

School of Mechanical, Industrial and Manufacturing Engineering

Earthquake Simulation Table

Luab Cha
Molly Halstead
Josh Heater



Agenda

Introduction
Design Development
Proposed Design
Prototype
Challenges
Activity





Josh

- From
 - Salem, Oregon
- Middle School
 - Judson Jaguars
- Engineering field of interest
 - Design and Analysis
- Internships
 - Daimler Trucks NA, PCC Airfoils
- Hobbies
 - Golf
 - Video games
- Favorite College Food
 - Beer





Louie

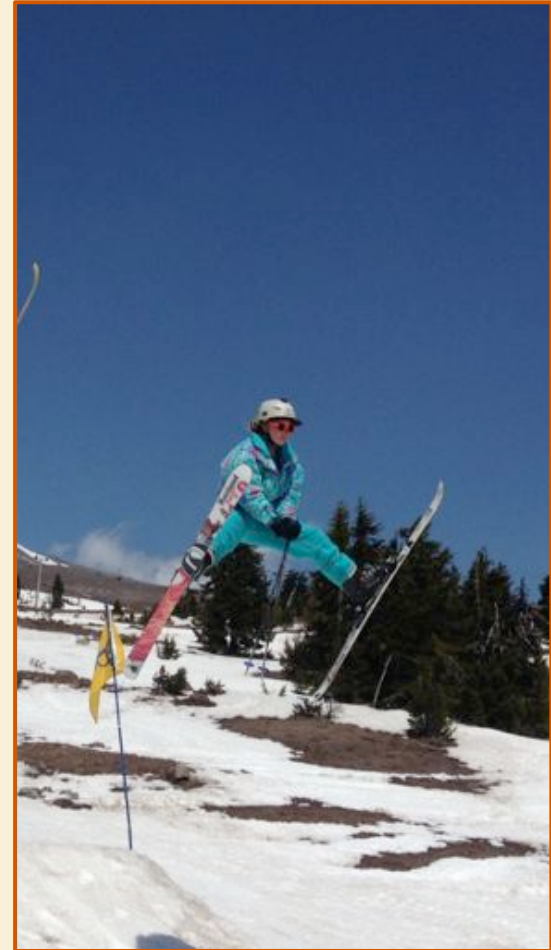
- From
 - Portland, Oregon
- Middle School
 - Portsmouth Cubs (César Chávez)
- Engineering field of interest
 - Project Management
- Internship
 - A-dec, Portland General Electric
- Hobbies
 - Fishing
- Favorite College Food
 - Ramen





Molly

- From
 - Beaverton, Oregon
- Middle School
 - Highland Park Raiders
- Engineering field of interest
 - HVAC Building Design
- Internships
 - PCC Structurals, ATI, Glumac
- Hobbies
 - Skiing
- Favorite College Food
 - Mac n Cheese



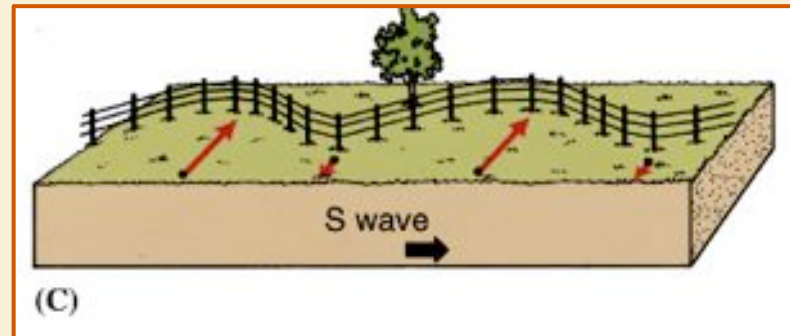
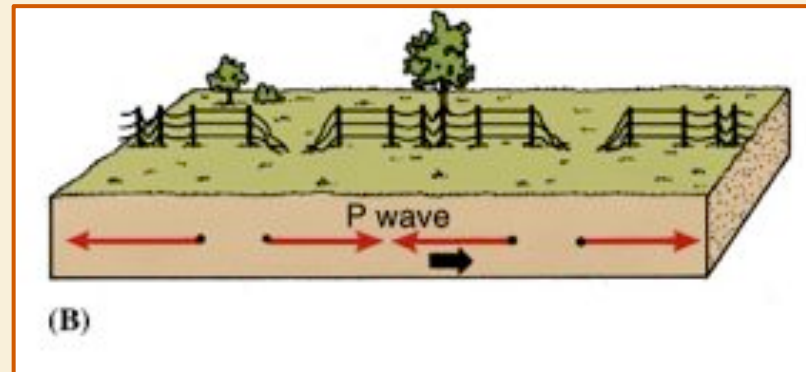
INTRODUCTION

