

OBJECTIVE

Develop a propulsion system that can fire various 9mm projectiles at consistent velocities, with the ability to adjust such velocities incrementally.

BACKGROUND/VALUE PROPOSITION

Vista Outdoor manufactures defensive ammunition cartridges that are difficult to test due to the variation in the projectile's velocity, which influences penetration and expansion upon impact.

To reduce the extensive testing currently required to isolate the results from these variations, our design will utilize an air propulsion system to provide cheaper and more efficient product design.

KEY REQUIREMENTS

- REACH A VELOCITY BETWEEN 900-1200 FT/S
- FIRE 100-GRAIN 9MM CALIBER PROJECTILES
- ABILITY TO ADJUST EXIT VELOCITY INCREMENTALLY
- 10 SHOTS WITHIN A 15-MINUTE WINDOW



GAS SELECTION

AIR

PROS:

- EASILY REFILLABLE
- INEXPENSIVE
- COMMONLY USED

CONS:

- LOWEST ENERGY VALUE

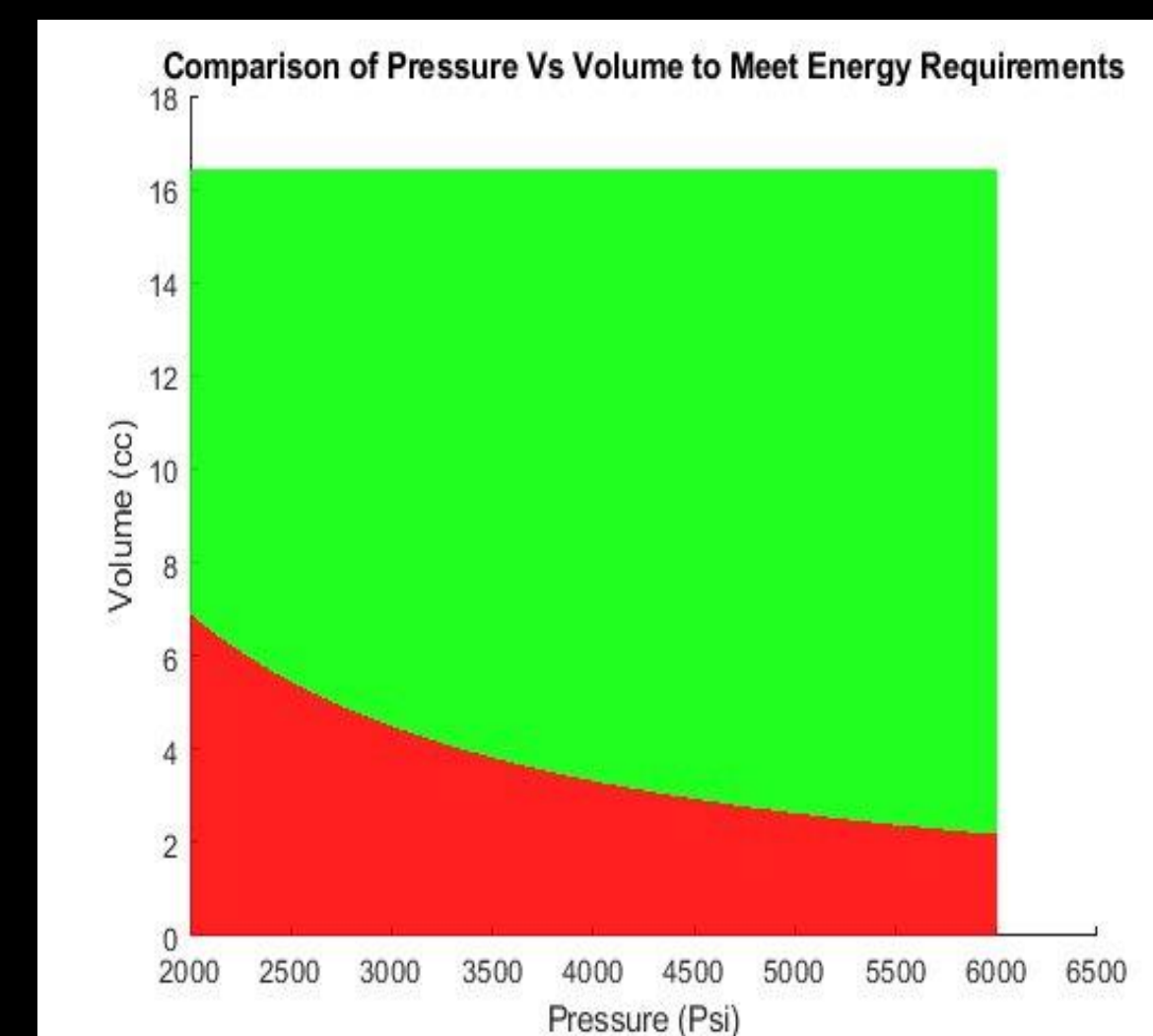
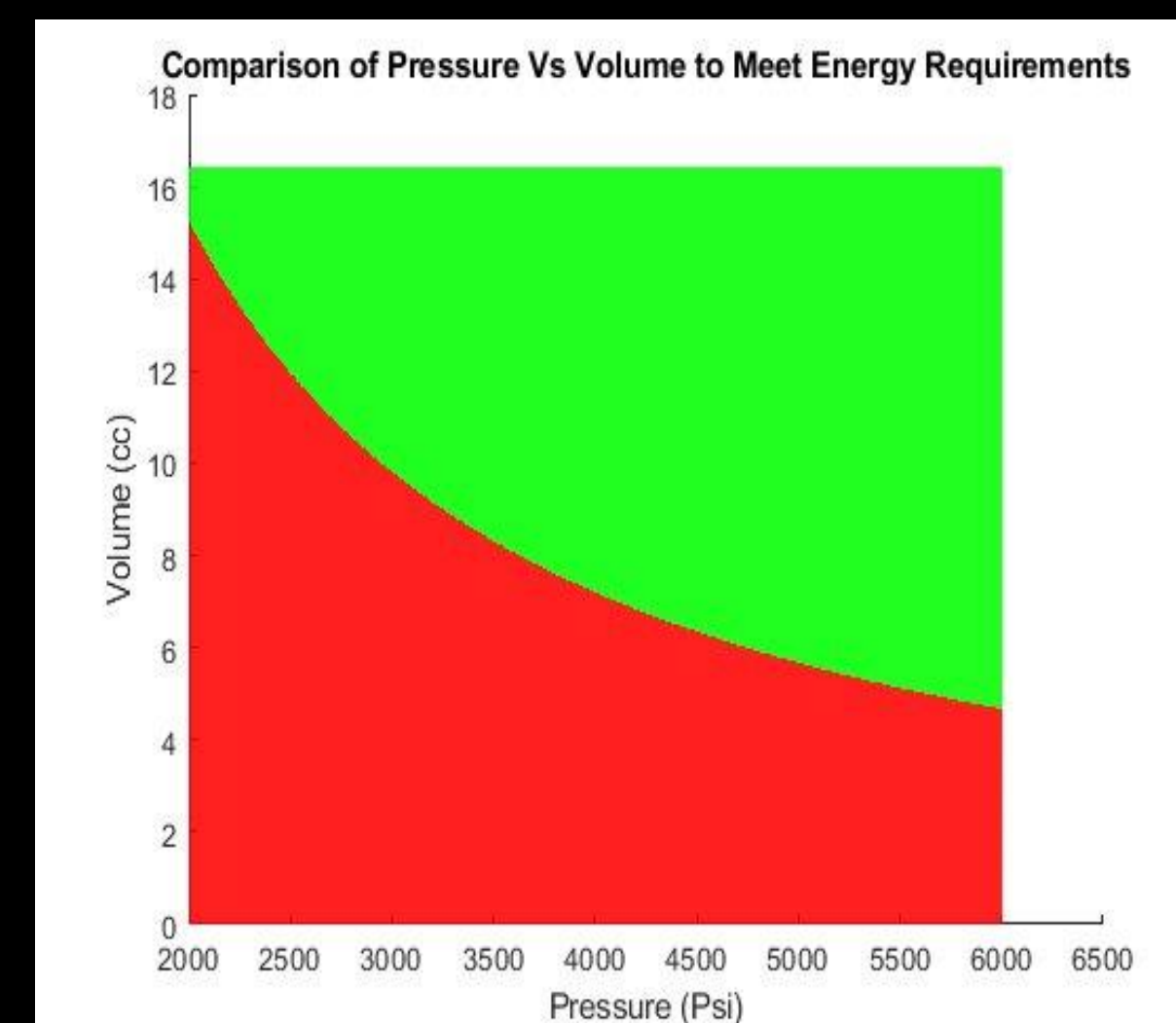
ARGON

PROS:

