



From Magnetic to Mechanical: Electromagnetically Powered Impact System



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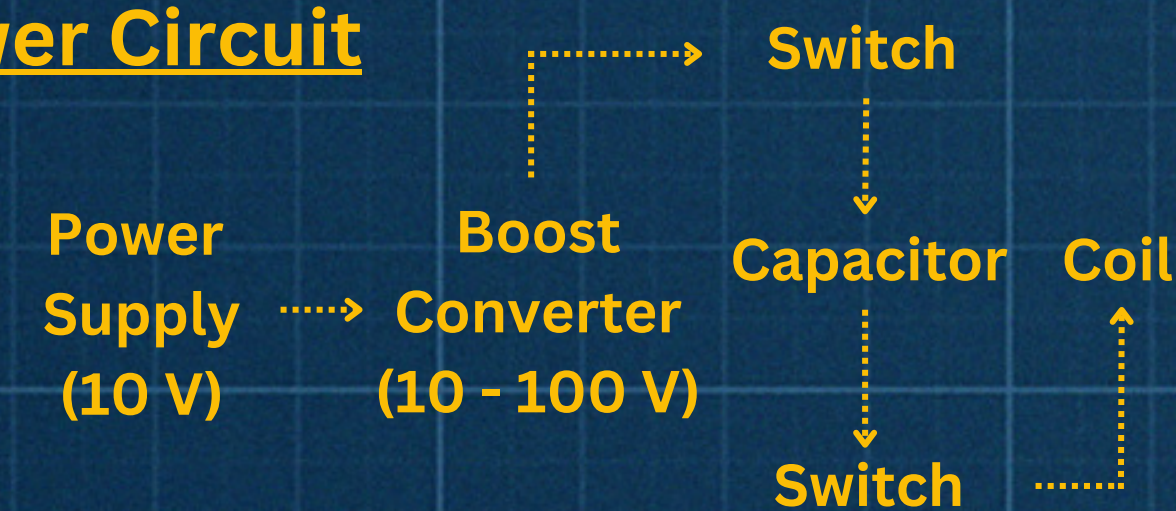
Objective

- Armour systems need to be tested at ballistic velocities, requiring an impact velocity of 100m/s +
- The final design is a ceramic armour impact test that is suitable for **limited lab space**. The design is **scalable**, **safe** to operate, **controllable**, and **repeatable**.
- Aim of the prototype is to prove the linear actuation and scalability of the design with a max. velocity of 10m/s

Linear Actuation & Power System

- Coil has 400 turns and 12 layers of copper
- Generates electromagnetic field to accelerate projectile