- **Goal:** Design an earthquake simulation table
 - Key Requirements: portable, durable, realistically scaled
 - Used in challenge
- **Purpose:** Inspire students to pursue engineering
 - Educational experience
 - Introduce design concepts
 - Accurate representation
 - Interest in engineering and higher education
 - FUN
- Product required for challenge

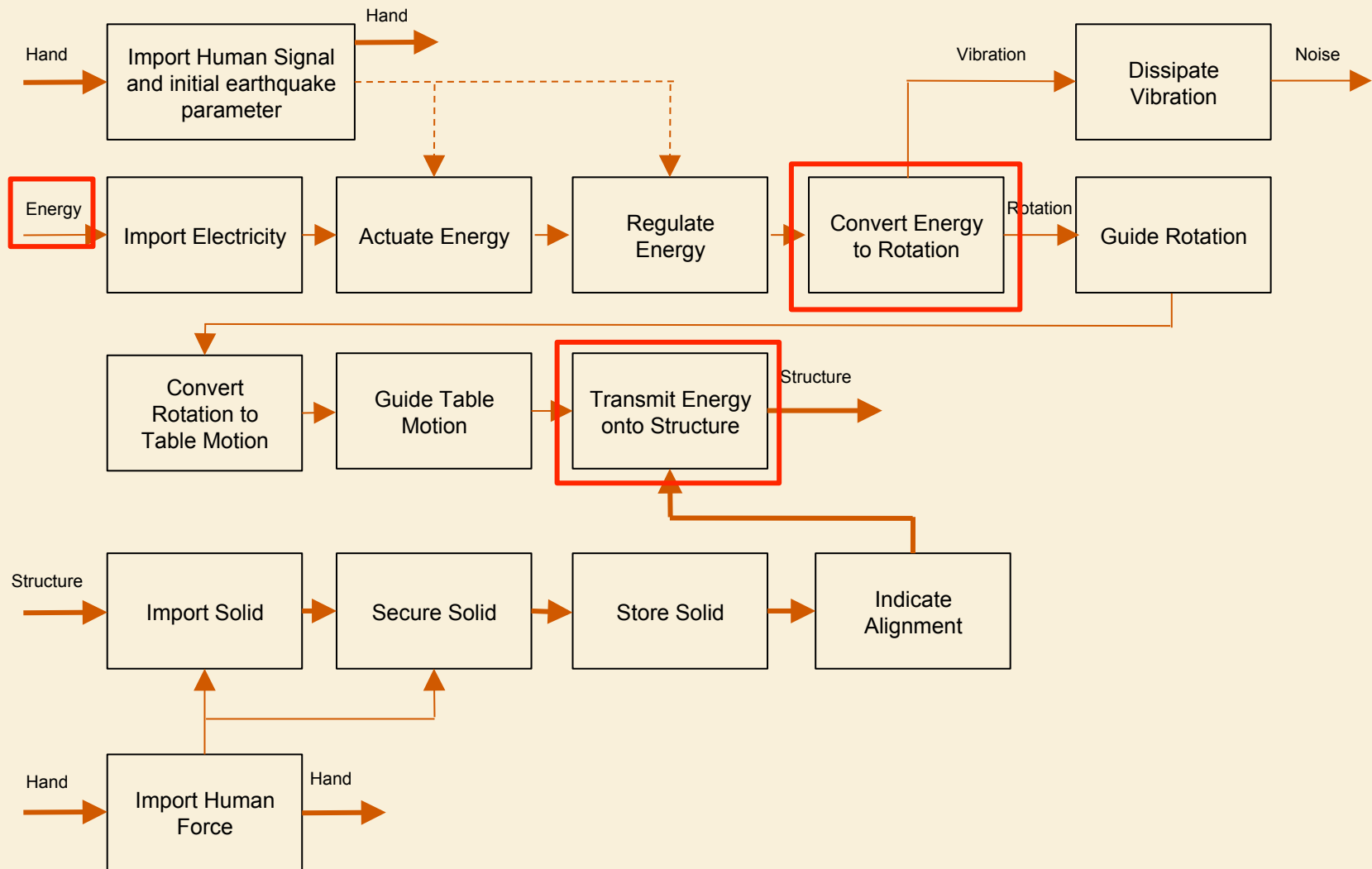


INTRODUCTION

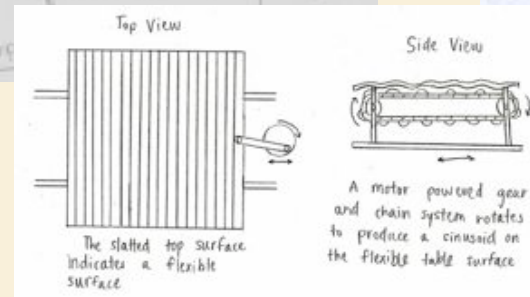
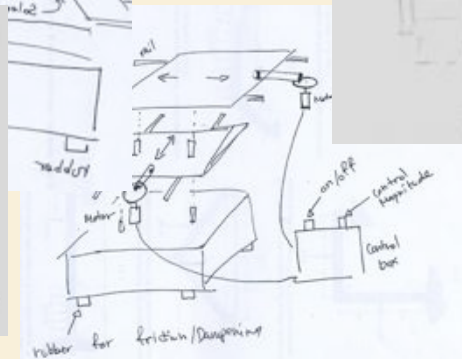
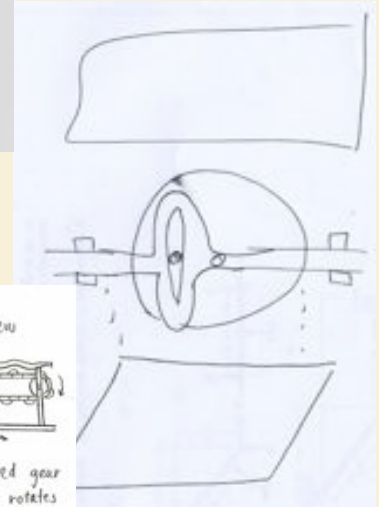
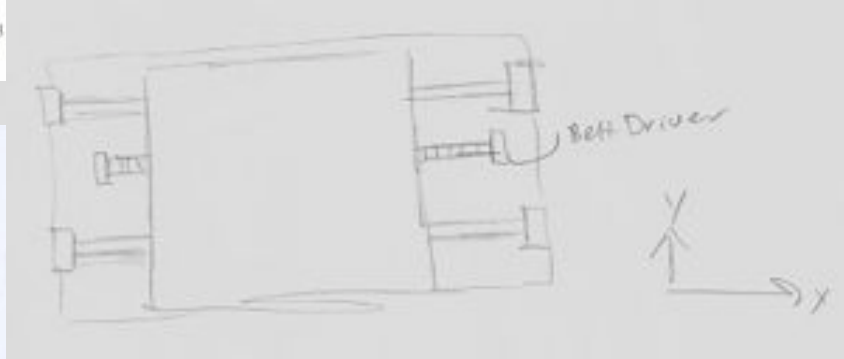
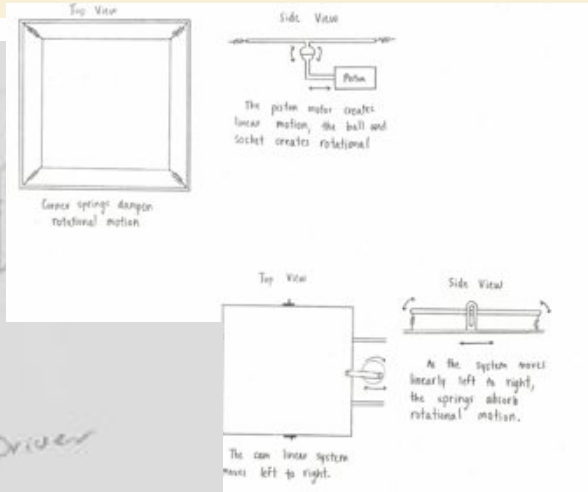
