

Project 34: Crush Prevention

Tommy Brocato [EE], James Cardinal [EE], Stephen Colomb [ME], David DeGeneres [ME], Jonathan Gioe [ME], Alejandro Leyton [ME], Zachary Roberts [ECE], Rodrigo Rodriguez [ME]

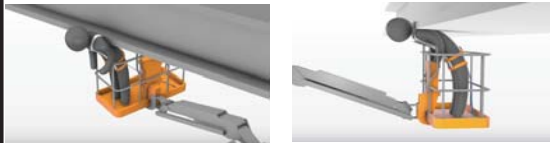


Objective

Unaware operators can be caught between the basket and obstacles leading to severe injuries or fatalities. The system will warn the operator and stop the lift if incident detected without altering regular use.

	2013	2014	2015	2016	2017
Fatalities	9	2	2	4	1

https://www.osha.gov/pls/lmis/accidentsearch.accident_detail?id=200627115

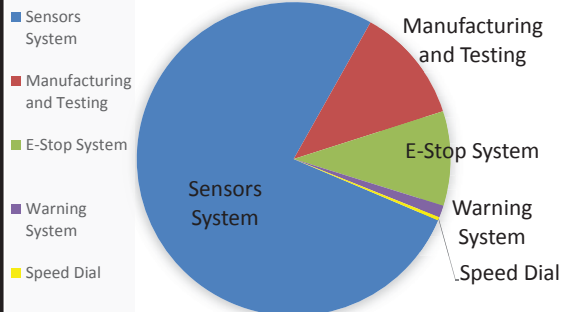


<https://www.youtube.com/watch?v=kVsk638DQzs>

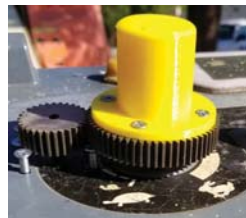
Safety

- Three students are authorized lift operators
- Redundancies considered to avoid false positive
- Stop lift in under 1 foot
- Housing units cover pinch points
- Tested under different environments
- Proper PPE during testing

Budget



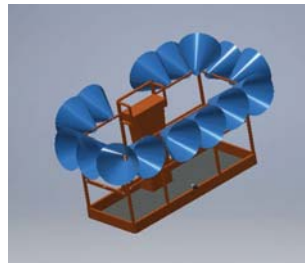
Corrective Action System



Speed Dial System Housing



Emergency Stop System Housing



Measurable Specifications

Travel Mode	Speed		Stopping Distance when E-stop engaged	
	Creep Mode	Rabbit Mode	Creep Mode	Rabbit Mode
Booming In and Out	$.1 \frac{ft}{s}$	$.7 \frac{ft}{s}$	1 in	1 in
Boom Articulating	$.04 \frac{rad}{s}$	$.5 \frac{rad}{s}$	5 in	5 in
Drive	$2.76 \frac{ft}{s}$	$6.8 \frac{ft}{s}$	9 in	4.5 ft

Goals vs Results

Category	Goal	Actual
Budget	\$10,000	\$6,370
Ultrasonic sensor sensing distance	2.5 m	4.25 m
LIDAR sensor sensing distance	2.3 m	20 m
Stopping distance when booming	13.8 in	13.6 in
Stopping distance when driving	20 in	4.75 in
Number of cycles in air tank	250 strokes	122 strokes
Speaker loudness	≥ 110 dB	
Housing robustness	4 J	170 J
Turn down speed dial to creep	312°	312°

System Upgrades

- Integrate sensor housing to basket
- No need for brackets or mounting hardware
- Truly modular design
- Improved LIDAR sensors
- Quanergy producing solid state 3D sensors late 2018



Concept Generation
August-October

Embodiment and Analysis
October- November

Order Parts and Manufacture Assemblies
December

Testing Ordered and Manufactured Parts
January

Test and Assemble Components
February - March

Final Adjustments to Prototype
April

Sponsors: Tony Brouillette

Advisors: Dr. Devireddy, Dr. Choi, Matthew