

Bouncing

Bullets

In a small midwestern city a uniformed police officer responded to a burglar alarm ringing at a corner liquor store. Two suspects emerged through the front door, and one suspect appeared to have a gun in his right hand. The officer assumed a prone position in the street and shouted, "Police officer, halt!" The suspect immediately fired at the officer. A .38 caliber bullet hit the concrete pavement 6 feet in front of the officer, ricocheted, and entered the officer's skull 2 inches below the bill of his cap. Unfortunate phenomenon? Unfortunate, yes, but not an unbelievable occurrence.

A rubber ball will ricochet off a flat surface at approximately the same angle from which it was thrown or directed.

How does a bullet ricochet?

In a large western city, detectives located an armed and dangerous fugitive in a modern steel and concrete building. One officer dropped to his knee as he brought his sidearm to bear on the subject and ordered him to "Freeze." The officer shot the subject as the latter attempted to draw an automatic. The subject recoiled backward after being hit and involuntarily fired at the floor. The bullet struck the tile-covered concrete floor several feet in front of the officer, ricocheted, struck the officer, and severed a femoral artery, a mortal wound. Again unfortunate; however, it can and does happen.

A rubber ball will ricochet off a flat surface at approximately the same angle from which it was thrown or directed. How does a *bullet* ricochet? Consider the following: Many indoor firing ranges use as a backstop a heavy piece of steel armor plate tilted at approximately a 30-degree to 60-degree angle. Bullets striking the plate ricochet into sand or a bullet trap. Figure 1 depicts a typical target range impact area after several thousand rounds have been fired. Note the accumulation of lead close to the steel wall.

The significance of the foregoing brings to mind certain questions. How

width by 40 inches in height. All .38 Special caliber ammunition used was, unless otherwise noted, standard service type with a 158 grain lead bullet. The .45 Auto caliber ammunition was fired from a Thompson submachinegun.

Ground Ricochet Shooting

In ground ricochet shooting the bottom of the target was at ground level. Tests were conducted with turf, asphalt, and concrete as initial points of impact or aim.

25-Yard Line

Police agencies generally agree the majority of combat shooting situations occur within 25 yards. Initial tests, kneeling and offhand, were conducted at that distance. The point of aim was 7 yards in front of the target.

Figures 2A, 2B, 2C, and 2D show the results of shots fired from the kneeling position at the 25-yard line with the point of aim 7 yards from the target on a concrete surface. The

do bullets of the type commonly used in police work deflect from different surfaces, and how many such deflections affect the police officer?

To resolve these questions, FBI firearms instructors conducted tests at the FBI ranges in Quantico, Va. The results of these tests are set forth in the following pages. In all instances the target used was the Army "E" bobber type measuring 20 inches in

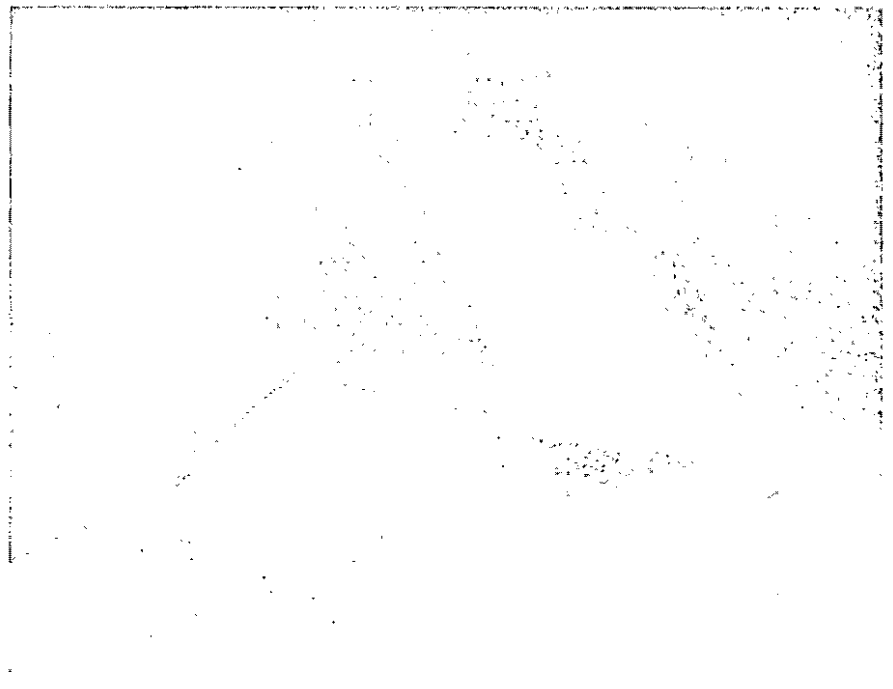


Figure 1.

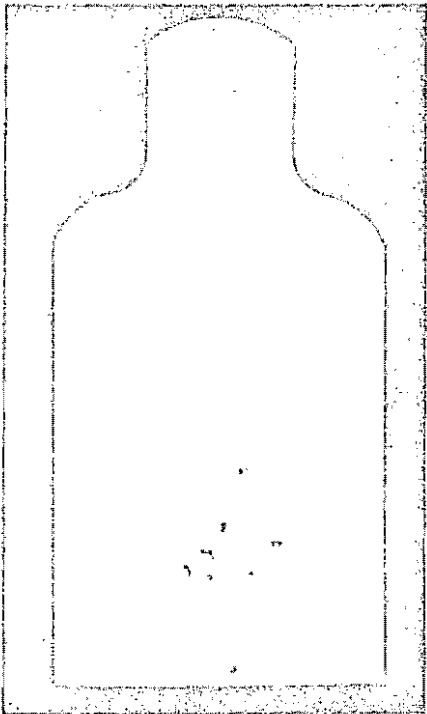


Figure 2A,
.38 Special.