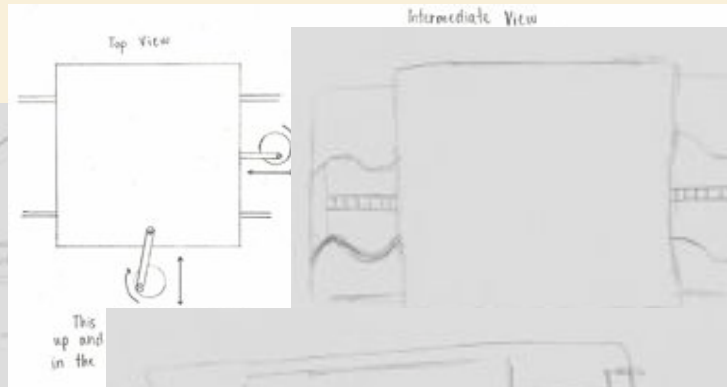
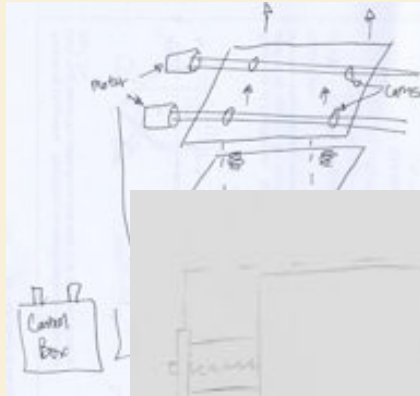
- P and S waveforms
 - P, compression wave
 - S, shearing wave
- Richter Magnitude
 - Max wave amplitude
 - Distance from epicenter
- Scaled simulation
 - Frequency & time
 - Calibrate to selected material



