

Objective

Design a small, mechanically actuated wire cutter that is able to rotate 360° and bend 90° to the shaft axis.

Requirements:

- Compatible with pre-existing handle provided by LANL
- Provide enough force to shear a 14 gauge copper wire
- Perform cuts with 2' minimum standoff distance
- Tool head should fit through a 1.5" diameter hole
- Operable with gloved hands

Background

Today's EOD technicians must rapidly adapt their tools and techniques to counter continuously evolving methods of constructing IEDs.

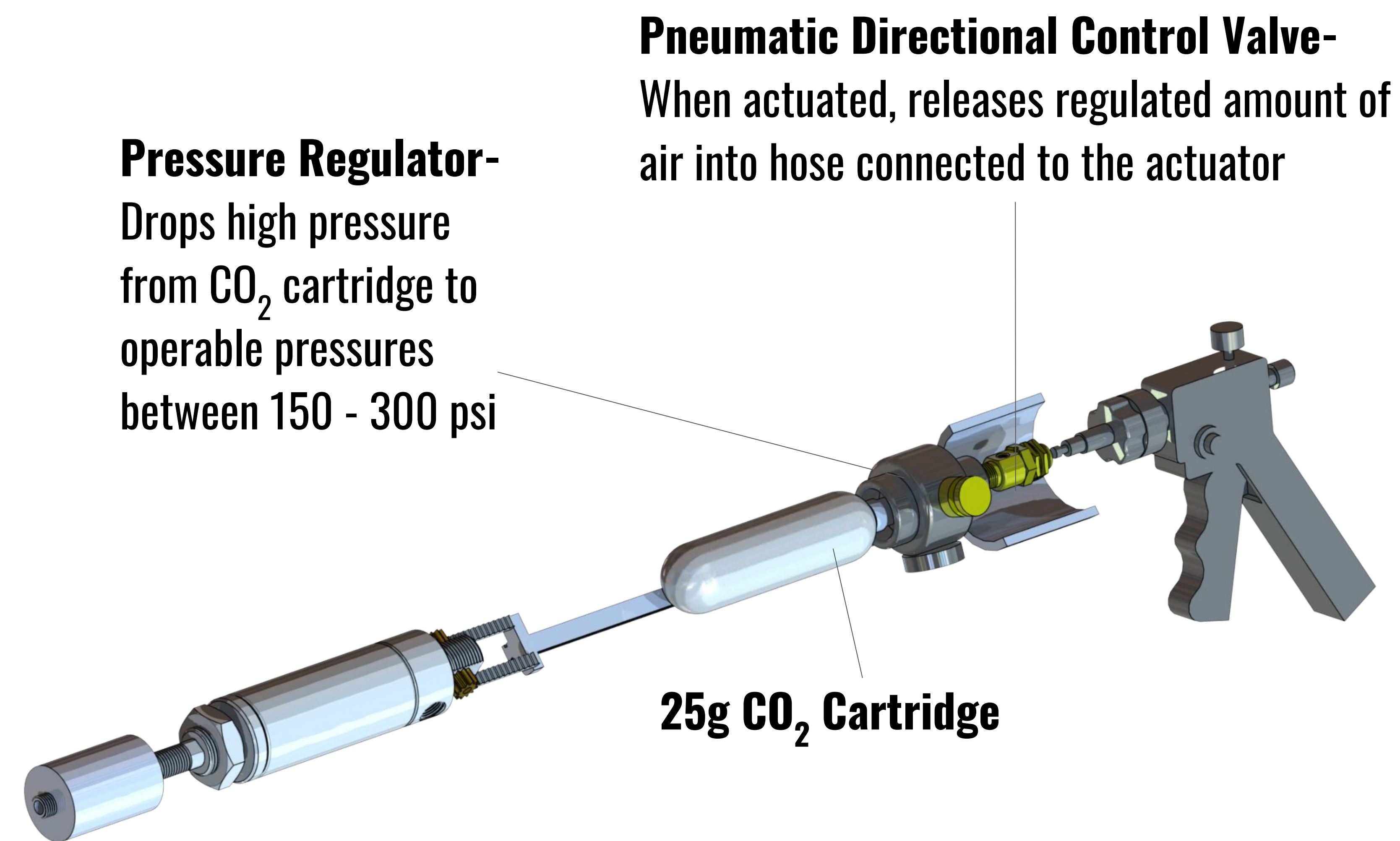
Design Overview

- Linear force translated from tool handle to activate internal pneumatic system
- Pneumatic actuator drives shear force through cutting head to snip wire
- Pneumatic system powered by reloadable CO₂ canister with capacity to last one full mission

