Terminal Performance of MPB Quik-Shok, CCI Stinger and Remington Viper .22 Long Rifle Ammunition when fired from a Beretta Model 21A Handgun into Standard Ordnance Gelatin

Introduction

We recently tested three different .22 Long Rifle cartridges, using calibrated 10-percent ordnance gelatin as a soft tissue simulant, to determine their adequacy for use as personal defense ammunition in a small "mousegun" -type automatic pistol.

Method

Quik-Shok and Stinger were chosen because of their popularity as personal defense cartridges. Whereas Viper was chosen because its truncated cone bullet appeared well suited for personal defense use.

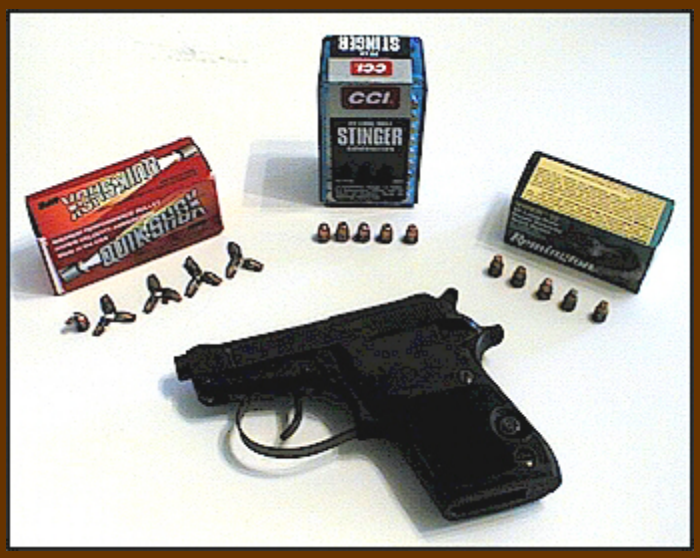

Figure 1. Recovered bullets which represent observed terminal performance. Clockwise from top: CCI Stinger hollowpoint (all bullets failed to expand), Remington Viper truncated cone, Beretta M21A test gun and MPB Quik-Shok prefragmented-hollowpoint (one bullet failed to fragment).

The bullets were fired into gelatin blocks measuring 6x6x16-inches in size. Prior to firing the test shots, each gelatin block was calibrated by firing a steel BB from a Crossman 2100 Classic .177 caliber pellet/BB repeater pneumatic pump air rifle. The velocity of the BB (and bullets) was measured using an Oehler model 35P Proof Chronograph, whose skyscreen sensors were positioned directly in front of the gelatin block test stand. The air rifle was unable to propel the calibration BBs at the specified velocity of 590 fps. Because our calibration BBs were propelled at non-standard velocity, the penetration depths were corrected using the method developed by MacPherson.[1]

Due to the shallow penetration performance demonstrated by the MPB Quik-Shok ammunition, the same block of gelatin was used to also test CCI Stinger. Six rounds of Quik-Shok were fired into one end of the gelatin block, and six rounds of Stinger were fired into the other. Each end of the block was calibrated immediately prior to testing. The data obtained from these tests are recorded in Tables 1 and 3, respectively (below).

Unfortunately a data collection error made it impossible to identify which bullet was associated with each test shot. The problem was caused by a failure to record the impact locations on the gelatin block, which could be used at a later time to positively identify what bullet was associated with a particular test shot. Because there were multiple rounds fired into the block, and because the block was returned to the refrigerator after the test, it was impossible to determine which bullet was related to "shot 1," "shot 2,"

"shot 3," etc. This mistake resulted in a loss of data. Therefore, the penetration measurements published in Tables 1 and 3 are listed as "Bullet A," "Bullet B," "Bullet C," etc.

Additionally, lighting conditions produced intermittent velocity measurement errors (the chronograph didn't sense the passing bullet and no measurement was made). Most anyone who uses a chronograph that uses skyscreen sensors is familiar with the occasional glitches that occur due to lighting conditions. These velocity measurement errors are identified in the Velocity column of Tables 1 through 4.