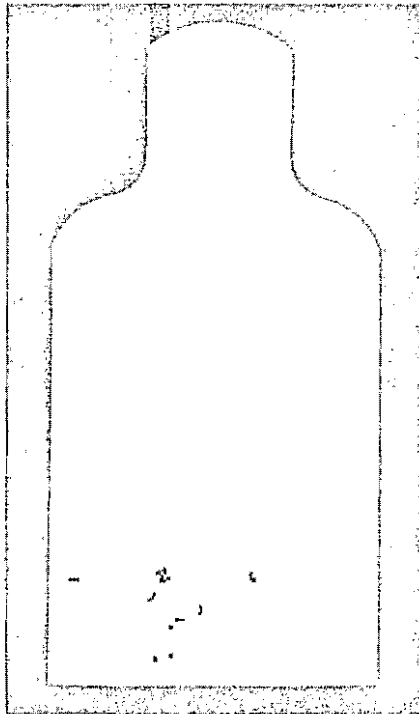


Figure 2B,
.357 Magnum.

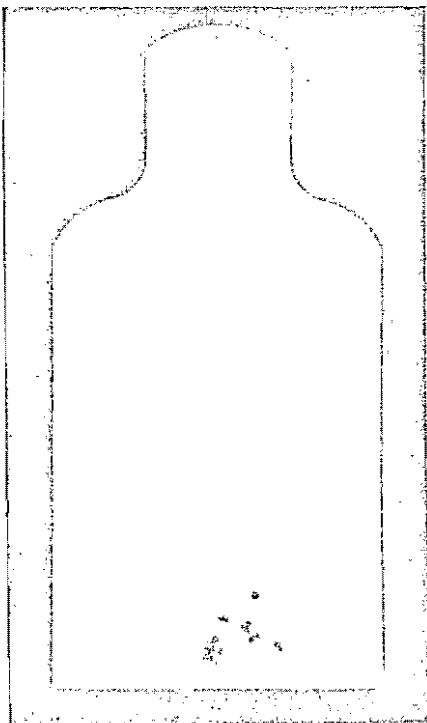


Figure 2C,
.45 Auto.

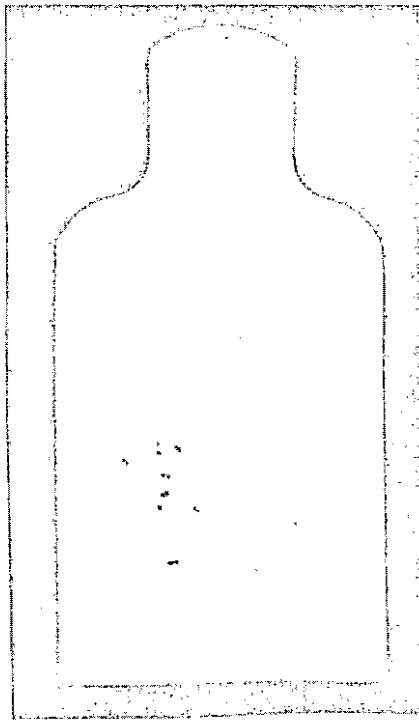


Figure 2D,
9 mm. Luger.

photos, in sequence, show the target results of .38 Special, .357 Magnum, .45 Auto, and 9 mm. Luger caliber ammunition. Ten shots were fired at each target.

Figures 3A, 3B, and 3C show target hits when the point of aim was the 7-yard line. Ten shots were fired at each target with .45 Auto caliber ammunition. The effect of ricocheting off the three surfaces—concrete, asphalt, and turf—seems to indicate that the harder the surface the less the deflection. High velocity and hollow-point bullets fired from handguns at this distance did not differ significantly as far as grouping on the target was concerned.

Figures 4A, 4B, and 4C show the results of five rounds of 00 Buckshot fired from the 25-yard line with the point of aim at the 7-yard line. The shots were fired at concrete, asphalt, and turf.

50-Yard Line

At the 50-yard line shots were fired from the kneeling and offhand positions. The points of aim from the 50-yard line were 12½ and 25 yards in front of the target. The results were erratic and are considered to be of little value.

Figures 5A, 5B, and 5C show the results of five rounds of 00 Buckshot fired from the 50-yard line with the point of aim 12½ yards in front of the target. The surfaces were concrete, asphalt, and turf.

Figures 6A and 6B depict 10 shots of the rifled slug fired from the 50-yard line. The point of aim was 25 yards in front of the target. These shots were fired off concrete and asphalt. While those fired off turf did not strike the target, observation of the impact area behind the target indicated all the shots went a few feet high and might have hit the head or chest of a man standing.

Figures 7A, 7B, and 7C record shots of the rifled slug fired from 10

.45 AUTO

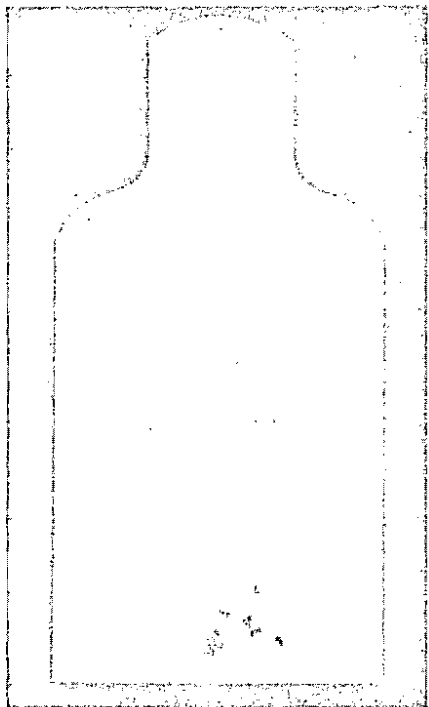


Figure 3A, Concrete.