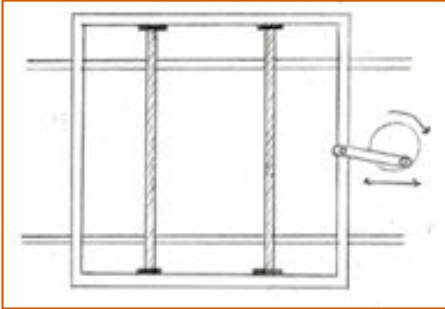
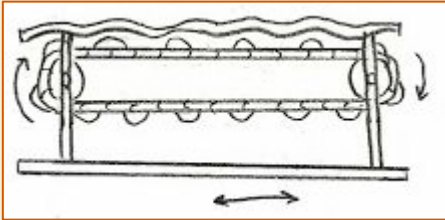
Design Development



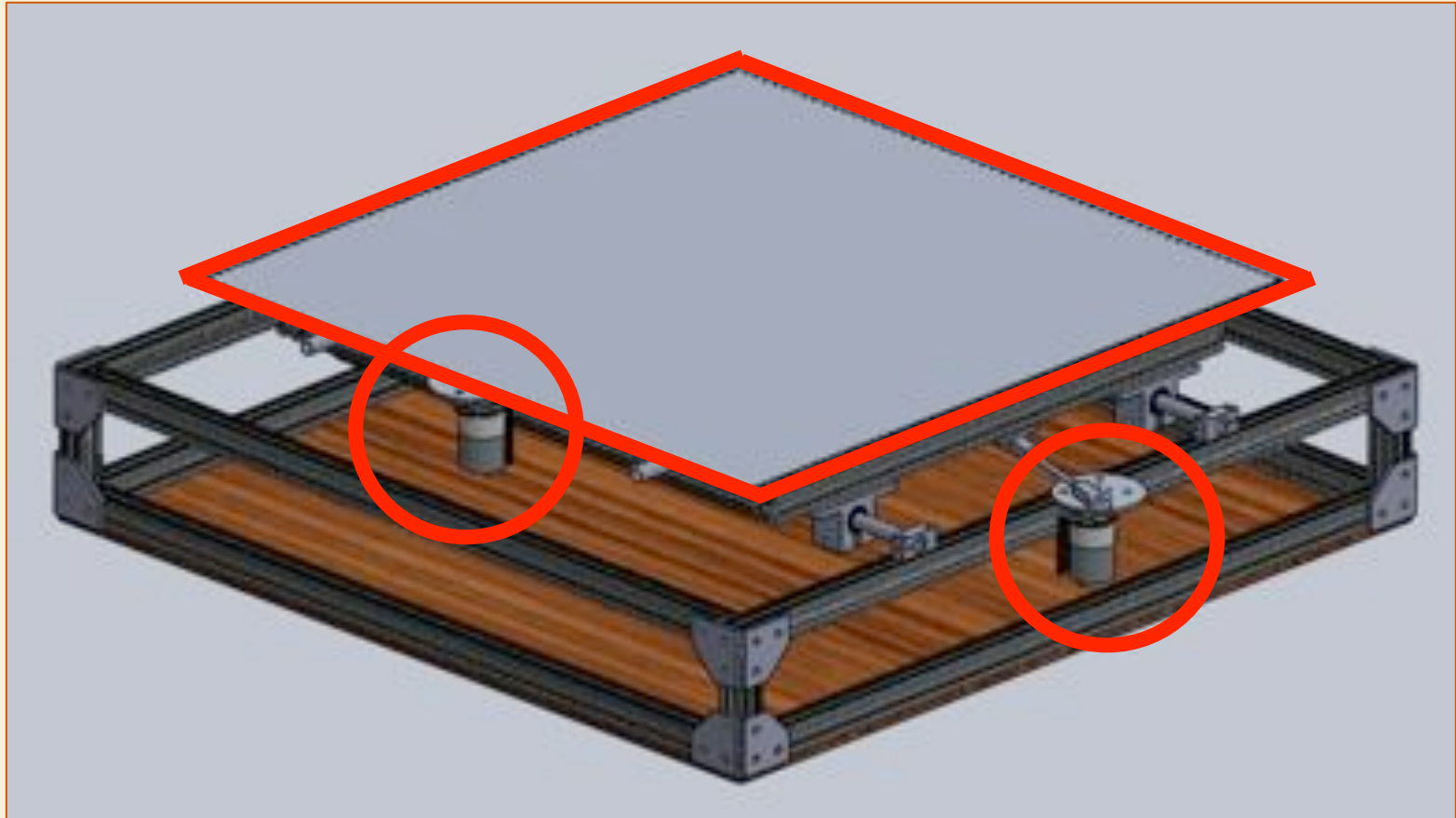
Proposed Designs



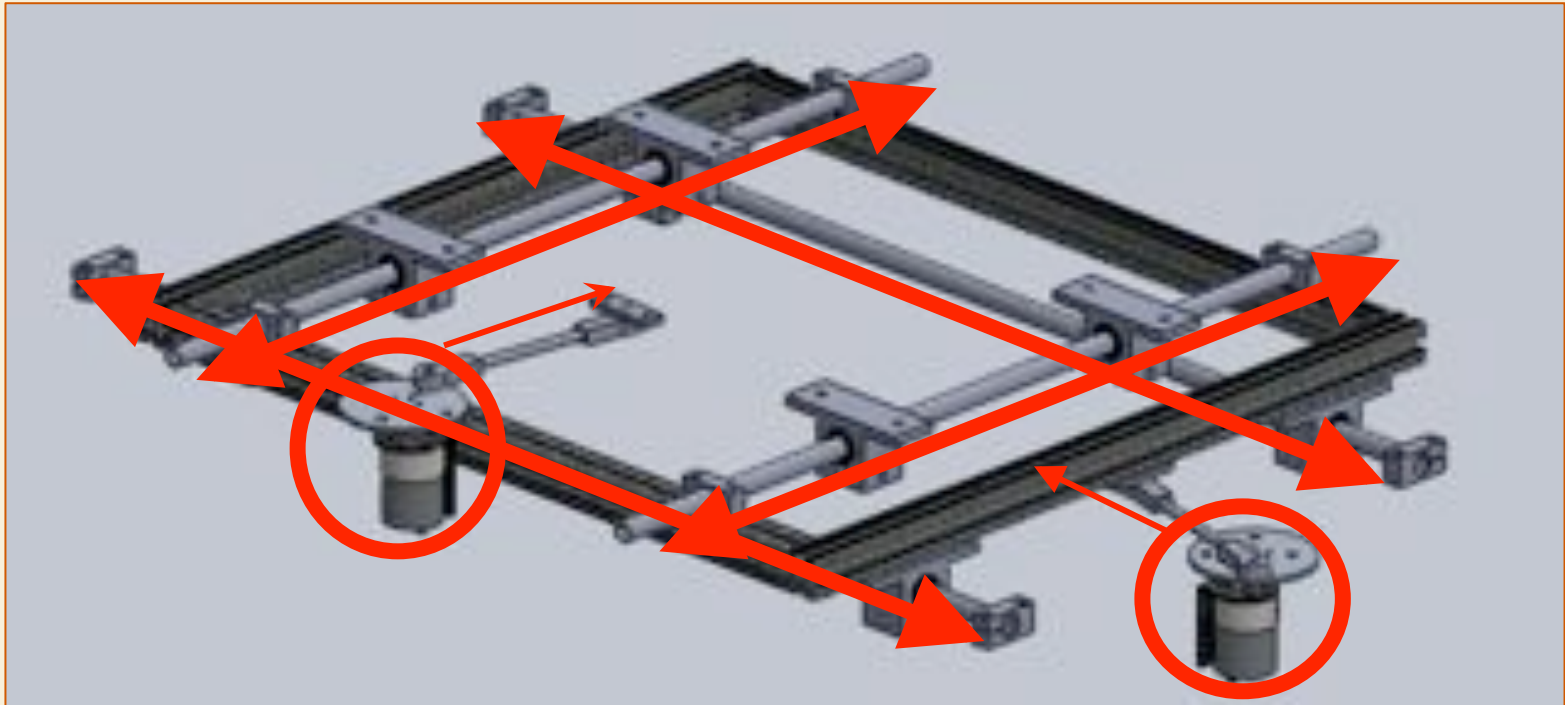
Design Development

Energy Subsystem	Mechanical Subsystem	Table Surface
<p>Mechanical Energy</p> <p>Human powered</p> <p>Electrical Energy</p> <p>Motor and microcontroller</p>	<p>Dual Linear Movement</p>  <p>Flexible Surface</p> 	<p>Rigid</p> <p>Easier to control Fewer moving parts</p> <p>Flexible</p> <p>Added functionality potential</p>

Proposed Design



Proposed Design



Proposed Design

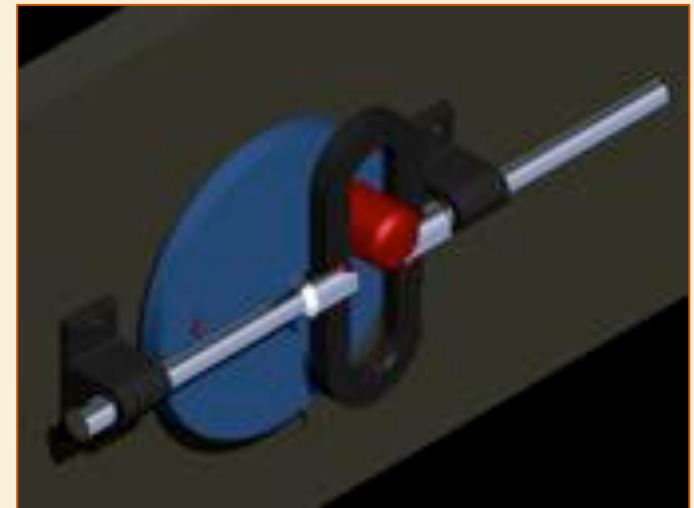
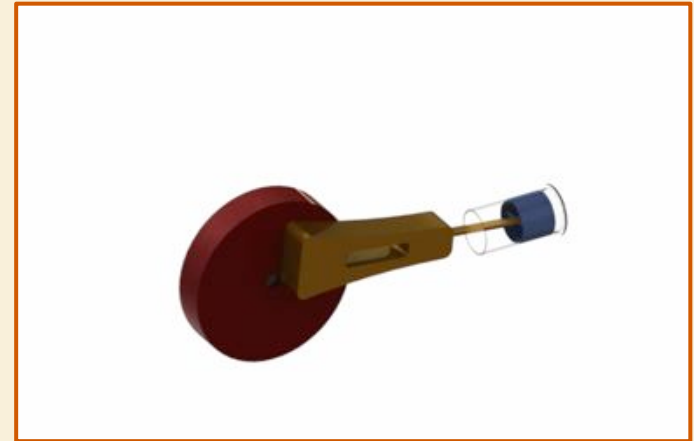


Prototype



CHALLENGES

- Design for manufacturing
- Translational mechanism
 - Crank-and-slider
 - Scotch yoke
- Richter Scale range accuracy
- Cost & weight
 - Machining vs purchasing premade
 - Light weight vs cost



Activity





KEEP
CALM
IT'S
ACTIVITY
TIME

ACTIVITY

- Objective
 - Build at minimum, a 12 inch structure that will support a textbook for 5 seconds
- Budget
 - \$100,000
- Material
 - Popsicle Sticks - \$5,000
 - Note Cards - \$3,000
 - Scotch Tape (6 inch) - \$1000
- Points
 - +1 per \$5k below budget
 - +5 for meeting the objective
 - +2 for each additional inches on your structure
 - -1 per inch below 12 inches
- Time Limit

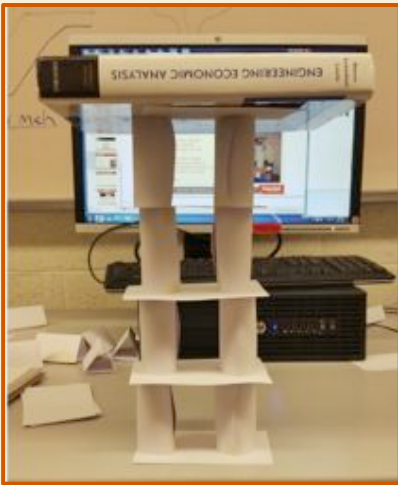




WHAT WE DESIGNED

LOUIE

- 13 notecards
- 0 popsicle sticks
- 18" tape
- 16.6 points



MOLLY

- 8 notecards
- 1 popsicle stick
- 24" tape
- 18.4 points



JOSH

- 12 notecards
- 0 popsicle sticks
- 18" tape
- 17.2 points



SUMMARY



Challenge Dates March 10&17