

OBJECTIVES

To design and produce a portable chair lift system that assists the clientele to transition to and from a seated position in a public setting.

Value Proposition

Offering a solution to the physically impaired that enables a return to normality. By renewing the capability to be in a public setting, this instills confidence and freedom once lost by time/ailments forcing a need for a caretaker.

Background

There are products in the market for this; however, they fail to offer a variety of assistance, primarily in the realm of torque and balance. These products typically have a short lifespan and can cost upwards of 1000\$.

PRODUCT REQUIREMENTS

- I

Portability: Hands-free carry
- I

Lightweight: 20-25 lbs.
- I

Size: <18x16x6 in.
- I

Compatibility: Fit within a standard chair
- I

Ergonomics: Comfortable user experience
- I

Functional Aid: 200lbs individual
- I

Safety: No uncontrolled energy
- I

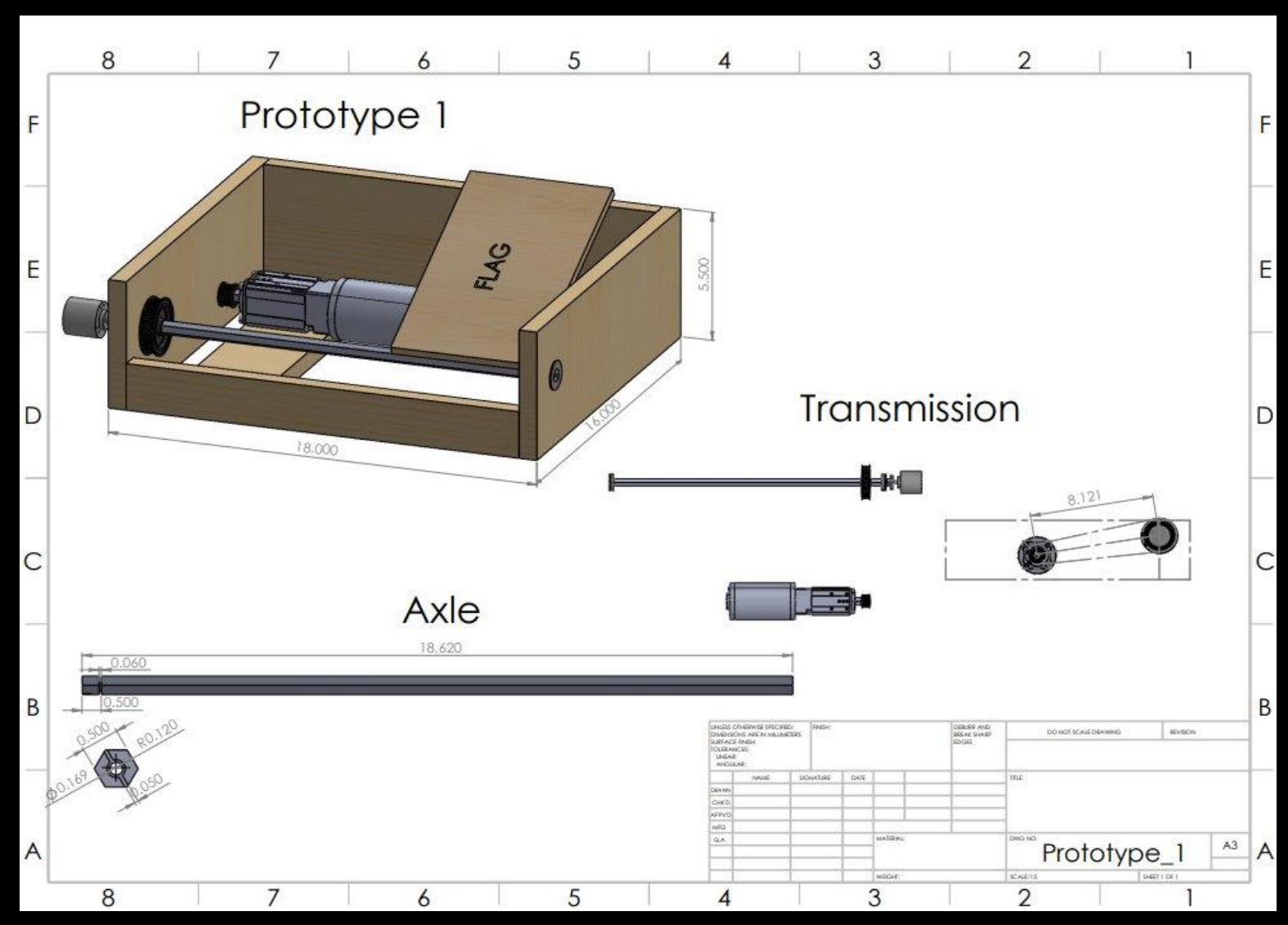
Durability: Long lifespan

ACKNOWLEDGEMENTS:

