The Stopping Power Myth

by Bruce L. Jones*

I am about to commit ballistic heresy. I suppose this admission shouldn't be taken lightly, but feeling my steadily advancing years I am too old to begin being a hypocrite at this stage of the game. I should mention that some people I know consider me sane the majority of the time, but the jury is still out.

I have been reading material written by very earnest people (grandaddy was named Earnest) for at least thirty years arguing the relative merits of one size pistol cartridge over another. The argument seems to center around whether or not someone's favorite caliber will put an end to the violent and sometimes maniacal attack of one of society's more disenchanting creatures.

The theory de jure in today's glossier periodicals was developed by a very sincere man named Evan Marshall who possibly has a pathological need to help old ladies cross the street. I am not sure where he acquired this pathogen but keep a firm grip on granny. Because of this tendency, I feel certain that Mr. Marshall is one sterling fellow. I have met him and spoken with him at some length and would probably feel proud to call him a friend. He’s a solid guy. Also, to his credit, he comes very close to disavowing any belief in his own theory, stating in his first book (which he would be happy to sell you) that the most important component of stopping power is shot placement; but we'll get to that later.

In his second book, Mr. Marshall - I am told - elaborates on the first book to a large degree. I have yet to read it. I read the first through an inter-library loan. The charge for an ILL then was only a quarter. In their constant search to provide better service, my library has since hiked the price for an ILL to five bucks. When my curiosity to read book two of the same stuff contained in book one reaches a five-buck threshold, I'll get it on ILL, too. Until then I am blissfully content to remain ignorant of the majority of its contents.

Later on, we will get to a phenomenon of ballistics that no one else considers; else referring to me. If you are a bright and inquisitive kind of person, you will then want to find ways to run out and test the information for yourself. For those somewhat less inquisitive, I'll give you a method to use that you can do "for free". We will also include some science of the absurd.

Sabers drawn, we enter the fray. There are two problems I have with Marshall's basics.

1. His theory.
2. His data.

Having said that, let us elaborate.

Mr. Marshall arbitrarily chose to include data in his findings from incidents wherein there was only a single fired round solidly striking the torso. What? How's that? Gee, this - of course - leaves out all other data. The problem here is that this excludes the majority of the available information. The kind of data missed in this method is - e.g. - the first shot fired, the second and subsequent shots fired, if any; and the reasons for multiple shots being fired. I am not sure if there are more tidbits being left out, but it seemed to me the first two considerations should be: "how many shots were fired" and "why were they fired". The total effect of all of this missing data is not fully appreciated.

Now, it may be considered academic to exclude first shot misses (I don't think so) but multiple pops should definitely be counted because the first shot failed to accomplish the goal, as we will demonstrate. This omission tends to make some products look better than they actually are. In some circles this could be said to be deliberately misleading. Everyone who wishes to be misled about the efficiency of their last resort personal life saving device, raise your hand. What, none? I didn't think so.

To take a close look at what I am talking about, lets look at some make-believe data and some easy to crunch numbers. Lets say that data collected for the .32 caliber had shown, under Marshall's method, 200 incidents where someone was solidly hit in the torso. Of those, 100 of the people were hit only once. These were counted, the remainder excluded (left 100 running amuck, I suppose). Thus, 100 single hits of 200 opportunities occurred and in 50 of those single shots the bad guy surrendered. This equates to a 50 percent probability of a one-shot stop. "Probability" is a word I am not crazy about were my life to be at stake, but we'll get to that later, too.

Well, let's say that the 100 incidents were excluded from the data above because they were multiple hits to the torso. Let's say, further, that of those, 75 of the follow-up shots were fired because the first one didn't faze the attacker (the other twenty-five were just double-tap advocates). I call this a "failure to stop". This data should be included. Why, you might ask (if you don't ask the story kinda stops here)?

Well, if this data is included with the rest then the actual stops are really 50 out of 175, not 50 of 100. This lowers the "probability" a considerable degree; to less than 29 percent. By following his method, Mr. Marshall inadvertently made poor performance appear much better. If one did not know better, one might wonder if Mr. Marshall owned stock in Seecamp. If he ever reads this, I hope he knows I'm just kidding.

Of course, the better a cartridge performed, the less these particular phenomena affected their respective data. But, the data are still skewed. The best calibers still come out on top as the best performers, but where is the "real data" in the noise? The problem with this last statement is: it is true. The effect, however, is that it still leaves in question just where this phantom line of separation lies between the poor performers who have been accidentally made to look good and the truly good performers that would actually enhance the probability of a stop.

For a minute, let's stop and consider the term "probability of a stop" as used in Marshall's context. Few people understand "probability" in its actual sense. A reasonable person would look at the above data and, if he carried a .32, would say, "Well, if the stop probability is 50%, I'll just shoot him twice and it will be 100%." Wrong. That's "real world math" not "math-math". With the rules for probabilities (math-math) you can never get to 100 percent. Huh? What was that? Lemme splain.

