Catching Bullets is Easier Than You Think

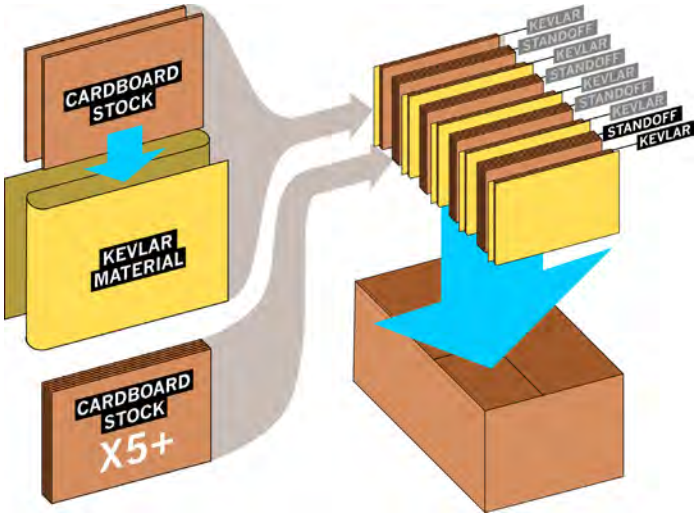
BY GEOFFREY T. DESMOULIN, GTD SCIENTIFIC INC.

In a recent case, two men discharged their firearm towards a vehicle, injuring a woman in the process. In the confusion and adrenaline of the moment, the victim was unable to identify the direction from which the injurious bullet came. What was known, however, was that one individual fired through the front windshield, while the other individual fired through the rear windshield. Although both windshields are made of glass, the two differ significantly in their property (tempered versus laminated). The influence of the material on the bullet is thought to be significant with respect to the resulting human injury, but how does an expert go about showing this difference and identifying which bullet was responsible for the injury?

The first step would be to shoot through each material and make sure that when the bullet comes to a stop, the only damage it has sustained is due to the glass material it perforated. Except, when bullets are stopped by an object, they typically incur large amounts of deformation. This is why it is necessary to slow the flight of the bullet gradually as to not induce high forces on the projectile and deform it further. In the past, multiple methods have been used to recover bullets during testing including vertical water tanks[1], pipes filled with cotton[2] and wadded balls of Kevlar[3]. Alternatively, people sometimes use high-speed video cameras to visualize the bullet as it exits the medium[4]. However, all of these methods have limitations due to expense, practicality, reliability or, in the case of high-speed video, it does not yield a sample which can be physically inspected. GTD Scientific Inc., in collaboration with Michael HAAG, have developed a cheap, easy-to-assemble and reliable bullet recovery device that's made up of cardboard and Kevlar sheets.

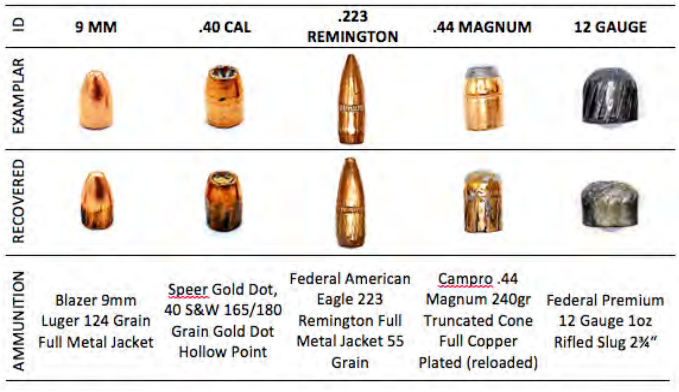
A key component is the Kevlar fabric – the principal means through which the bullet is decelerated. In the case of this simple design, a malleable and fibrous Kevlar was obtained through a major online retailer along with cardboard stock sheets. The cardboard stock was used as means to spread out the Kevlar along the path of the bullet and extend the distance over which the deceleration occurred. To do so, the stack of Kevlar and cardboard was placed within a cardboard box for repeatable construction but also for convenient transport and usage. This simple design is illustrated in Figure 1.

Figure 1: Kevlar/Cardboard construction



As long as bullets are fired along the long axis of the device, perforating as many layers of Kevlar as possible, many common copper jacketed bullets are able to be captured with low amounts of additional deformation (Figure 2).

Figure 2: Influence of capture on the geometry of bullets



ID	9 MM	.40 CAL	.223 REMINGTON	.44 MAGNUM	12 GAUGE
EXAMPLAR					
RECOVERED					
AMMUNITION	Blazer 9mm Luger 124 Grain Full Metal Jacket	Speer Gold Dot, 40 S&W 165/180 Grain Gold Dot Hollow Point	Federal American Eagle 223 Remington Full Metal Jacket 55 Grain	Campro .44 Magnum 240gr Truncated Cone Full Copper Plated (reloaded)	Federal Premium 12 Gauge 1oz Rifled Slug 2¾"

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[1]Werner, D., Rhumorbarbe, D., Kronseder, P., & Gallusser, A. (2018). Comparison of three bullet recovery systems. Forensic science international, 290, 251-257.

[2]McCombs, Nancy, (2007) "The Cotton Pipe Recovery System." AFTE Journal 39, no. 4.

[3]Haag, Lucien. "An Inexpensive Portable Bullet Recovery Device." AFTE Journal 23, no. 1 (1991).

[4]Fuller, P. W. (2005). Some highlights in the history of high-speed photography and photonics as applied to ballistics. In High-Pressure Shock Compression of Solids VIII (pp. 251-298). Springer, Berlin, Heidelberg.

SAVE THE DATES!

The BCPA looks forward to seeing you in 2023! Save these dates in next year's calendar.

- Friday, March 3: Annual Networking Event
- Friday, May 12: Fraser Valley Networking Event
- Friday, June 2: Okanagan/Interior Networking Event

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As evidenced in Figure 2, not all bullets can be easily recovered after being fired. In fact, considerable care and effort would be necessary to capture a purely lead-based projectile. As seen with the shotgun slug and the .44 magnum, the lead material sustained significant deformation. However, copper jacketed bullets such as the 9 mm can be reliably captured assuming the device has enough layers of Kevlar to slow the bullet down gradually.

Therefore, to answer the original question, how would an expert identify the shooter in such a situation? The answer is multifaceted but a key component of this answer would be the results of test firing through the two mediums of interest (laminated and tempered glass) with a recovery box ready to receive the bullet and capture it. The recovered bullets' shape and trace evidence would detail the state of the projectile prior to making contact with the human and could therefore be used to formulate opinions about which most likely caused the documented injuries. For example, here is how different the bullets could look.

Figure 3: Examples of bullets recovered through different glass mediums

REAR WINDSHIELD (TEMPERED GLASS) | **FRONT WINDSHIELD (LAMINATED GLASS)**

Of course, these rudimentary devices can be used to examine bullets in a variety of other investigations. Perhaps the influence of a ricochet on a certain surface needs to be examined, or perhaps understand if a bullet travelling through a combination of two materials would still have been able to cause a specific injury. Whatever the reason, being able to reproduce the evidence presented by a projectile enables an expert to provide much more context to a firearm discharge. All they have to do, is catch it.

Geoffrey T. Desmoulin, PhD., RKin., EngL., Principal of GTD Scientific Inc., holds two degrees in both Engineering Sciences and Kinesiology, allowing him to predict human injury in any environment. He was previously an Emergency Medical Technician, firefighter and military reservist. Since 2009, GTD Scientific Inc. has garnered Federal and Supreme Court qualifications and an extensive international client list within the legal and law enforcement communities. gtdesmoulin@gtdscientific.com