



## ABE: Evaluating LTL Technology

*Until recently, manufacturers' claims regarding their less-than-lethal (LTL) products have not been verified by independent testing. Law enforcement and corrections professionals now have a source of information about LTL munitions and launchers—one that can help with purchasing decisions and operational choices.*

In a joint study titled *Attribute-Based Evaluation (ABE) of Less-Than-Lethal, Extended Range, Impact Munitions*, by Pennsylvania State University's (PSU's) Institute for Emerging Defense Technologies and the Los Angeles Sheriff's Department (LASD), less-than-lethal munitions were tested under simulated field conditions to give police and corrections personnel not only more information than is typically found on manufacturers' data sheets, but also comparative information among manufacturers.

The study involved a coalition of law enforcement, academia, and manufacturers of LTL projectiles, who donated more than \$20,000 in time and ammunition. Not all LTL projectiles were considered for the test, however. Those that were had to meet certain criteria: They had to be capable of being launched; they had to be effective beyond the muzzle (also known as extended range munitions); they had to be designed as a less-than-lethal munition; and they had to rely on impact for effectiveness.

To replicate field conditions, researchers fired from two ranges: 21 feet and 75 feet. The 21-foot range is generally considered to be the distance at which an adversary armed with a knife or blunt object can close before an officer can defensively respond. The longer range of 75 feet is based on a nationwide study that showed that officers on the street typically fire LTL munitions accurately from about 75 feet. However, the minimum "far range" desired for the effective deployment of LTL munitions is 180 feet or more, which is considered the distance a person can throw an object large enough and hard enough to cause injury. This distance is based on a December 2000 LASD test in which male cadets hurled items commonly used in riots—bricks, rocks, baseballs, and water bottles. Less than 3 percent could throw objects weighing 1.2 pounds farther than 180 feet, with

a mean range of 99 feet. However, some small objects such as golf balls, spark plugs, and lead wheel weights were hurled further than the 60 yards. Because some launchable, extended-range-impact munitions are not capable of reliably hitting a man-sized target at these distances, the 75-foot benchmark was selected until LTL munitions technology advances to provide the desired tactical advantage.

For the ABE study, members of LASD's Special Enforcement Bureau fired projectiles using the launcher specified by each manufacturer. A ballistic pendulum and high-speed camera measured the impact momentum of each projectile. Testing took place at the Scientific Applications Research Association's (SARA) Laboratory in Huntington Beach, California.

The study noted a variety of attributes for each type of munition: method of engagement, cartridge size, material, weight, and the launcher required. Of more importance, though, was the study's assessment of accuracy and impact.

- **Accuracy.** The accuracy of less-than-lethals is not defined by the same parameter as live ammunition—that point-of-aim and point-of-impact are the same. For less-than-lethals, accuracy is generally viewed as a percentile score that the shooter will hit a man-sized target at a given range. Where the projectile hits is not a defining consideration; any hit meets the standard.

To ensure a realistic test, the testers measured the amount of dispersion the rounds had when fired from 21 and 75 feet at a 6-inch bulls-eye paper target centered on the impact plate. Five shots were fired at each range. Accuracy was determined by measuring the smallest circle enclosing all five shots.

- **Imparted momentum.** Imparted momentum defines a projectile's impact. The PSU/LASD study showed that LTL munitions vary widely in impact. According to researchers, "We observed large variations in

imparted momentum for a single type of munition. For example, within the five rounds fired of a single type of munition, the highest imparted momentum could be almost three times that of the lowest imparted momentum.”

Another important attribute noted by the study was cost. Prices vary considerably, the study says, from \$1.60 to \$25 per round. The authors said they felt this was a key consideration in purchasing decisions, since at least four rounds are fired in training for every round fired on the street.

The study does not provide all the answers, but it offers a database into which law enforcement and corrections personnel can enter their requirements and ascertain their own answers. The study’s authors stress that no one type of projectile is appropriate for every circumstance. Some use impact for effectiveness, others use a chemical, such as OC (oleoresin capsicum). What a department buys depends on its operational needs.

The authors also caution that the study is only a snapshot of what was available at the time. In the short time since testing was completed and the report published, new products have become available. They hope future studies will add new munitions to the database

and address how impact projectiles affect the human body, an attribute that was outside the scope of the ABE report.

Providing objective performance information for law enforcement was not the only goal of the study. The authors hope it will result in making consumers more knowledgeable and provide realistic guidelines for LTL developers.

***For more information about the Attribute-Based Evaluation (ABE) of Less-Than-Lethal, Extended Range, Impact Munitions, contact John Kenny, Ph.D., at Pennsylvania State University’s Applied Research Laboratory, 814-863-9401. The Attribute-Based Evaluation can be downloaded from [www.arl.psu.edu/areas/defensetech/defensetech.html](http://www.arl.psu.edu/areas/defensetech/defensetech.html).***

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