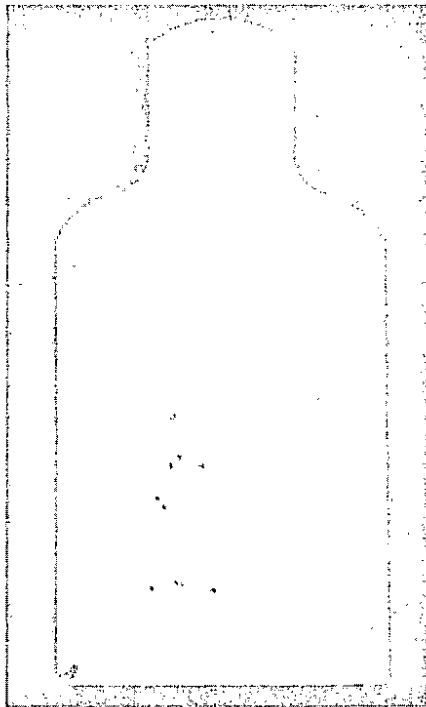


Figure 3B, Asphalt.

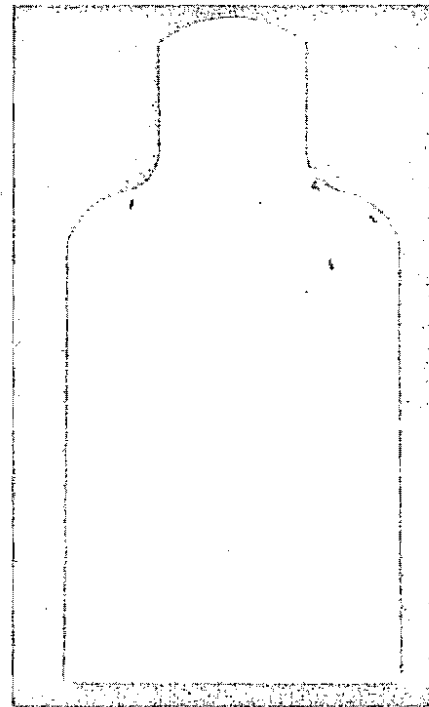


Figure 3C, Turf.

OO BUCKSHOT

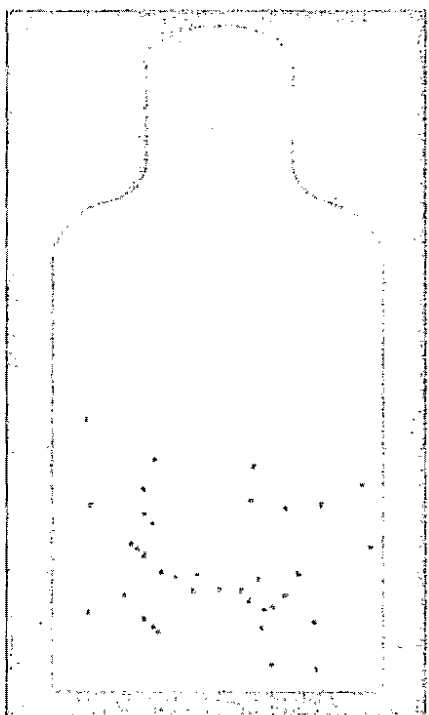


Figure 4A, Concrete.

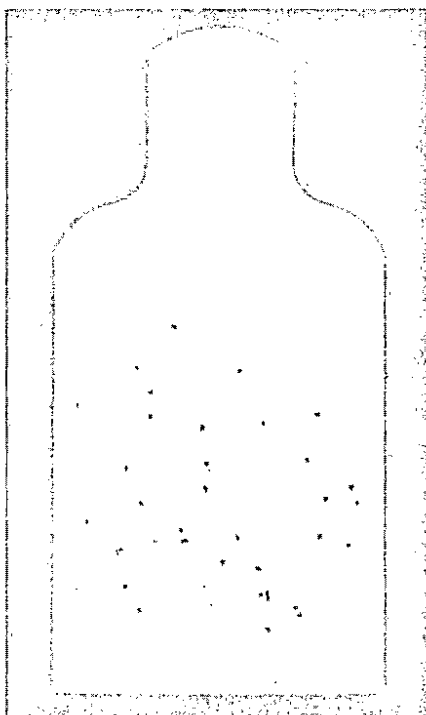


Figure 4B, Asphalt.

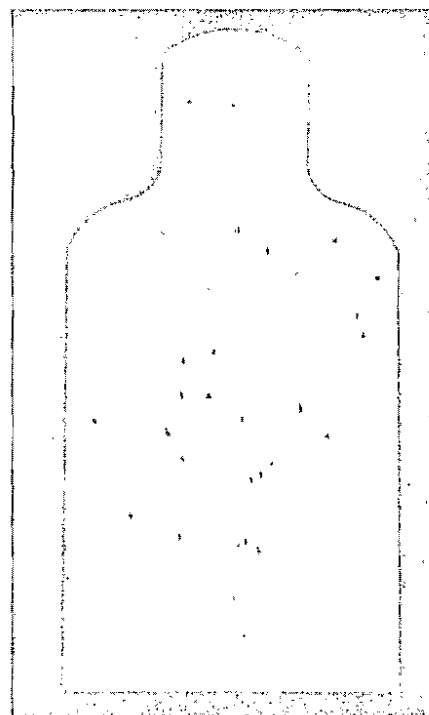


Figure 4C, Turf.