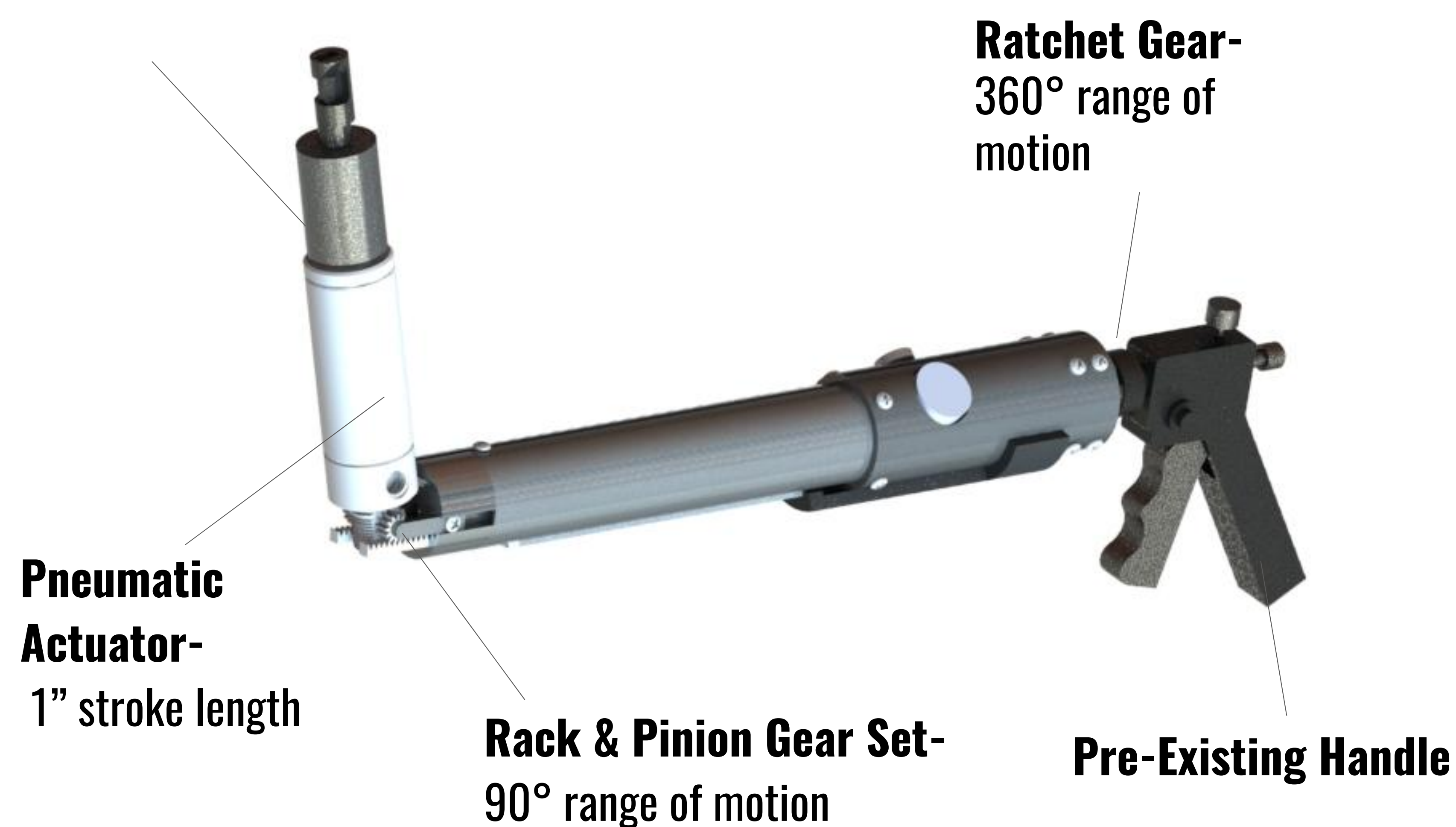
Key Advantages of this Design

- Increased safety of operators
- Flexibility of tool allows for deactivation in a wide range of orientations
- Entirely mechanical design – no reliance on electricity in the field