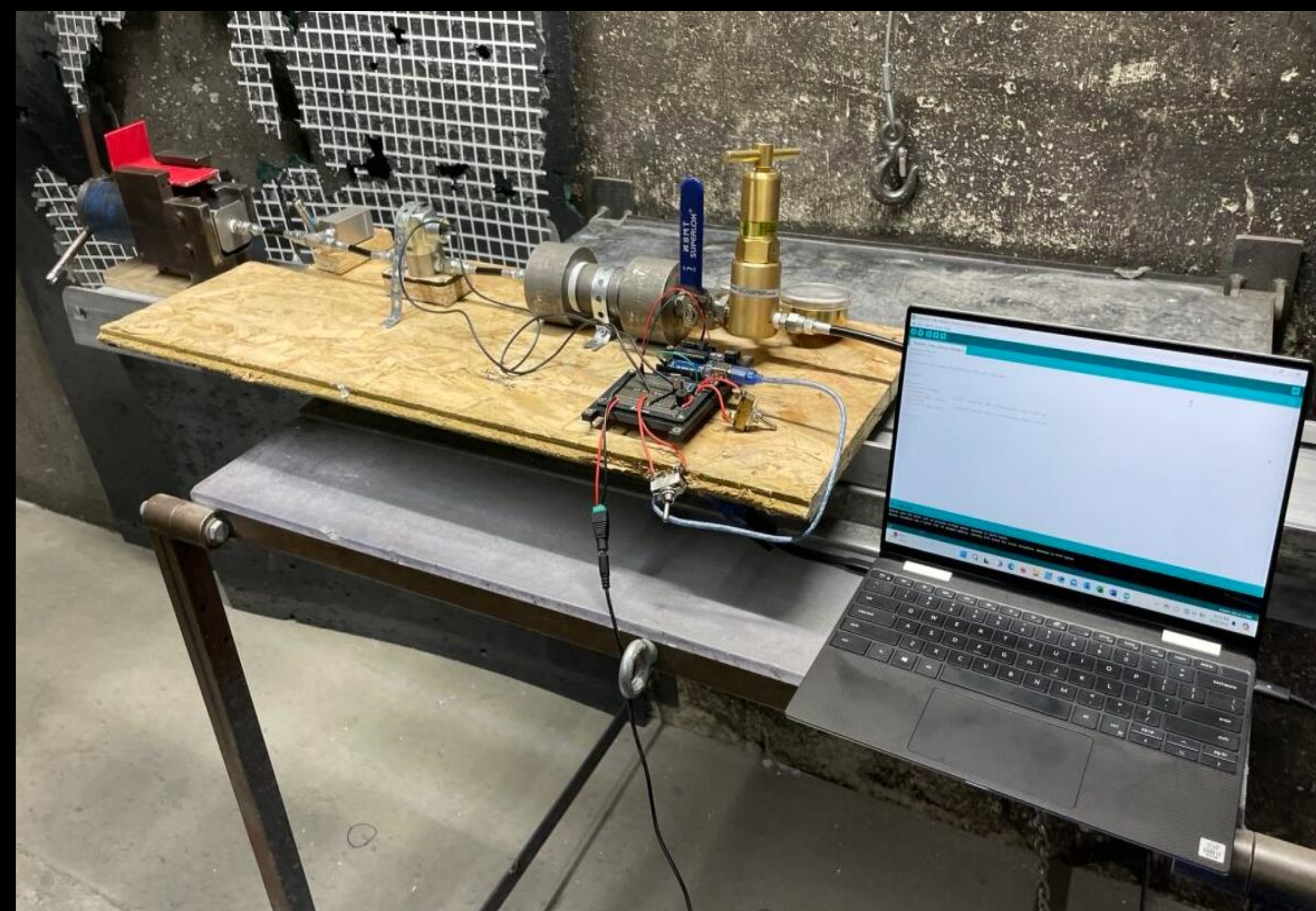
- BEST ENERGY DENSITY
- REGULARLY AVAILABLE

CONS:

- EXPENSIVE



FINAL DESIGN



System layout & configuration of final design

KEY FEATURES

- BALL VALVE – ISOLATE AIR SUPPLY TO SYSTEM
- SOLENOID – ADJUSTABLE OPENING DURATION
- BLEED VALVE – DEPRESSURIZE SYSTEM
- WHEEL MOUNT – CONSISTENT PROJECTILE TAMPING & QUICK RELOADING

VALIDATION

REQUIREMENT	TEST	RESULT
Fire 10 shots within a 15-minute window.	Live fire test timing full loading & firing procedure.	Loaded & fired one round in about 75 seconds.
System holds 3500 psi without failure.	Perform both dry fire and live fire tests at 3500 psi.	System experienced no leaks or failures at 3500 psi.
Ability to adjust exit velocity incrementally.	Live fire test following full procedure.	Unable to receive velocity measurements from chronograph.

CONCLUSION

This project was a successful proof of concept that air propulsion is an effective avenue in pursuing a more consistent firing system. With further development and refinement this design could be implemented in a commercial application to accelerate the designing process of defensive ammunition.