OO BUCKSHOT

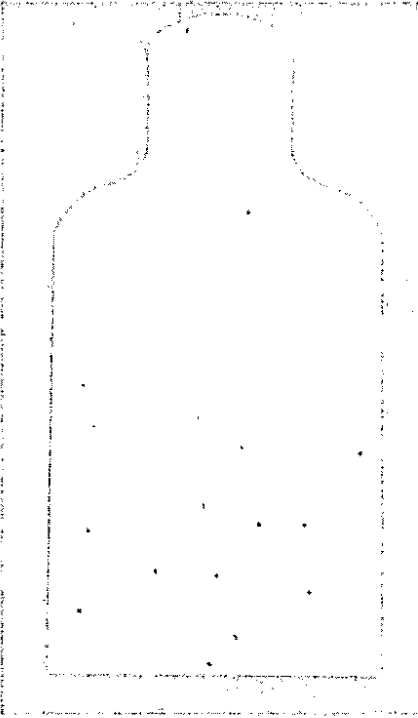


Figure 5A, Concrete.

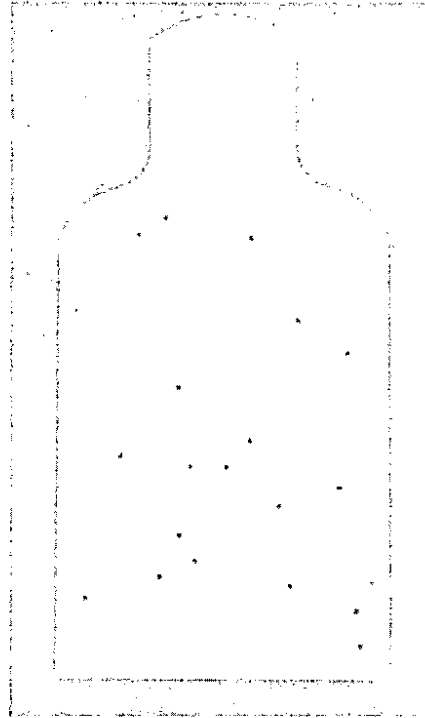


Figure 5B, Asphalt.

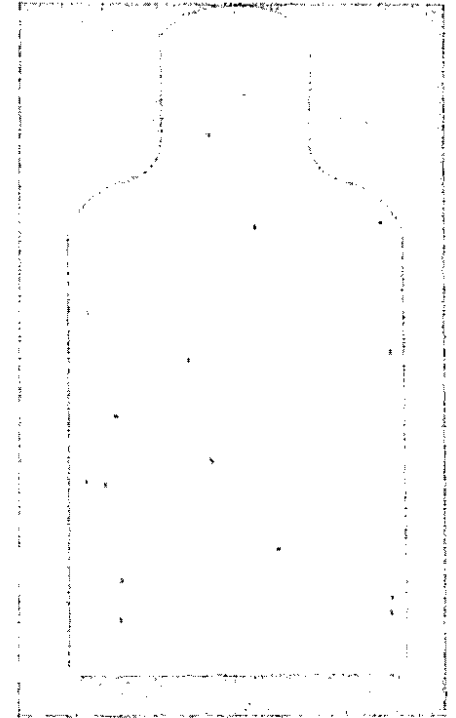


Figure 5C, Turf.

RIFLED SLUG

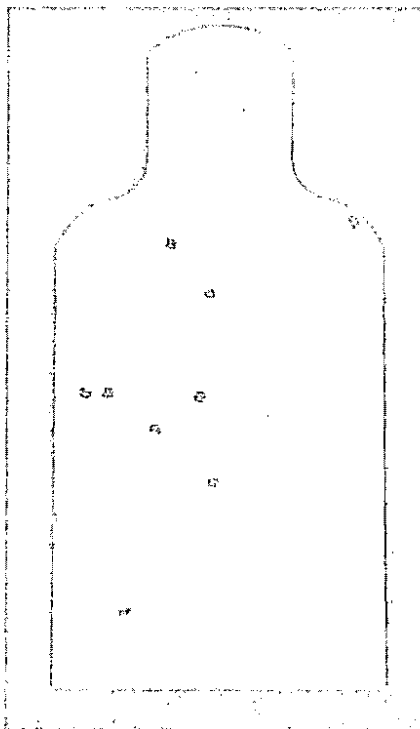


Figure 6A, Concrete.

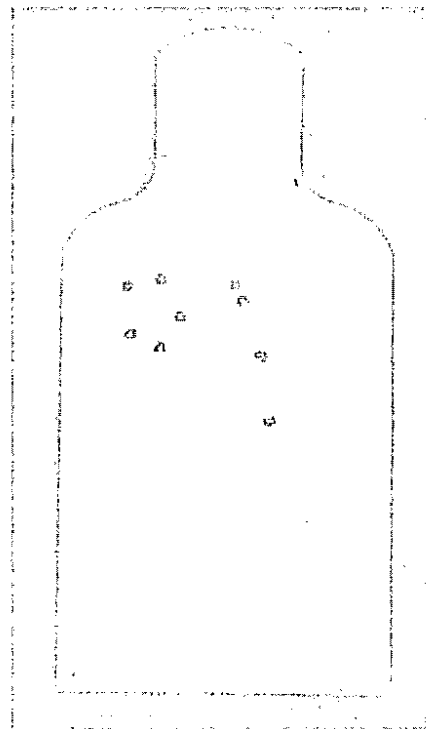


Figure 6B, Asphalt.

(Continued on page 20)

BOUNCING BULLETS

(Continued from page 6)

50-yard line. The point of aim was 12½ yards in front of the target. The

surfaces were concrete, asphalt, and turf.

Sidewall Ricochet Shooting

In all sidewall ricochet shooting the

target protruded its full width from the wall with the left side of the target against the sidewall. The target was at the extreme end of the sidewall and the shooter was 25 yards from the

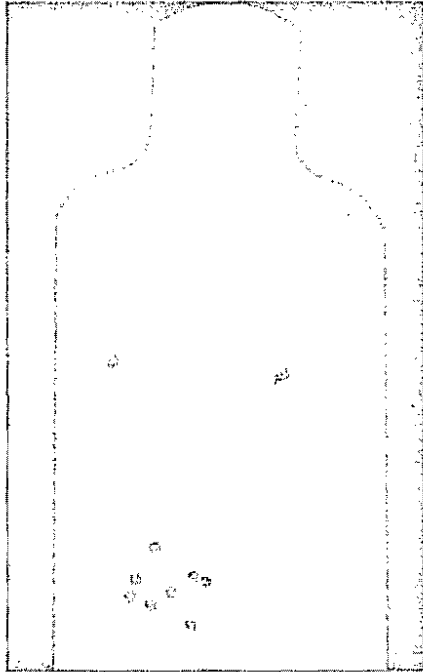


Figure 7A, Rifled Slug, Concrete.