Design



Cutting Head Attachment Adapter

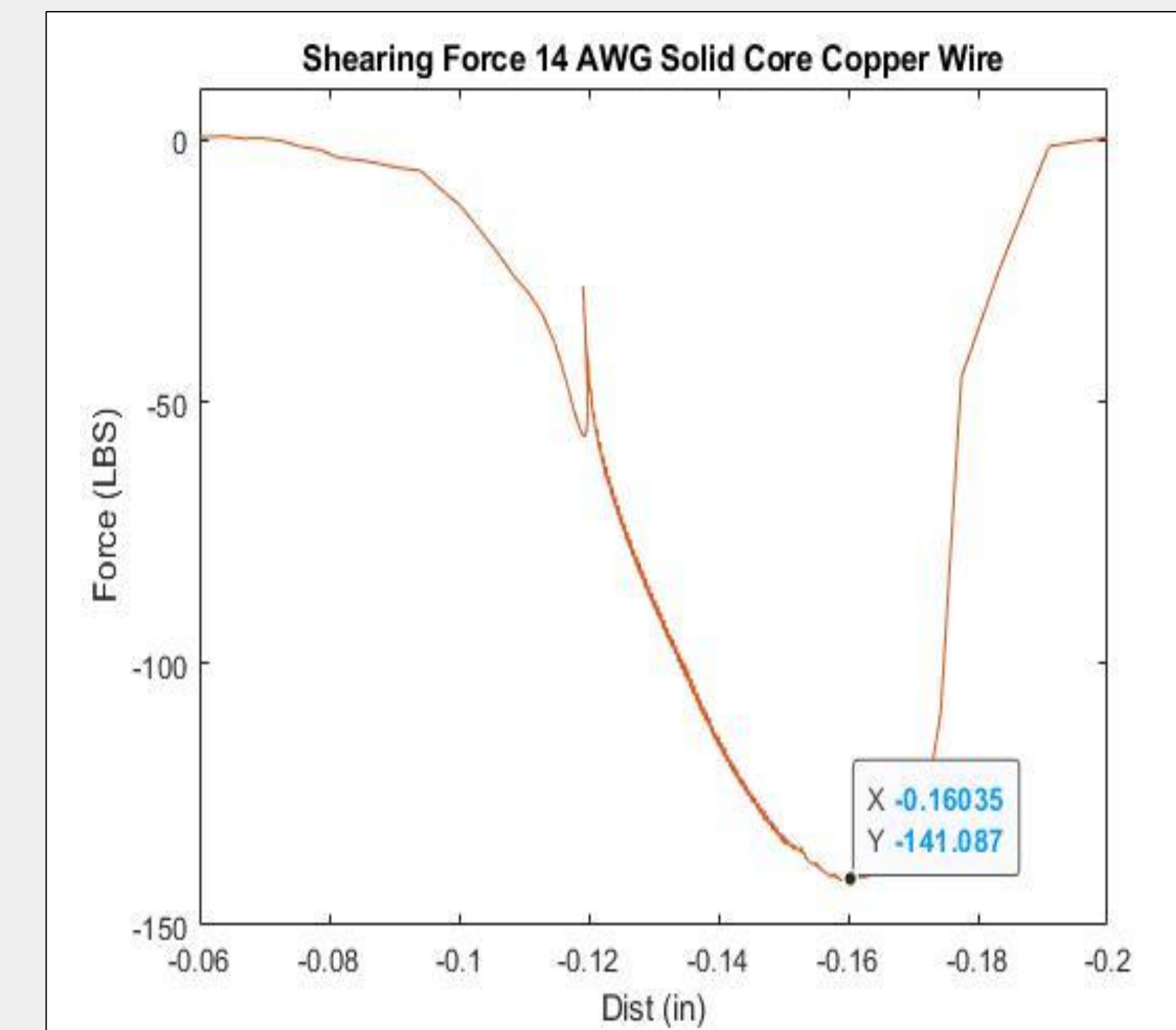


Shear Cutting



Testing & Analysis

Instron Testing



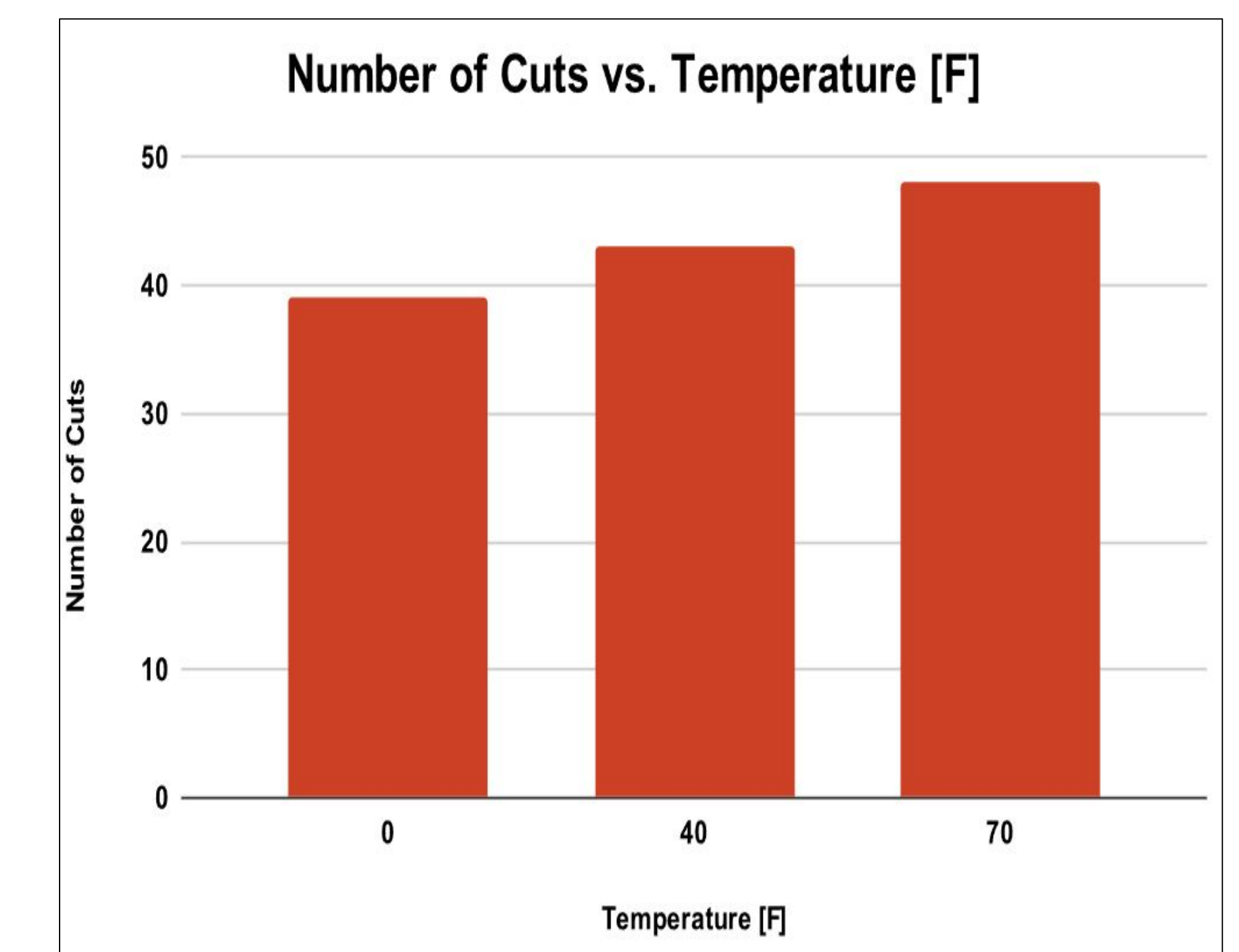
Key Results:

- Approximately 141 pounds needed to cut 14 AWG copper wire with shear cutting head

Temperature Testing

Key Results:

- 0°F: 39 cuts average
- 40°F: 43 cuts average
- 70°F: 48 cuts average



Moving Forward

Future Design Recommendations:

- CO₂ canister reload could be done in the field so tool does not need to be deconstructed
- Limited by hose capacity unable to withstand pressure in CO₂, a suitable hose could be developed to fit size constraints
- Refillable CO₂