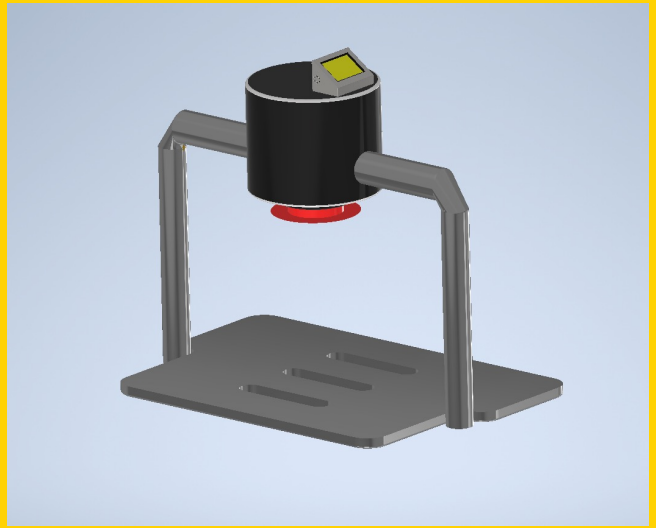
Our Solution

- A 3D printed aCPR device with automated ventilation and an affordable price tag and an optimized user interface to guide non-trained personnel through the process

Safe Hands Innovation members Trae Valentine and Zach Rodriguez working on an early prototype of our idea

Design Concepts





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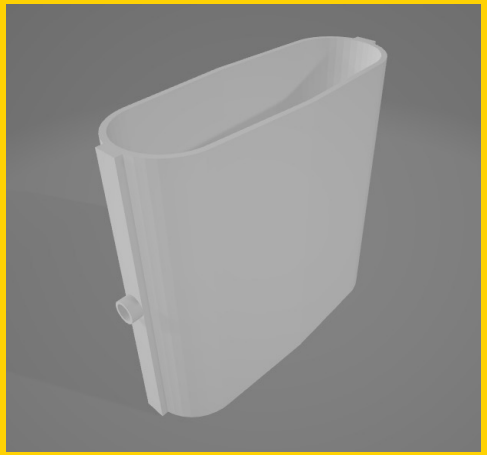
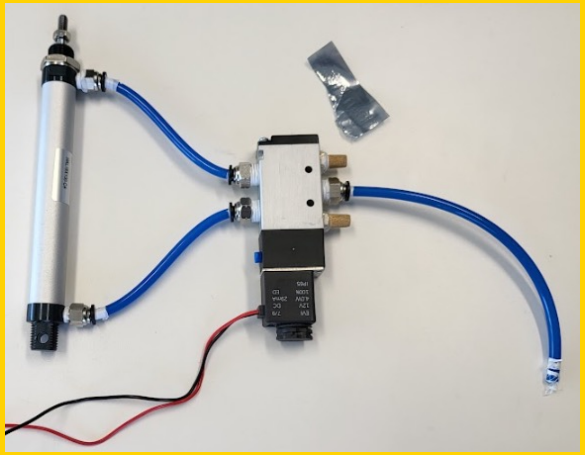
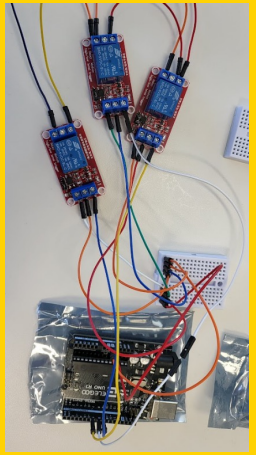
Final Design and Prototype



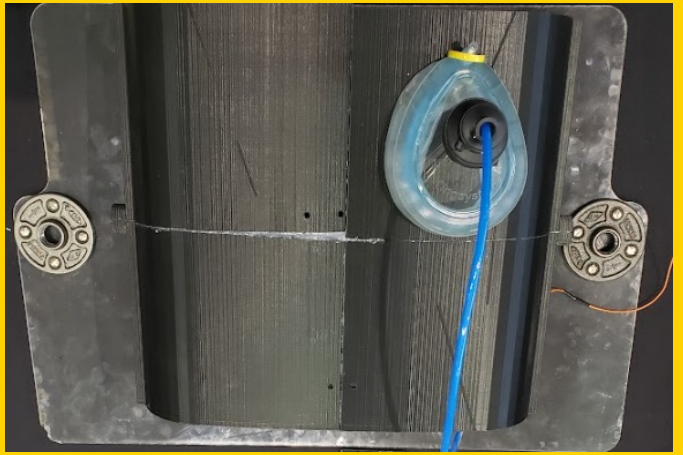
3D model of body



Pneumatic Cylinder Assembly

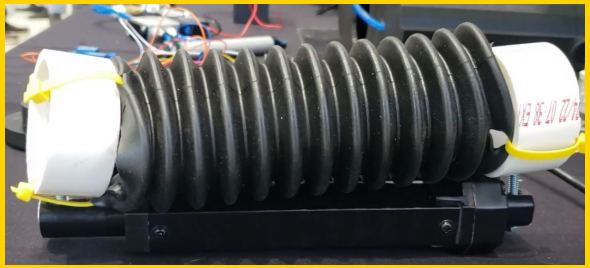


Control Assembly



Chassis with Base Plate and Mask

Carbon Dioxide Assembly



Bellow Assembly

All components will be housed in the body which will be mounted on a base plate with hinges. Adjustable legs will account for different body sizes

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Prototype Testing

- The prototype was tested to prove the concept.
- The pneumatic cylinder was successfully powered by carbon dioxide gas; however, the output force was ~50 lbs. Required force is ~100 lbs.
- Arduino code ran the cylinder and bellow successfully.
- More testing is needed to get consistent depth and compression timing.
- More testing is needed to determine time to set up and how successfully a non-trained user can operate the device.

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Conclusion

- A proof-of-concept prototype was successfully created.
- Much more testing and research is needed before device will be ready for market.