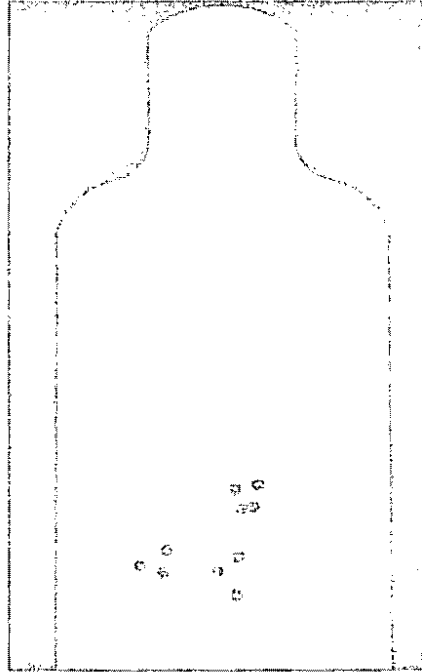


Figure 7B, Rifled Slug, Asphalt.

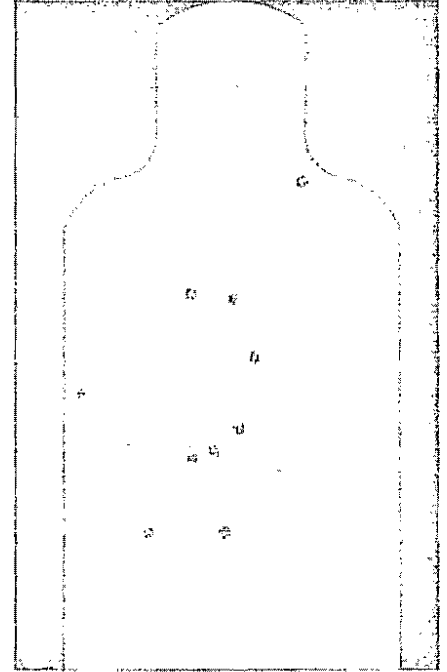


Figure 7C, Rifled Slug, Turf.

BRICK SIDEWALL, 22½ DEGREES

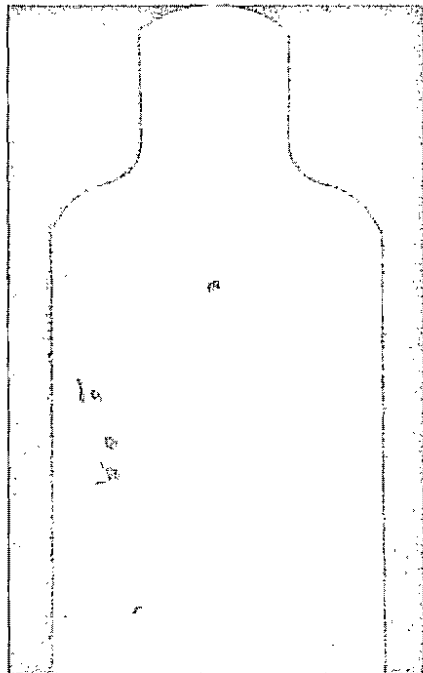


Figure 8A, .30 S&W.

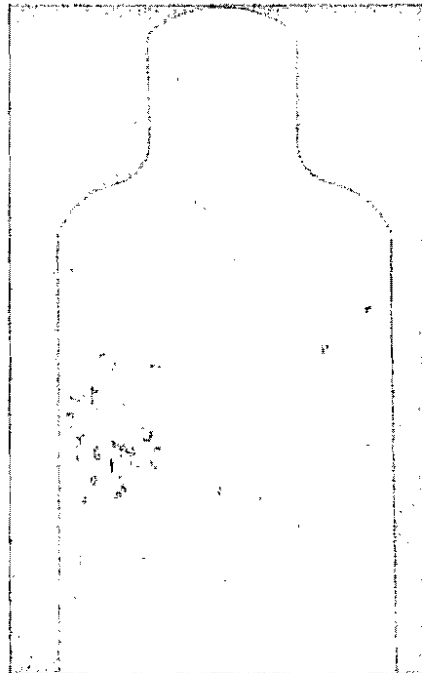


Figure 8B, .30 High Vel., 110 grains Hollow Point.

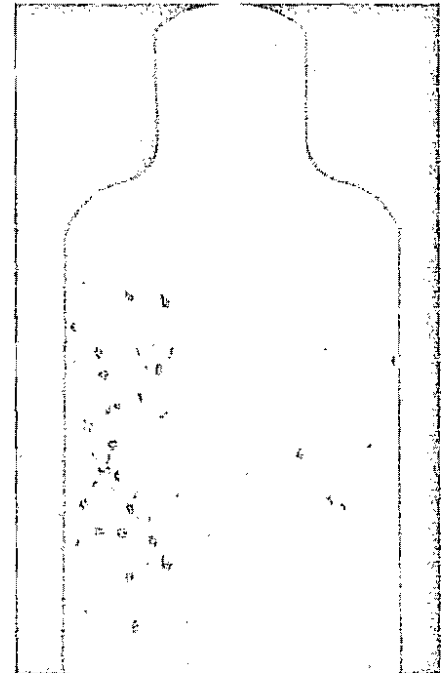


Figure 8C, .00 Buckshot.

point of aim or impact. Shots were fired at $22\frac{1}{2}$ - and 45-degree angles from the point of impact.