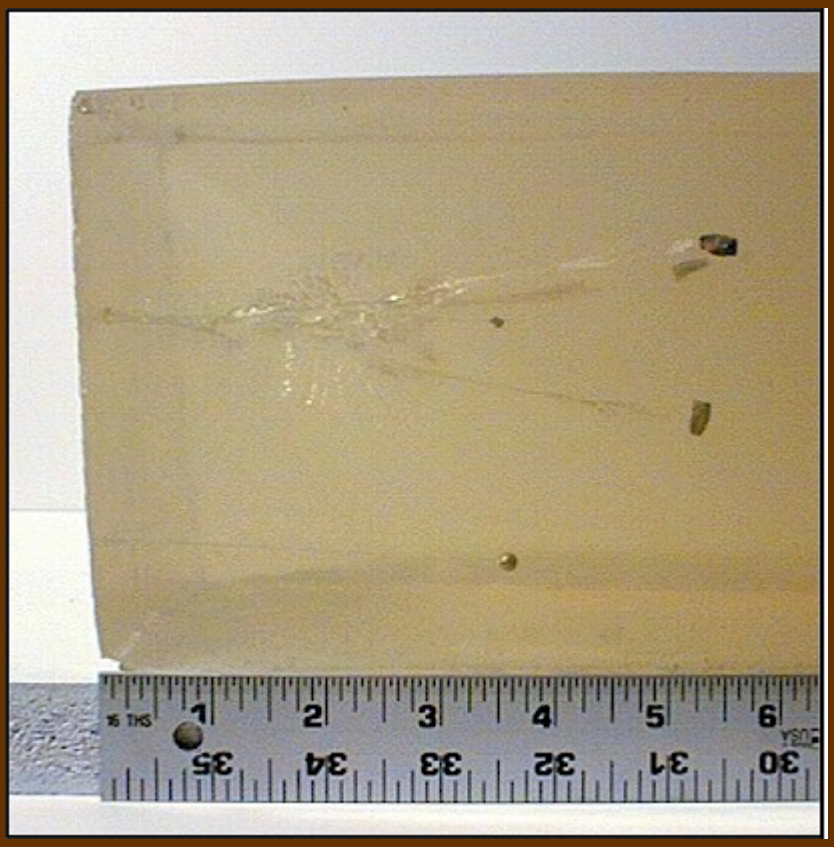

Figure 2. Typical performance of Quik-Shok bullet. In most cases the bullet fragmented, and the three fragments penetrated symmetrically. Penetration depths of the fragments shown in this photograph are as follows: top and middle fragments penetrated 5 7/8", and bottom fragment penetrated 5 3/4". (Parallax between the measurement scale and fragments is producing the optical illusion of a measurement error.) The tiny fragment located about 2-inches above calibration BB is the center "hub" that holds all the fragments together. The performance data listed in Table 2 was obtained from this test shot. Quik-Shok would be a good choice for hunting or pest control to shoot treed rodents and small varmints where limited bullet penetration is desired. This bullet is a poor choice for personal defense.

Discussion

Of the seven Quik-Shot bullets fired into gelatin, one failed to fragment. The fragmentation failure may have been caused by an unusually low velocity, but due to chronograph and data recording errors, the available data doesn't support failure analysis.

In most cases, the Quik-Shok bullet penetrated approximately 1-inch before it fragmented. After fragmentation, the individual segments continued penetrating in a symmetrical pattern. All three pieces penetrated to approximately the same depth.

When the fragments were recovered from the gelatin, they were weighed using an RCBS 10-10 powder scale. Two of the three bullet fragments weighed approximately 10 grains each, and the third fragment weighed approximately 11 grains if the center "hub," which holds the fragments together prior to impact and penetration, remained attached. If the "hub" detached, it was found to be within an inch or two from the point where the main fragments diverged.

Penetration performance of the Quik-Shok bullet, combined with the extremely narrow wound tracks produced by the fragments, makes this bullet a poor choice for personal defense use.

CCI Stinger is very popular as a personal defense cartridge, primarily due to its high-velocity hollowpoint bullet. When Stinger is fired from a .25 ACP-sized handgun, the short barrel does not allow the bullet to reach the velocity it needs to expand. The bullet's failure to expand permits it to penetrate more deeply.

Stinger is probably the best choice for a small, 2 1/2-inch barreled automatic handgun. When fired from handguns fitted with longer barrels, the increased barrel length will increase muzzle velocity causing the bullet to expand and under-penetrate. In the future, we intend to test Stinger's performance from a Ruger 22/45 automatic handgun fitted with a 5 1/2-inch barrel.

Viper fires a non-expanding truncated cone bullet. Although it demonstrated marginal penetration performance in our tests, it's probably a very good choice for .22 Long Rifle handguns which have a barrel length greater than 2 1/2-inches. The truncated cone shape, with its flat meplat, crushes a larger diameter permanent cavity than a round nose lead bullet.

The following tables list the test results:

Table 1

Magnum Performance Ballistics .22 LR 32gr Quik-Shok Hyper-Velocity PFB-HP Product # QS22HV, Lot # A21D08			
Gelatin block s/n V1-990528-1, calibration: 8.2cm @ 563 fps (8.8cm corrected[1])			
Test gun: Beretta M21A, 2.4" bbl. Date tested: 6-14-99. Bare Gelatin			
Shot #	**Velocity (fps)**	**Penetration**	**Expansion**
1	1009	See remarks	N/A
2	Error	See remarks	N/A
3	1021	See remarks	N/A
4	993	See remarks	N/A
5	1013	See remarks	N/A
6	Error	See remarks	N/A
Averages	**1009**	**14.9cm (5 ¾")**	**N/A**

Remarks:
Due to a recording error, penetration data cannot be associated to shot number. Penetration measurements are as follows:

- Bullet A: 19.2cm, 14.0cm, 14.7cm (Average: 16.0cm)
- Bullet B: 13.7cm, 13.2cm, 16.8cm (Average: 14.5cm)
- Bullet C: 25.5cm (did not fragment)
- Bullet D: 14.7cm, 14.8cm, 15.6cm (Average: 15.0cm)
- Bullet E: 15.6cm, 13.1cm, 15.2cm (Average: 14.6cm)
- Bullet F: 14.0cm, 13.4cm, 16.5cm (Average: 14.6cm)

