Name(s)	Project Number
Kaitlyn A. Wakefield	**S0226**

Project Title

Fire and Ice: A Two-Year Study on the Effectiveness of Ice Bullets Fired upon a Drywall Target

Abstract

Objectives/Goals
The purpose of this project was to determine which set of three sets of ice bullets, all containing different amounts of sawdust, is the most effective at penetrating a drywall target. The ice bullets of the 2006 project contained only water. The water-only ice bullets shattered on impact with the drywall target. This ability to break easily is defined as frangibility. By adding sawdust to the ice, the bullets should be less frangible. This project seeks to support the statement that if ice bullets contain sawdust, then they will penetrate the drywall target deeper and more effectively.

Methods/Materials
Three different sets of ice bullets with different ratios of sawdust were tested. Ice bullets were constructed 4 days in advance using an ice mold with sawdust-water mixtures. Each bullet contained 0.3 grains of gunpowder. The first 20 bullets were composed of 25% sawdust and 75% water (Group A). The second 20 were composed of 40% sawdust and 60% water (Group B). The last 20 bullets were composed of 50% sawdust and 50% water (Group C). The bullets were selected at random to reduce variation in the experiment. The ice bullets were fired from a .357 magnum revolver into a drywall target placed 15 feet from the end of the gun barrel. The drywall created a physical record of bullet impacts that were uniquely identified by number. Penetration depth of each impact was measured. A chronograph measured bullet velocity that was used to calculate kinetic energy. A Hunter Safety Class and Certificate was also acquired.

Results
Group A was the most effective at penetrating the target, possessing a 3.100 mm average depth and average kinetic energy of 204.84 joules. This was 0.875 mm deeper than Group C. Group B possessed an average depth of 2.025 mm with an average kinetic energy of 207.26 joules. Group C penetrated on average 2.225 mm with an average kinetic energy of 180.2 joules. Overall, 44 percent of the bullets penetrated fully 2 mm into the target. Group C had the lowest kinetic energy. Group A bullets were the most effective penetrators in all.

Conclusions/Discussion
Overall, the data refuted the hypothesis. Although the use of sawdust improved projectile performance with respect to results of last year's project, the bullets with lesser amounts of sawdust penetrated deeper into the target. The data shows that bullets with a low sawdust to water ratio resulted in deeper target penetration.

Summary Statement

The purpose of this project was to determine which set of three sets of ice bullets, all containing different amounts of sawdust, is the most effective at penetrating a drywall target.

Help Received

Fired ice bullets under parental supervision; parents were data recorders at firing range