An Angle of $22\frac{1}{2}$ Degrees

Figures 8A, 8B, and 8C show the results of brick sidewall shooting with the point of aim 8 feet from the target at an angle of $22\frac{1}{2}$ degrees. Ten shots were fired in each of two targets with .38 Special and .38 Special hollow-point ammunition. Five rounds of 00 Buckshot were fired into the third target.

Figures 9A and 9B depict concrete sidewall shooting at a $22\frac{1}{2}$ -degree angle. Ten shots were fired with the rifled slug and 10 with 00 Buckshot. The point of aim was 8 feet from the target.

Figures 10A, 10B, and 10C show 10 shots each with .38 Special, .45 Auto, and .357 Magnum caliber ammunition 25 yards from the concrete sidewall at a $22\frac{1}{2}$ -degree angle. The point of aim was 8 feet from the target.

CONCRETE SIDEWALL, $22\frac{1}{2}$ DEGREES



Figure 9A, Rifled Slug.

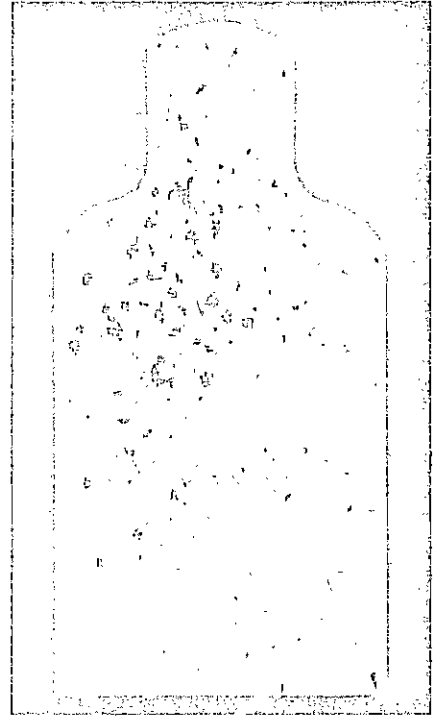


Figure 9B, 00 Buckshot.

CONCRETE SIDEWALL, $22\frac{1}{2}$ DEGREES

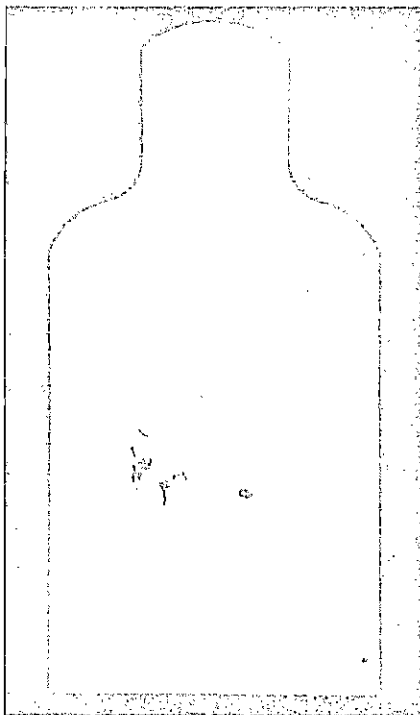


Figure 10A, .38 Special.

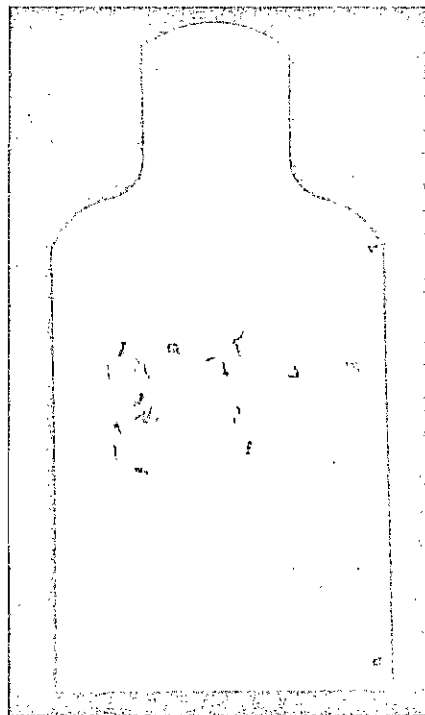


Figure 10B, .45 Auto.

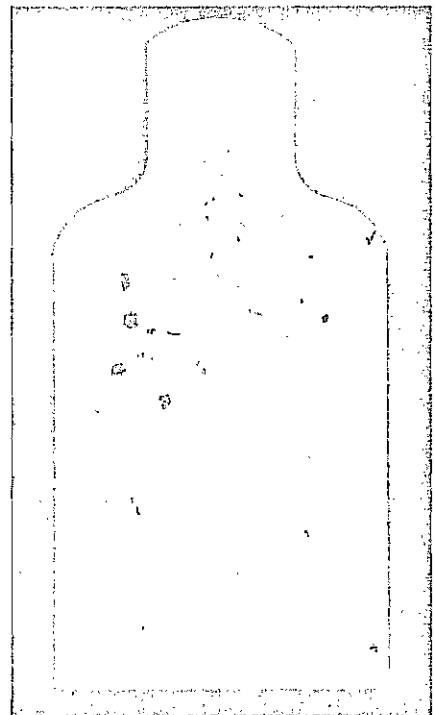


Figure 10C, .357 Magnum.