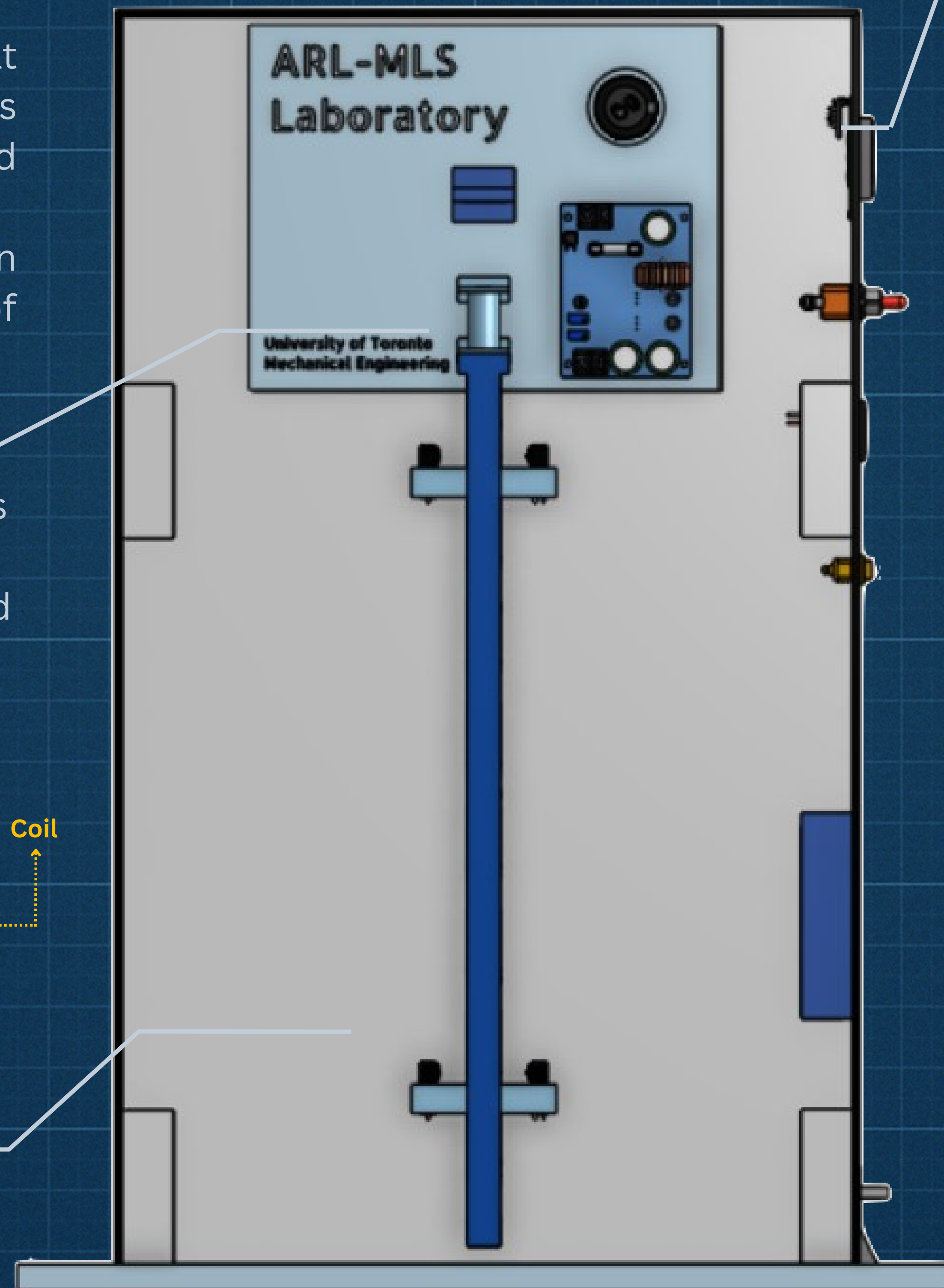
Power Circuit



Sensor System

- 2 sets of IR sensors placed 25 cm apart
- IR sensors are controlled by an Arduino Uno
- Estimate average velocity

Design of Prototype



Control System

- LCD screen
- Toggle switch
- Push button
- Voltmeter

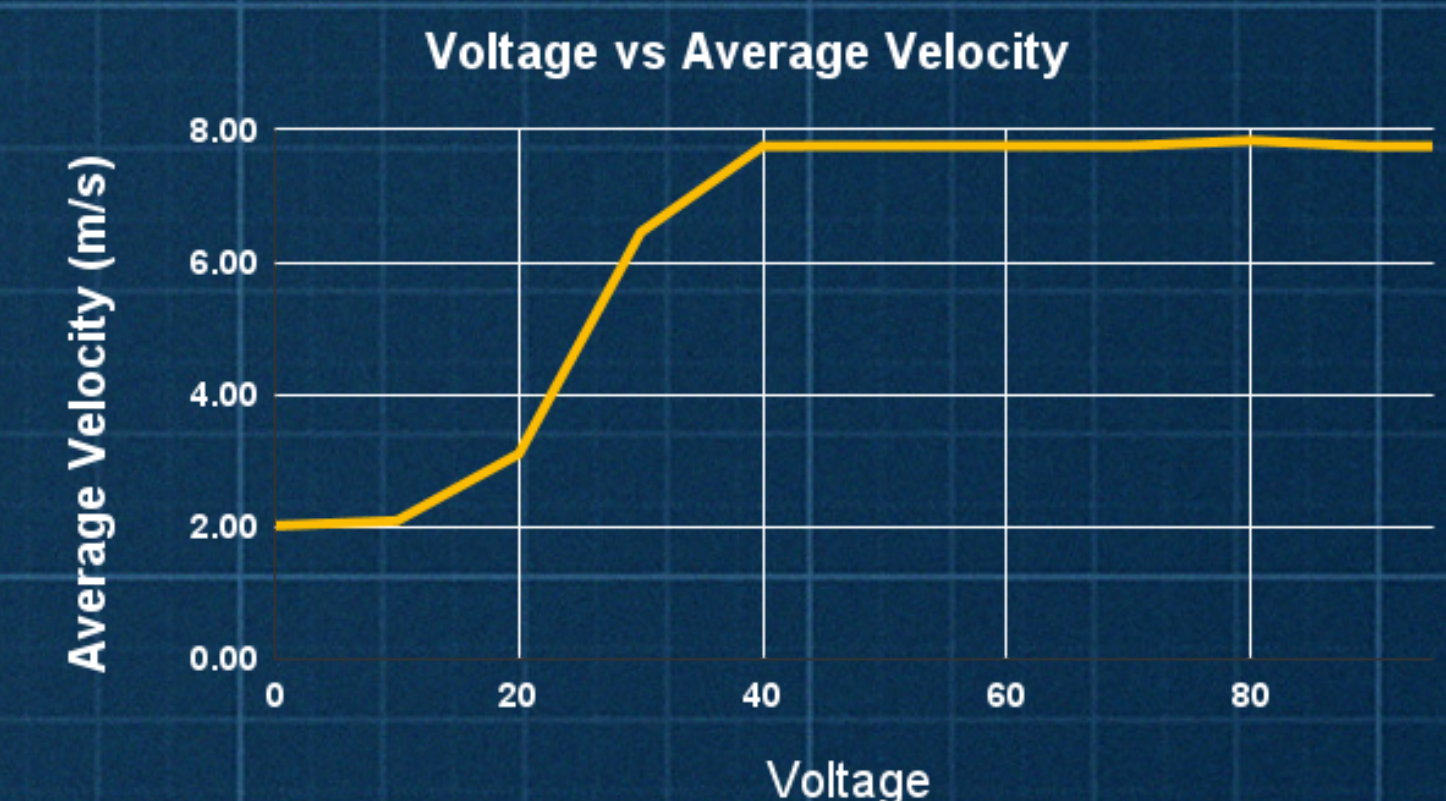


Procedure

1. Toggle on switch
2. Wait for desired voltage on capacitor
3. Toggle off switch
4. Press button to release projectile

Testing Results

Maximum velocity recorded: 8.48 m/s at 50 V



Future Work

- Add MOSFET to improve release time of projectile
- Add more coil stages to increase projectile velocity
- Adjust coil geometry to increase efficiency