If the .32 shows a 50 percent probability of a one-shot stop (sure it does), then the first shot should stop half of the bad guys, half of the time. The second shot should stop half of the rest of those that didn't fall the first time; this makes only 75 percent! The third shot should stop 50 percent of whoever's still standing hefting the total up to grand 87.5 percent. And so-on and so-on. Using this method, we need about four rounds from the .32 right off the top to approach what Marshall states is the probability for a single round from a .357 magnum. Thus, reality is much more dismal that the bare numbers make it seem. This becomes immediately worse if one starts with the more abysmal 29 percent rating developed from the multiple hit data.

Now for some fun …

All of this notwithstanding I have another major problem when considering the data from Marshall's book. Put in the simplest terms, the data base has no way of correlating the extent - or even if - the skill of the individual shooter plays in the equation. Considering that shot placement is the single most important factor in accomplishing a ballistically inspired stop, the relative skill of the shooters must be considered if one uses actual "street" data. If you do not, it would tend to invalidate all of the data. I'll show how.

An example of what I am talking about can be demonstrated with some more fictional data.

Lets suppose that we create two teams of shooters that will be exposed to the need for expressing lethal force with a handgun.

The first team, let's call them Team 1, is comprised of 5 ft. tall, 100 lb., 80 year old great-grandpa's with no firearms training other than basic instruction in how to fire the weapon. We assume that they can see well enough to acquire the rear sight and have enough physical strength to eventually pull the trigger with one or more fingers. We are not entirely sure; they have never fired the weapon. They are armed with the new H&K Mk. 23 Mod. 0 .45ACP SOCOM semi-automatic pistols loaded with hardball ammo and carried in their bathrobe pockets. They carry Bugs Bunny flashlights that their great-grand-kids left during their last visit. To turn them on (no, the flashlights!), you have to push the switch forward and bang the side of the lens bezel simultaneously.

The second team, let's call them Team 2, is made up of tall, well muscled, young female clones of Gina Davis' character in "The Long Kiss Goodnight". You know, your basic spy/ paramilitary

types with 20-20 vision, each of whom can bench-press a Buick and are completely impervious to pain. They are all highly practiced and trained; experienced veteran combat shooters. They are armed with .22LR S&W Model 63 revolvers with the standard 4 -inch barrels and Aim Point Red Dots. These are loaded with Stinger hollowpoints and carried in tactical holsters strapped over skin-tight stretch-pants. They shun upper-body tactical armor with hard panel inserts in favor of Versace t-shirts and helmets with night and thermal sights built-in.

Now we send both teams onto the street in any of America's more blighted urban centers on a typical weekend with instructions to secure their respective areas. Naturally, they both have an unlimited supply of ammunition and batteries.

Team 1 is involved in 40 incidents. They were able to actually discharge their weapons in 27 of them. A remarkable 22 actually hit their targets. Of these, 20 were torso hits; primarily love-handle perforations. They experienced a total of 5 one-shot stops, all fired in their team's classic stance; eyes closed with the weak side index finger in the weak-side ear and the index and middle finger of the strong hand on the trigger. Range averaged about 40 yards. A total of 27 rounds of ammunition were expended.

Team 2, on the other hand, also had 40 incidents - in the first hour. Each was a one- shot stop to the brain-case of the perpetrators. In each instance the range was approximately 2 yards and firing was from the isosceles stance. Having frightened off all other inhabitants in their area they spent the remainder of the weekend target practicing on urban self-propelled high-mobility targets (rats, dogs and cats). Team 2 expended a total of 3000 rounds of ammunition.

By the above example we can see that what everyone already knows is proven beyond a doubt. The lowly .45 ACP is only a 25 percent one-shot stopper and the amazingly effective .22 LR is a 100 percent one-shot stopper!

Now, I don't know about you, but if Team 2 does that good with .22 caliber revolvers, then I'm gonna run right out and buy a Ruger auto pistol with a politically correct 10 round capacity so that I can be perfectly protected against at least 10 bad-guys, right? And the H&K, forget that. Who would want such an abysmal performer?

The examples provided by the experiences of teams one and two serve to illustrate the importance of the skill, training and physical capabilities of the shooter in the stopping power debate. These are perhaps the most important factors of all.

At this point I ask myself, "Is there anything left out". Well, some other fine folks like to ponder the effects of mass versus energy. I think the eventual outcome is probably similar to the stopping power index Marshall developed. I do know that one factor is observed and seldom measured. For lack of a better term, I like to think of it as a "radial pressure wave". This radial pressure wave is a very real phenomenon that is characterized by a "wave" or cyclic series of pressure that is radially dispersed from the point of ballistic impact, perpendicular to the path of projectile

trajectory. I first thought of it hunting feral hogs.

I happened upon a particularly corpulent porker one day and placed a solid hit with a large magnum caliber projectile just behind his front shoulder. I also noticed that, almost immediately, a cloud of dust flew off his back, as if he had given a mighty shudder. I don't think he shuddered though as he just looked at me through his one-side eye as if to say, "Huh?". He was unimpressed. He turned to look at me, then fell over dead. I wondered about the dust cloud though, and sort of mentally filed it away. Some years later, it would resurface in an unexpected way.

