Georgia Institute of Technology
Capstone Project
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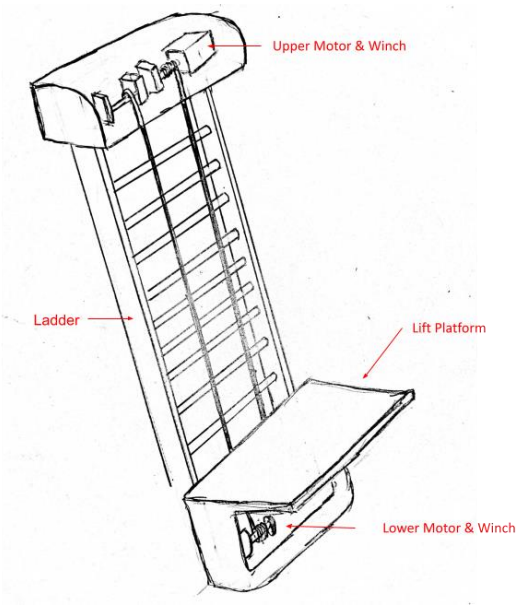
Project 18: TranzVolt 2.0
Preliminary Ideation Report

Concept 1 – Dual Motors

Description: This concept has two motors: one stationary motor attached at the top of the ladder and one moving motor as part of the lift platform.

Sketches:

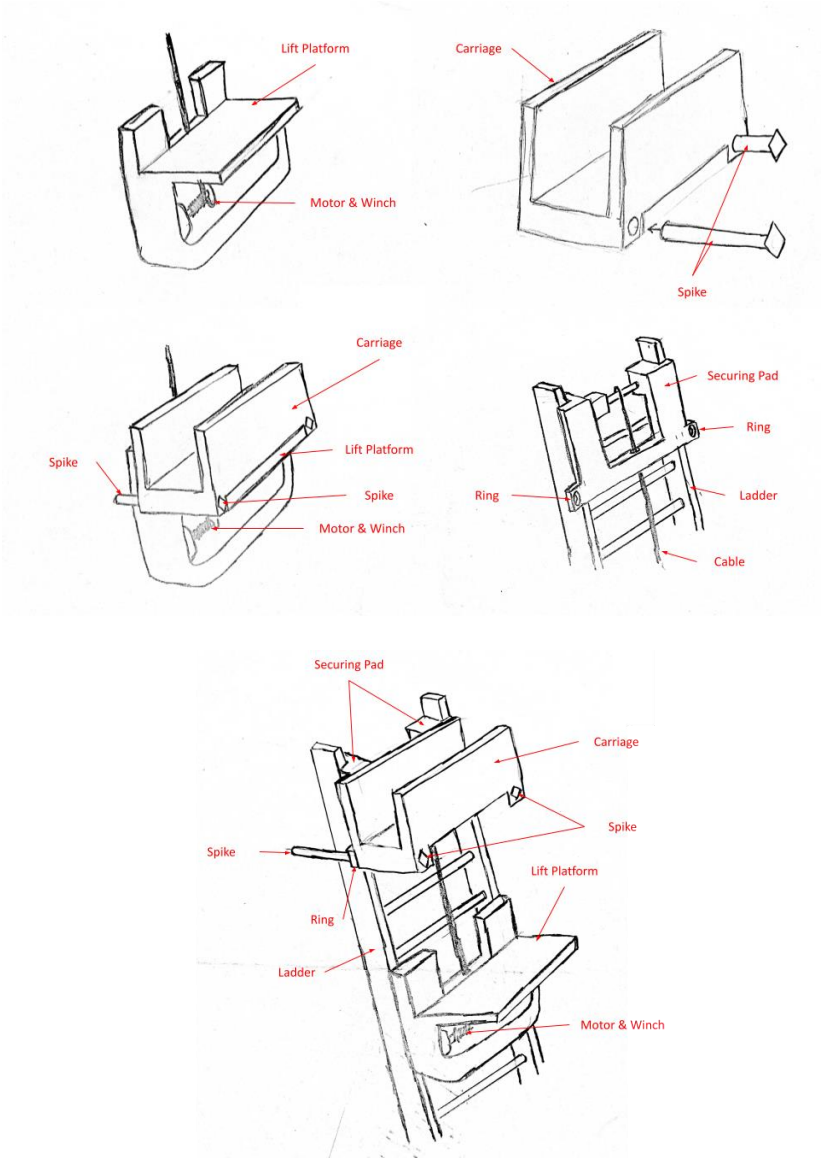


Plus	Interesting	Minus
• Dual motors double the existing available force, lifting more weight at a faster speed. • Failure of one cable can be mitigated by the presence of the second cable.	• Can be setup so that the detection of sudden increase in force leads to controlled descent by the other	• Longer setup time, motor must be setup at the top of the ladder. • Double power consumption • Double communication devices to synchronize motors • No deadload reduction

Concept 2 – Detachable Carriage

Description: This concept features a detachable carriage. Separating the lifting platform from the carriage enables the possibility of increasing efficiency by descending the lifting pad while unloading occurs at the top of the ladder. Once the lifting pad has reached the bottom, a second pre-loaded carriage can be placed on and secured to the lifting pad for immediate ascent upon completion of unloading at the top.