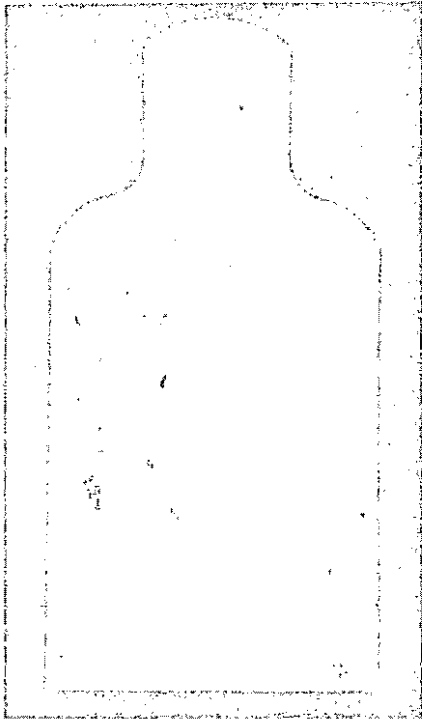


Figure 11A, .38 Special.

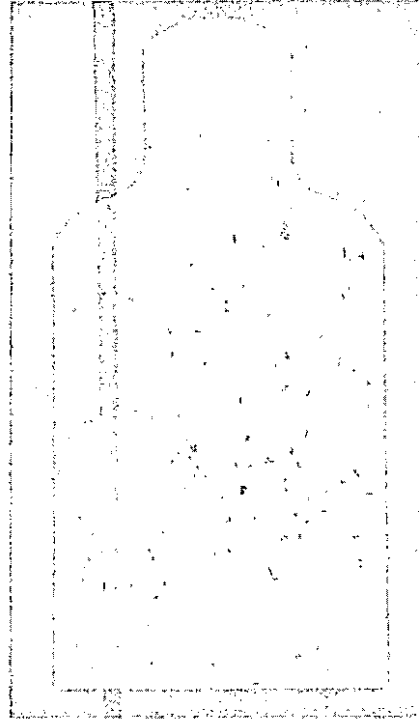


Figure 11C, 00 Buckshot.

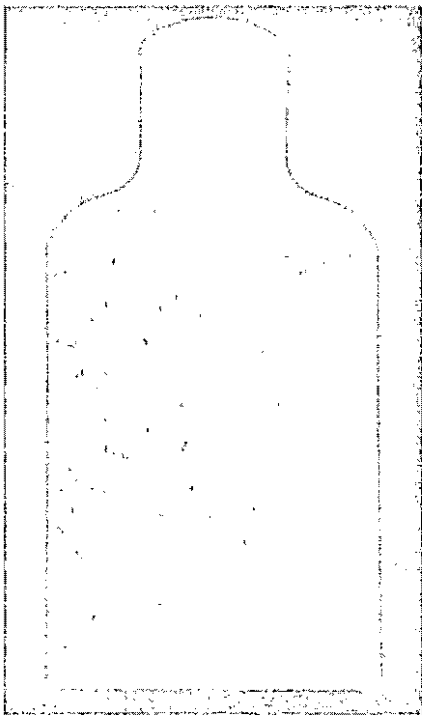


Figure 11B, .38 High Vel., 110 grains Hollow Point.

Figures 11A, 11B, and 11C record shots fired from 25 yards with point of aim 6 feet from the target at an angle of 45 degrees from a brick wall. The ammunition used was 10 rounds of .38 Special, 10 of .38 Special hollow point, and five rounds of 00 Buckshot.

Figure 12A, 12B, and 12C show the results of 10 shots fired at a concrete sidewall at an angle of 45 degrees. The point of aim was 8 feet from the target. The ammunition used was .38 Special, .45 Auto, and 00 Buckshot.

Figures 13A, 13B, and 13C depict some of the extremes attempted in the tests of sidewall shooting. The target on the left shows ten .38 Special caliber shots fired at a point of aim 20 feet from the target at an angle of 22½ degrees from a concrete sidewall. The target in the center shows 10 rounds of 00 Buckshot fired at a point of aim 12 feet from the hobbler target at a 45-degree angle to the side-

wall. The last target shows a five-shot group of .38 Special caliber ammunition fired at a 22½-degree angle to the sidewall at a point of aim 3 feet from the target.

To further implement the survey on ricochet shooting, the firearms instructors fired shoulder weapons in calibers .30-06, .30 Remington, .243 Winchester, .223, and .220 Swift at varying distances and angles and on different hard surfaces. The tests indicated that the high velocity bullets disintegrated on impact with the effect that only a few particles of lead and/or surface material struck the target.

It was noted during the firing that occasionally a shot did not perform like others in a group. These "flyers" resulted when the shot hit a particularly hard or soft spot in the surface material, a projecting edge of brick, or a previous bullet scar.

Conclusions

What do these findings mean to police officers? They mean that an officer should take complete advantage of all possible cover when returning fire and leave as little of his body exposed as possible to avoid becoming the victim of a ricocheting bullet. If he must expose himself, he should stay away from sidewalls. When returning shots at a person hiding at the end of a sidewall, he should aim at the wall side of the person. He should consider lowering his point of aim when shooting back at a subject in a low position, such as prone, sitting, or kneeling. However, a round of 00 Buckshot fired under a car from behind which a subject is shooting may make him surrender.

Ricochet shooting should of course not take the place of the well-aimed shot of the qualified police officer and should not be considered where innocent persons might be affected. Indiscriminate firing in the general direction of a subject should not be condoned.

CONCRETE SIDEWALL, 45 DEGREES

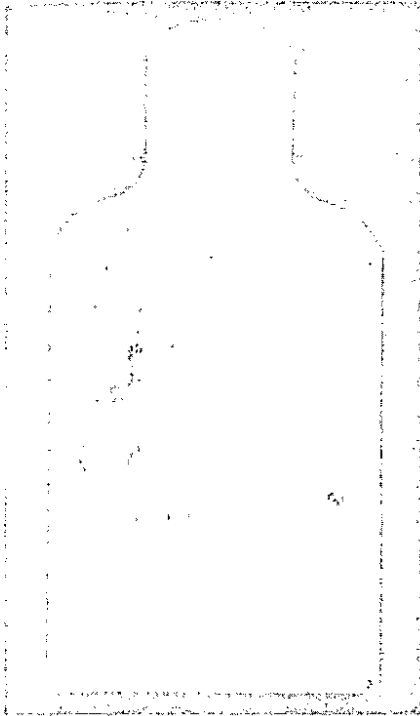


Figure 12A, .38 Special.

