The Feasibility of Using an Electric Arc Flash as a Propellant

Freeman, Nathanael

The destructive force of an arc flash has plagued industry for years because it is essentially uncontrollable. This experiment studied the feasibility of harnessing this energy as a propellant for firearms. An arc flash is a type of electrical explosion that is formed by a low expedience connection to ground resulting in extreme temperatures and an associated pressure wave. This pressure wave, also known as an arc blast, can be used to propel a projectile at high velocities. This project investigated the feasibility by constructing a power supply to allow for a high current discharge. This was achieved by using three 6800 microfarad capacitors with a suitable charging circuit. Then an arc chamber was constructed to allow for a low impedance connection to ground. Two methods were investigated to achieve a low impedance connection: the first being a thin strip of an aluminum filament between the electrodes and the second being a conductive aqueous solution submersing the electrodes. The arc chamber was mounted to a 4.3 mm barrel and numerous shots were made at varied gap distances for both arc media. It was found that aluminum produced the best results with average velocity of 244 m/s (meters per second) while a saturated saline solution produced an average velocity of 198 m/s. The aluminum filament worked best at a wider gap than the saline solution. This showed that the gun is feasible for small firearms.

Awards Won: