

Objective:

Design, build, and validate a fully-functional package dropper for Schweitzer Engineering Laboratories.

Value Proposition:

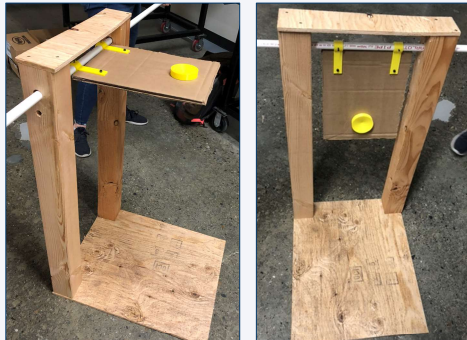
SEL currently performs package drops by hand which is physically strenuous, requires multiple people, and has large room for error. Our project will make package drops easy to perform and more efficient.

Key Requirements:

- Drops packages onto edges, faces, and vertices
- Holds packages up to 27-5/8" x 18-3/4" x 18-1/4" and up to 70 lbs.
- Can drop packages from heights of 18", 24", and 30"
- Device must fit disassembled into a 2' cube
- Must be operable by a single-user with distanced trigger mechanism
- Ten-year life based on 3 tests per month, each test includes 20 drops

Prototyping:

- Tested a trap-door style mechanism
- Verified that it wouldn't induce rotation on boxes

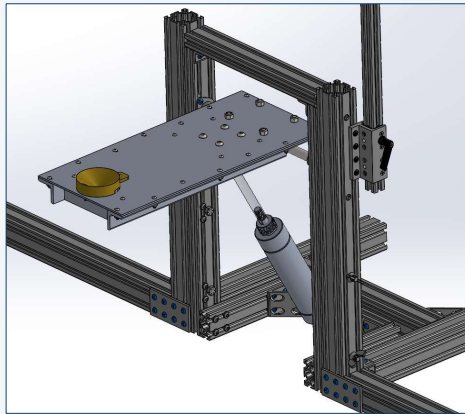


Height Adjustment:

- Platform subassembly slides up/down along 80-20 aluminum frame.
- Pins secured with wingnuts lock system in place at required height

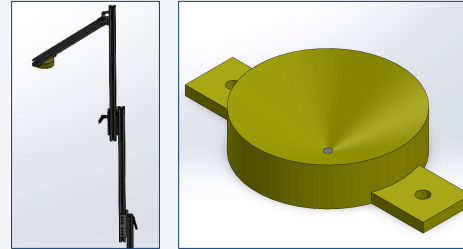
Platform:

- Plasma-cut aluminum sheet with L-brackets for increased rigidity



Overhead Stabilizer:

- Secures packages in any orientation
- Telescoping 80-20 with rotating arm allows for full range of motion
- Inverted cone holds package corners



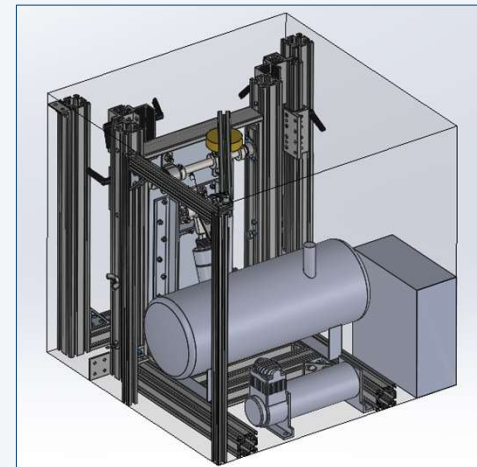
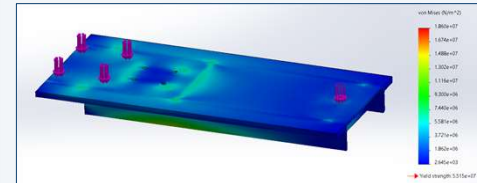
Pneumatics System:

- Double-acting cylinder moves the platform up/down

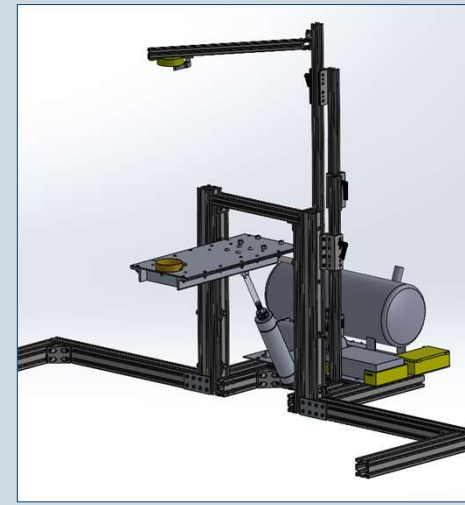


Validation:

- SolidWorks FEA verifies platform can withstand 70 lb. load
- All components fit in 2' box



The Final Design



Recommendations:

- Add additional padding to absorb platform drop
- Use rubber shims to keep legs balanced on uneven flooring
- Create a secondary trigger mechanism to avoid accidental drops

Acknowledgements:

SEL Clients: Jonathan Richards and Kristina Scrimshaw

Lead Instructor: Matthew Swenson

Graduate Mentor: Jack Gonzalez