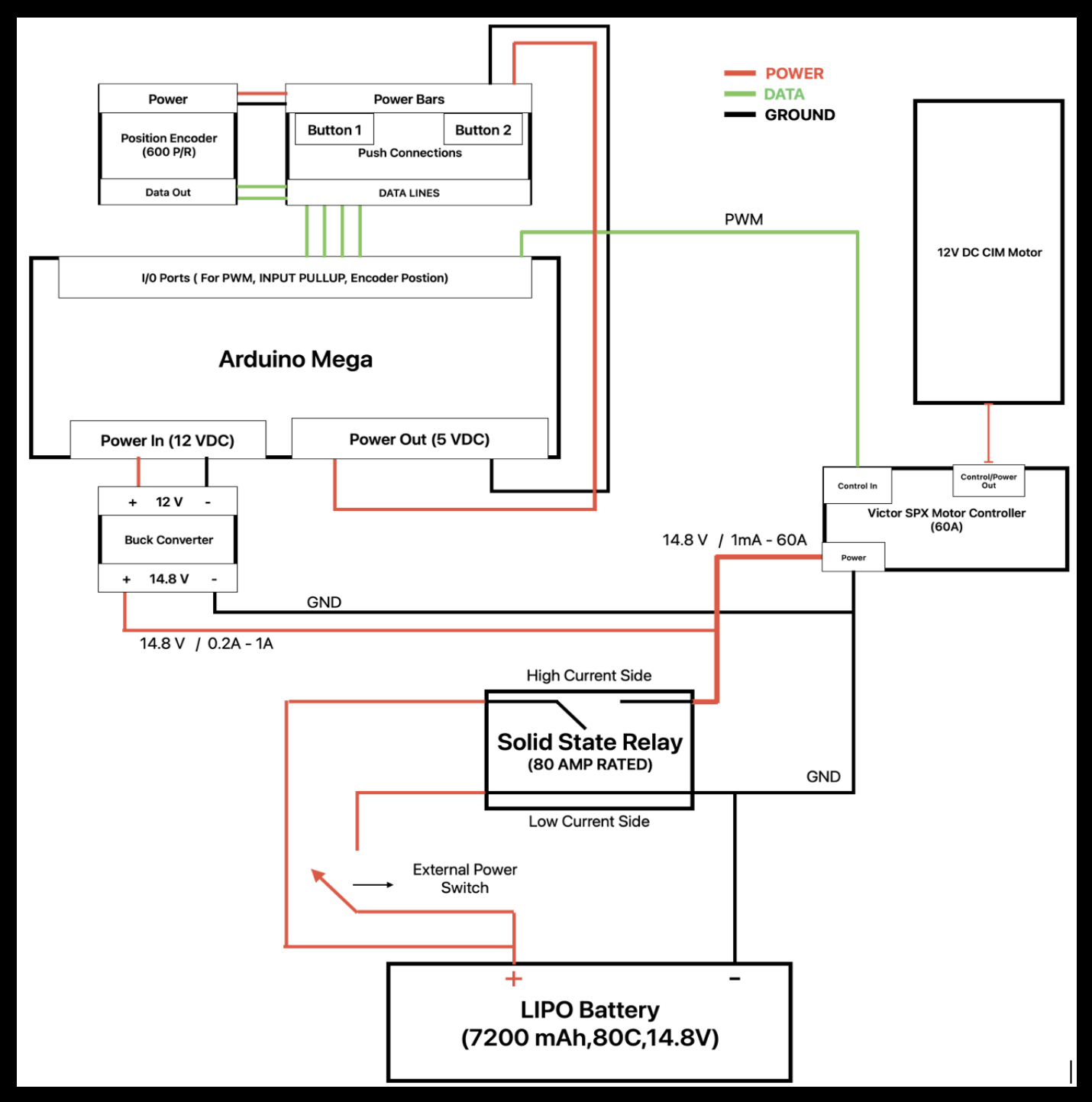
Thank you, Kip Sikes, Levi Bailey, and Asher Holden, for your expertise and guidance.