Sketches:

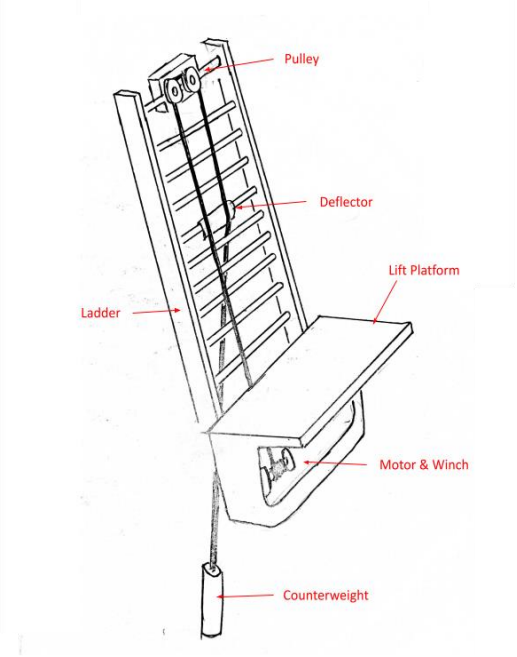


Plus	Interesting	Minus
• Higher throughput. • Decreased chances of system failure because the carriage is separated from the lifting platform.	• Detachable carriage introduces a different take on basic processes like maintenance and setup.	• Need to carry a securing pad, two carriages, and a lifting pad. • Possible increase in deadload dependent on carriage specifications. • Strong material required for the spike and the ring to secure carriage in the air.

Concept 3 – The Counterweight

Description: This concept features a counterweight. By having a counterweight, the motor uses less force to lift the system and can possibly ascend faster aided by the counterweight.

Sketches:

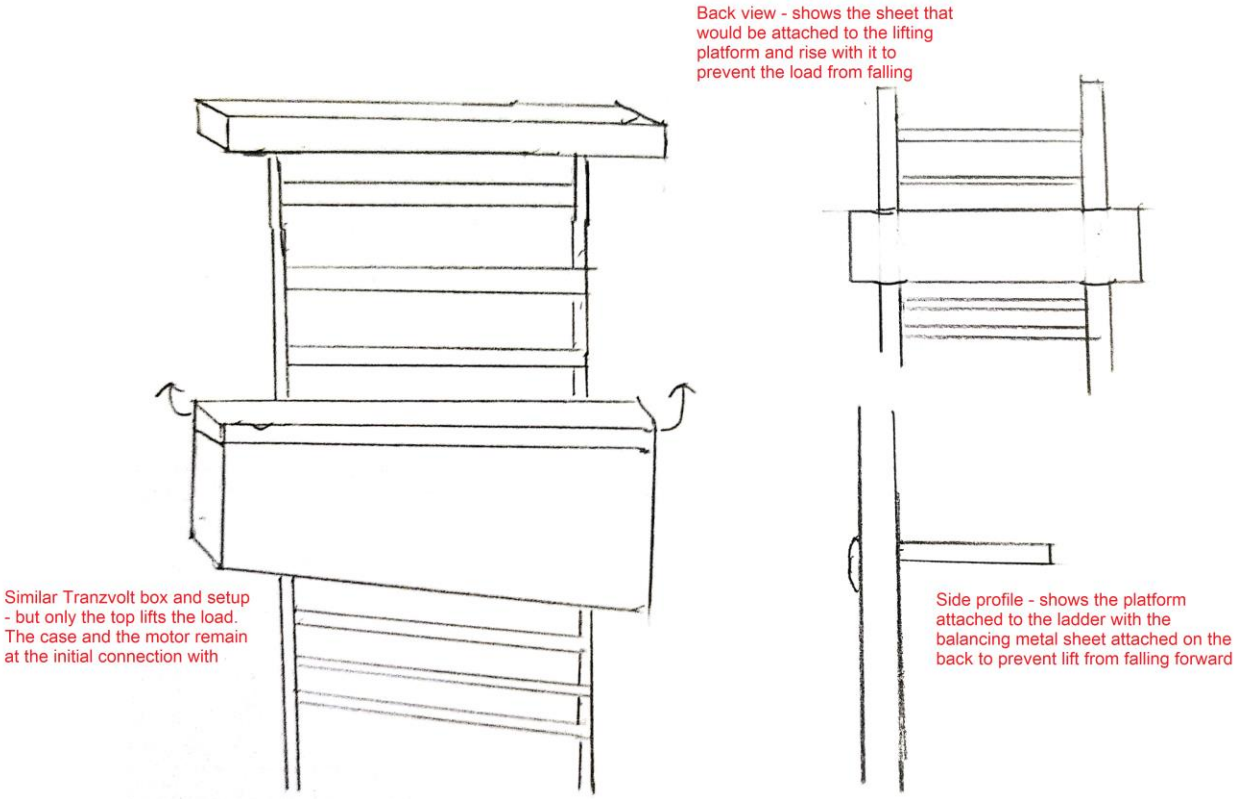


Plus	Interesting	Minus
• Faster ascent rate • Extended power and usage cycle life • Slower descent rate	• Design of counterweight	• Two falling items if cable snaps • Carrying of counterweight • Longer setup time due to pulley system

Concept 4 – Current Tranzvolt without dead weight

Description: This is similar to concept 2, in that it involves a detachable carrier. It differs in the fact that this design would use most of the assets of the current Tranzvolt, only with a detached top that lifts the load while the motor, battery, etc. remain at waist height.

Sketches:



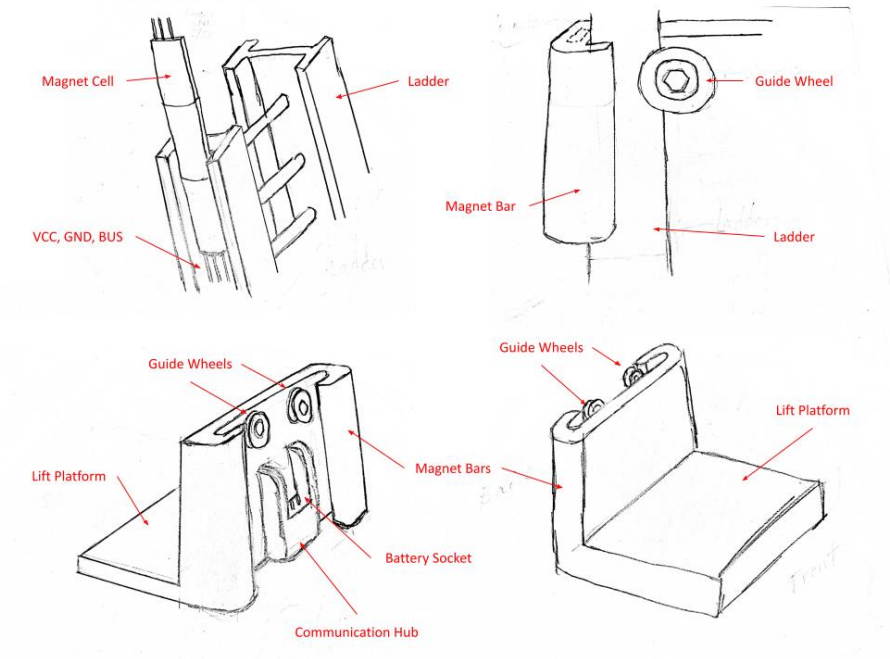
Plus	Interesting	Minus
• Beneficial to previous customers. • Removes the issue of significant dead load due to internal materials. • Improvements on the setup mechanism.	• Brand recognition is something to be considered.	• Too conservative with design and creativity. • Requires a metal sheet securing pad to work

Additional Comments: This design would need to still make improvements on decreasing setup/training time, and on controls. The main advantage of this physical design, when compared with concept two, is its minimal changes to the current Tranzvolt (while still improving upon it).

Concept 5 – Magnetics

Description: This concept features the use of electromagnetic forces. A strip of magnet cells are secured to the two sides of the ladder. The lift platform itself has magnet bars on both sides. Lift force comes from magnet attraction/repulsion along the sides of the ladder. No motors on either part of the system.

Sketches:



Plus	Interesting	Minus
• Simple setup (like sticking LEDs on a wall). • No cable, ability to control lifting force throughout traversal of ladder. • Potential high rate of climb. • No motor on lift platform, light deadload.	• Revolutionary design that can lead to a complete change in the market if successful.	• Magnets of desired spec may be difficult to acquire. • Required wired connection of magnetic strips to power. • Possibly difficult to maintain and repair. • Prone to electrical failures.

Additional Comments:

- Solution to faster load times is to separate the moving component from the carriage component. That way when the system reaches the top, the operator can secure the carriage and allow the moving component to go back down while the operator unloads on the roof. Meanwhile once the moving component reaches the bottom, a second operator can easily attach a fully loaded carriage to the moving component and be ready to go the moment the unloading at the top is finished.