Fast forward to the Viet Nam war. Near the end of the war (having served my time) I was working - at the time - in an Army Depot helping to assess battle damage of equipment that returned from the zone. There I stood one fine afternoon surveying the side of a shelter (for non-military types this is a camper-like box used in military trucks to house all manner of portable facilities). There was a large impact hole through-and-through the side. I was observing the entry side. The hole was probably the result of a dud artillery shell that passed through without exploding. It was large enough to stick my hand through, probably made by about a 75mm. What caught my attention was the damage caused by the impact. There was, for sure, the hole. But what was different was that the entire aluminum skin was rippled and many of the rivets that held it to the frame around the edges were popped loose. I immediately thought the damage caused by some time of ripple effect radiating from the center of impact.

When the skin was finally peeled back from the side of the shelter, some of the interior ribs also had partial ripples and buckles radiating outward from the center of impact. The damage was much more than what would have been expected from just the material being displaced from the path of the projectile. I began to ponder other examples I had seen of this and I remembered my hog years before. Now I see the effects of this pressure wave in almost every ballistic impact I examine (some materials are so resilient it isn't observed). It is also three-dimensional. It travels forward along with the projectile. It is coincident with the sound wave, but is more. The addendum is that pressure is increased proportionately to the velocity and mass of the projectile. The frequency of the pressure wave also fluctuates with changes in velocity and mass. The frequency of the pressure wave is also altered by the specific gravity of the object being struck. Materials of differing densities resonate at differing frequencies in response to the pressure effect.

All of the ballistic test media used by modern researchers shows the effects of this pressure. Water, wet newsprint, phone books, sacks of flour, melons and the standby ballistic gelatin all reveal it. The observable after-effect is now called the "crush cavity", either temporary or permanent. The crush-cavity is only the after effect. Radial Pressure Wave is the cause. It doesn't take a rocket scientist to figure it out. If one looks at the crush cavity in ballistic gelatin what you are observing is the physical evidence left behind by the pressure wave traveling through the material.

If you want to ponder the effect and waste a little time here's what you do:

Gather up two sacks of pebbles. One sack should contain pebbles of approximately a quarter inch in diameter. The other sack should contain pebbles of about three-quarters of an inch in diameter. Don't be too picky, size doesn't matter all that much. Retire to your favorite swimming hole with appropriate refreshments and make yourself comfortable. Drop one small pebble into the test media (the water) and observe the ripples that evenly radiate outward from the center of impact of your projectile (the pebble). This is the pressure wave.

Now repeat this procedure with one large pebble. Notice that the resultant wave has a different appearance, or "signature" than the waves created by the first pebble. Repeat this procedure, alternating between large and small pebbles. Observe that with the different size pebbles the height and distance between the little waves that they cause is different with each, yet consistent among like-size pebbles. This is the observable frequency of the pressure wave.

Now vary the experiment. Launch more pebbles downward, still alternating size, but increase the introductory velocity by increasing the launch momentum (throw them harder). As you do so, you will notice that the frequency signature of the pressure waves change in a dramatic and noticeable manner. They become higher and closer together. The pressure waves also move through the test media with a noticeably greater velocity between frequency spikes.

If you have chosen your refreshments carefully, after a while you will be able to accurately predict the effect of the introduced projectiles on the test media and the frequency of the pressure wave that will result by varying the size of the projectile and the launch velocity.

Now, most people would be satisfied at this point. But, if you want to pretend to be a scientist you can conjure up ways to test this phenomenon even further. First, begin by varying the specific gravity of the test media. Gradually increase the density. When the media becomes dense enough to stand without support, stand it on it's side and place pressure sensors all around it and feed the data they obtain into a computer. The main problem with this is that the media will eventually become too dense for you to penetrate by just throwing the pebbles by hand. You may want to devise some kind of pyrotechnic-like method for launching the pebbles so that they will penetrate the test media. In fact, you may eventually want to switch from pebbles to something else, perhaps small, metallic, pellet-like objects.

What might be gained from this? Well, if enough experimenting is done, you may eventually discover that an optimal destructive pressure wave exists for any given test media that induces some kind of sympathetic resonance with only a certain mass and velocity of projectile. Or not. I might conduct the research myself someday if I can find a benefactor to fund it. Imagine, I could discover the perfect mass and velocity of projectile that would create a pressure wave that would be 100% effective in stopping an attacker. Or, I could find a handgun I can shoot well and practice, practice, practice.

*About the author:

Bruce L. Jones recently retired (in 2000) after thirty-one years in the weapons business within the U.S. Department of Defense. His last posting was as the United States Marine Corps'Program Manager, Artillery and Infantry Weapons, Pacific Theater. He is widely recognized as one of the world's foremost authorities on weapons and their application in both civil and military environments.