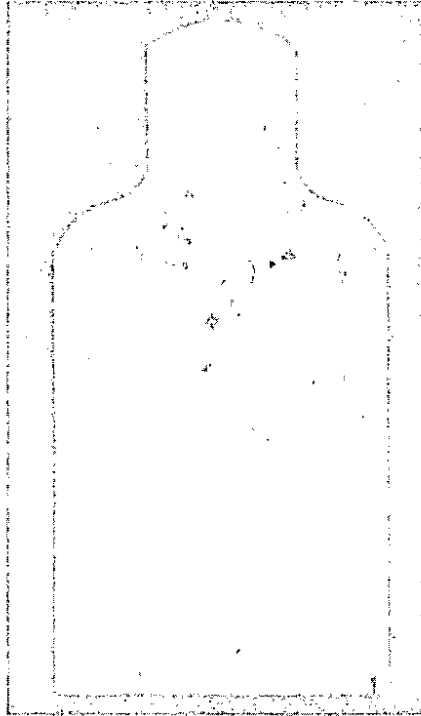


Figure 12B, .45 Auto.

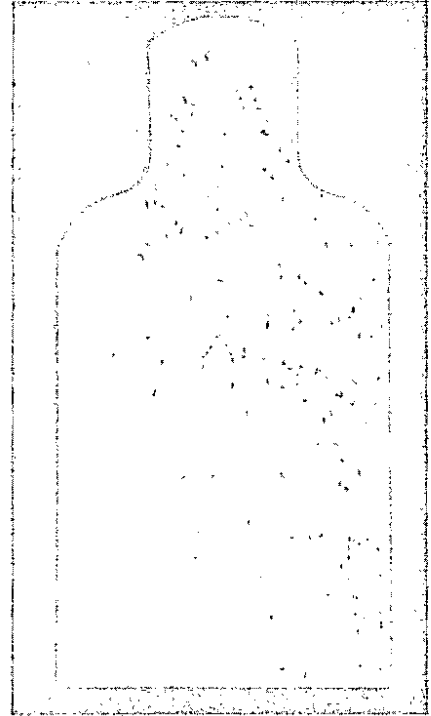


Figure 12C, 00 Buckshot.

CONCRETE SIDEWALL

22½ DEGREES

45 DEGREES

22½ DEGREES

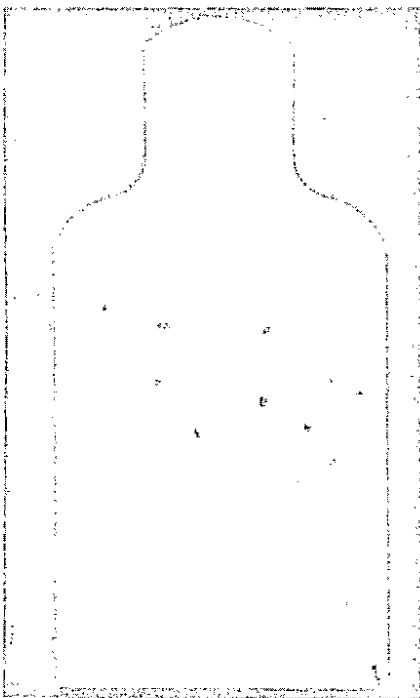


Figure 13A, 10 shots, .38 Special, Point of aim 20 feet from target.

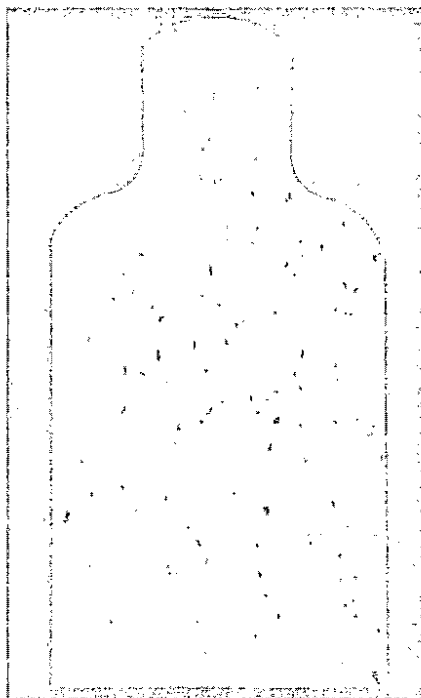


Figure 13B, 10 shots, 00 Buckshot, Point of aim 12 feet from target.

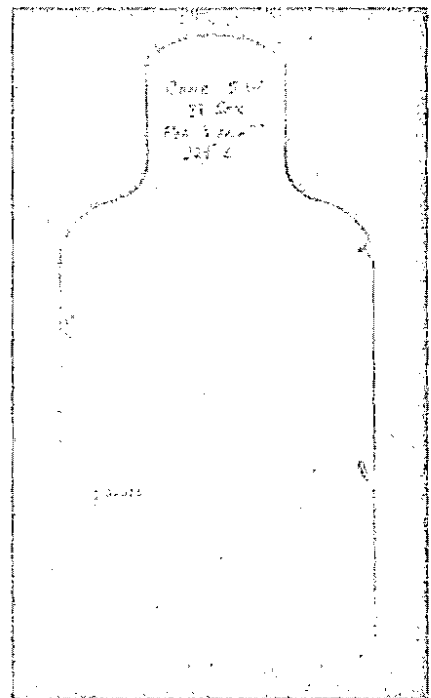


Figure 13C, 5 shots, .38 Special, Point of aim 3 feet from target.