*Investigation of the Effects of Sound on Propellant Gas Used in Electronic Propulsion Devices*

Cory Andrew Hofstad

Present and future spaceflight missions depend on the ability to produce high exhaust velocities while reducing the dependence on chemical fuel and its mass onboard a spaceflight vehicle. Oscillation of gaseous molecules allows for ejection out of propulsion systems at higher velocities, increasing chemical fuel efficiency. Oscillation of granulate and liquid reagents using simple harmonic motion has been shown to excite particles, forming geometric patterns when using calibrated frequencies. Methods shown to induce geometric patterns were used to attain vortex formations in the reagents *Lycopodium*, CO2(g) and SF6(g). Sulfur hexafluoride (SF6) were used to simulate xenon, a dense gas used in modern electronic propulsion devices. Ten-millimeter polypropylene, air-filled mass objects were used to observe acceleration, force, and velocity for a dense gas during oscillation and vortex formation. Observation of non-zero forces within gas formations shows that additional thrust velocity can be achieved through the oscillation of propellant gas via wave drivers embedded within experimental electronic propulsion systems. Force and velocity calculations taken during oscillation of SF6 demonstrate proof of concept for future experimentation using xenon as an oscillation and ionization medium for ejection at velocities which can be used for spaceflight. Results of this experiment introduce a new method for achieving increased velocity during space flight.