DESIGN

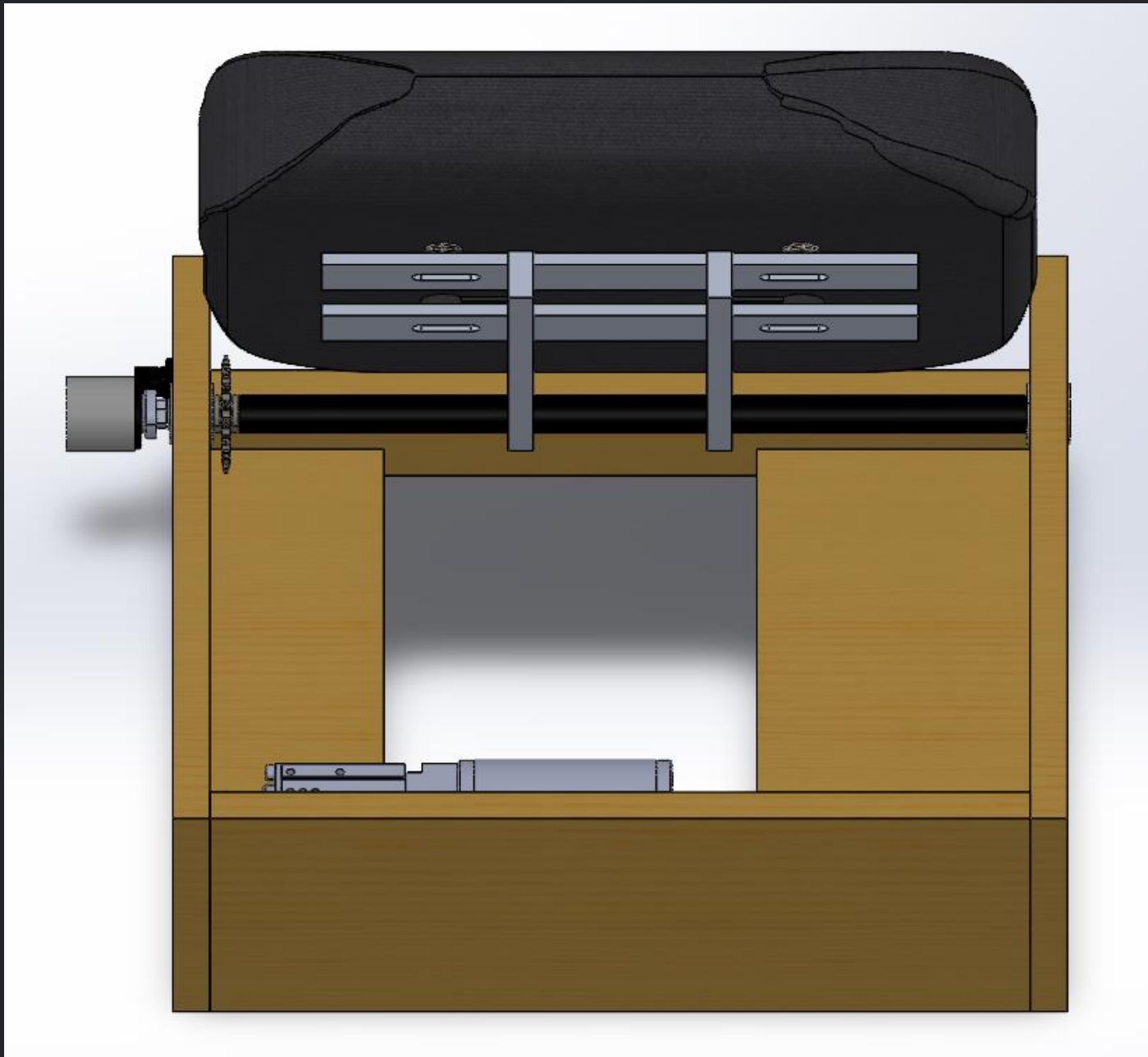
First Prototype



Electrical Design



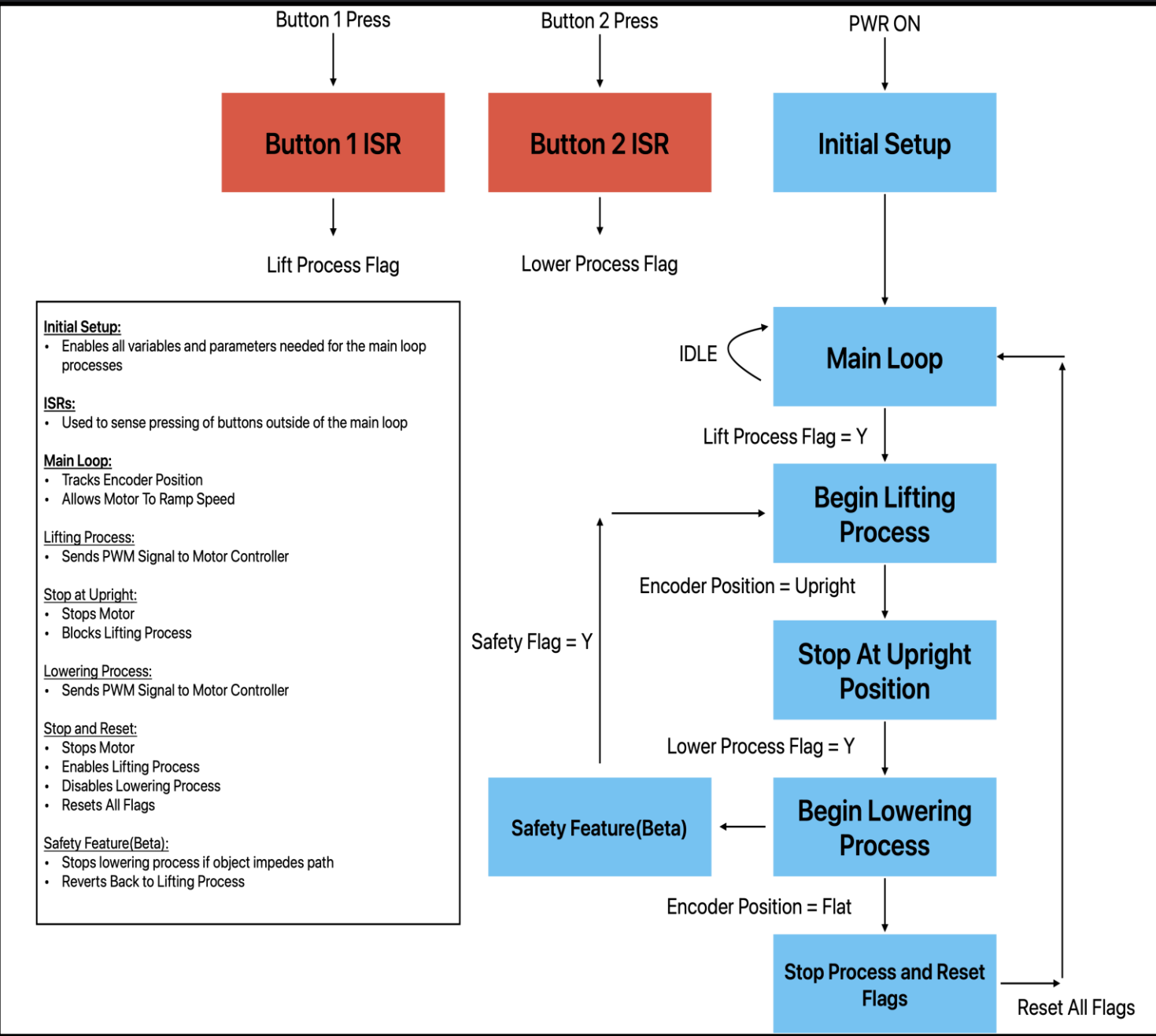
Final Design



Key Testing at this stage:

- Proof of Design Concept: motor driven pivot
 - Design chosen for its precision control and high lifting capacity
- Application/Confirmation of Electrical Controls:
- Motor Functioning

Control Flow Diagram



Key Electrical Design Choices

- CIM motor pulls up to 60 A of current limited by motor controller.
- Solid-state relay implemented to protect the external switch connecting the energy system to the 14.8V LiPO Battery.
- Arduino MEGA tasked with sending PWM signals to motor controller based depending on position encoder and button inputs.

Key Final Changes

- Switching from belt to chain drive to accommodate for slip occurring when applying higher torque on the axel
- Reinforced frame with additional crossmembers and aluminum plate
- Mounting bars for seat to axel link

VALIDATION

Final Product



Requirements Satisfaction

- ✓<25 lbs.
- ✓18x16x6in.
- ✓Office chair compatible
- ✓Comfortable seating
- ✓Safe energy output
- ✓Lasting Battery Life
- ✗Desired Torque Output
- ✗Hands Free

Testing Results and Conclusions

Load testing on the final prototype was able to exert enough force to lift a 150lbs individual. The current peaked at 30 amperes and a comfortable rising speed was achieved. With a 170lbs individual, the frame fractured under stress. The frame needs to be strengthened in this form factor.

RECOMMENDATIONS

- Fully-Mechanical Product
- Stronger Frame
- Safety
- Sleeker Design for Aesthetics
- Specific Rehabilitating Applications
- Elaborating electrical controls for specificity
- Hands-free carry