Table 2

Magnum Performance Ballistics .22 LR 32gr Quik-Shok Hyper-Velocity PFB-HP Product # QS22HV, Lot # A21D08			
Gelatin block s/n R1-990616-1, calibration: 9.6cm @ 614 fps (9.1cm corrected[1])			
Test gun: Beretta M21A, 2.4" bbl. Date tested: 7-16-99. Bare Gelatin			
Shot #	**Velocity (fps)**	**Penetration**	**Expansion**

1	984	14.8cm (5 ¾")	N/A
Remarks: Fragment penetration depths: 15cm, 14.9cm, 14.5cm (Average 14.8cm)			

Table 3

CCI .22 LR 32gr Stinger HP Product # 0050, Lot # J30D01			
Gelatin block s/n V1-990528-1, calibration: 9.0cm @ 563 fps (9.5cm corrected[1])			
Test gun: Beretta M21A, 2.4" bbl. Date tested: 6-14-99. Bare Gelatin			
Shot #	**Velocity (fps)**	**Penetration**	**Expansion**
1	971	See remarks	None
2	1002	See remarks	None
3	999	See remarks	None
4	972	See remarks	None
5	Error	See remarks	None
6	993	See remarks	None
Averages	**987**	**30.7cm (12")***	**None**
Remarks: Due to a recording error, penetration data cannot be associated to shot number. Penetration measurements are as follows: • Bullet A: 34.0cm • Bullet B: 29.6cm (backwards at rest) • Bullet C: 30.8cm • Bullet D: exited block at 29.7cm • Bullet E: 28.7 (penetrated 25cm and ricocheted off test stand surface under block) • Bullet F: 28.5 (backwards at rest) • *Penetration average excludes shots D and E. It should be noted that the calibration BB penetrated approximately 13-percent deeper than the calibration standard. As a result, the bullets will not penetrate standard gelatin as deeply as listed here.			

Table 4

Remington .22 LR 36gr Viper Hyper Velocity Solid Bullet TC Product # 1922, Lot # E03J1D			
Gelatin block s/n V1-990530-1, calibration: 9.9cm @ 622 fps (9.3cm corrected[1])			
Test gun: Beretta M21A, 2.4" bbl. Date tested: 7-16-99. Bare Gelatin			
Shot #	**Velocity (fps)**	**Penetration**	**Expansion**
1	861	25.9cm (10 1/8")	None
2	865	32.0cm (12 ½")	None
3	880	30.8cm (12")	None

4	901	24.0cm (9 3/8")	None
5	Error	26.6cm (10 3/8")	None
6	Error	23.4cm (9 1/8")	None
7	787	27.5cm (10 ¾')	None
Averages	**859**	**27.2cm (10 5/8")**	**None**
Remarks: • Shot 2 backwards at rest • Shot 4 backwards at rest			

Summary

Stinger demonstrated slightly superior penetration performance than Viper. Stinger's penetration performance is marginal at best, but it's probably the best choice for a small 2 1/2-inch automatic pistol.

Viper is probably a better choice for handguns with barrel lengths between 3- and 6-inches, because if Stinger is used, and it expands, it might not penetrate deeply enough to reach vitals. This is not a concern with Viper. When fired from a longer barrel, the increased velocity will permit Viper to penetrate deeper than Stinger.

Quik-Shok is intriguing, but its use as a personal defense cartridge is not recommended, based on its shallow penetration and mild wound trauma.

Many people have the mistaken belief that a 2 1/2-inch handgun chambered to fire the .22 Long Rifle cartridge is superior to a 2 1/2-inch handgun chambered to fire the .25 ACP cartridge. These tests show that when you fire .22 LR from a .25 ACP sized handgun, you should expect nothing better than .25 ACP-like performance. When fired from small handguns, .22 LR is virtually identical in performance to .25 ACP.

We like to think of small automatics chambered in .22 LR, .25 ACP and .32 ACP as "shoot and scoot" guns. They're best used as a means to escape deadly danger. They're not gunfight guns.

Finally, the Beretta M21A, chambered to fire .22 LR, is not a good choice as a personal defense handgun. The reason is because the Beretta does not have an extractor. When a cartridge misfires, the firing pin swages the rim of the cartridge to the breech, and the faulty cartridge must be either pried from the chamber with the blade of a knife or removed by inserting a cleaning rod down the bore. If you're considering the Beretta M21A pistol as a personal defense weapon, we feel you'd be better served by choosing one that's chambered to fire .25 ACP.

If you're contemplating .22 LR as a personal defense cartridge, we advise you to consider a revolver instead of an automatic pistol. Rimfire ammunition has a higher incidence of misfire failures than centerfire ammunition. With a revolver, when a misfire is encountered, the problem is solved immediately by pressing the trigger again.

Endnotes

1. MacPherson, Duncan: Bullet Penetration, Ballistic Publications, El Segundo, CA, 1994: "Figure 5-2, Velocity Variation Correction to Measured BB Penetration Depth:" p. 84.