

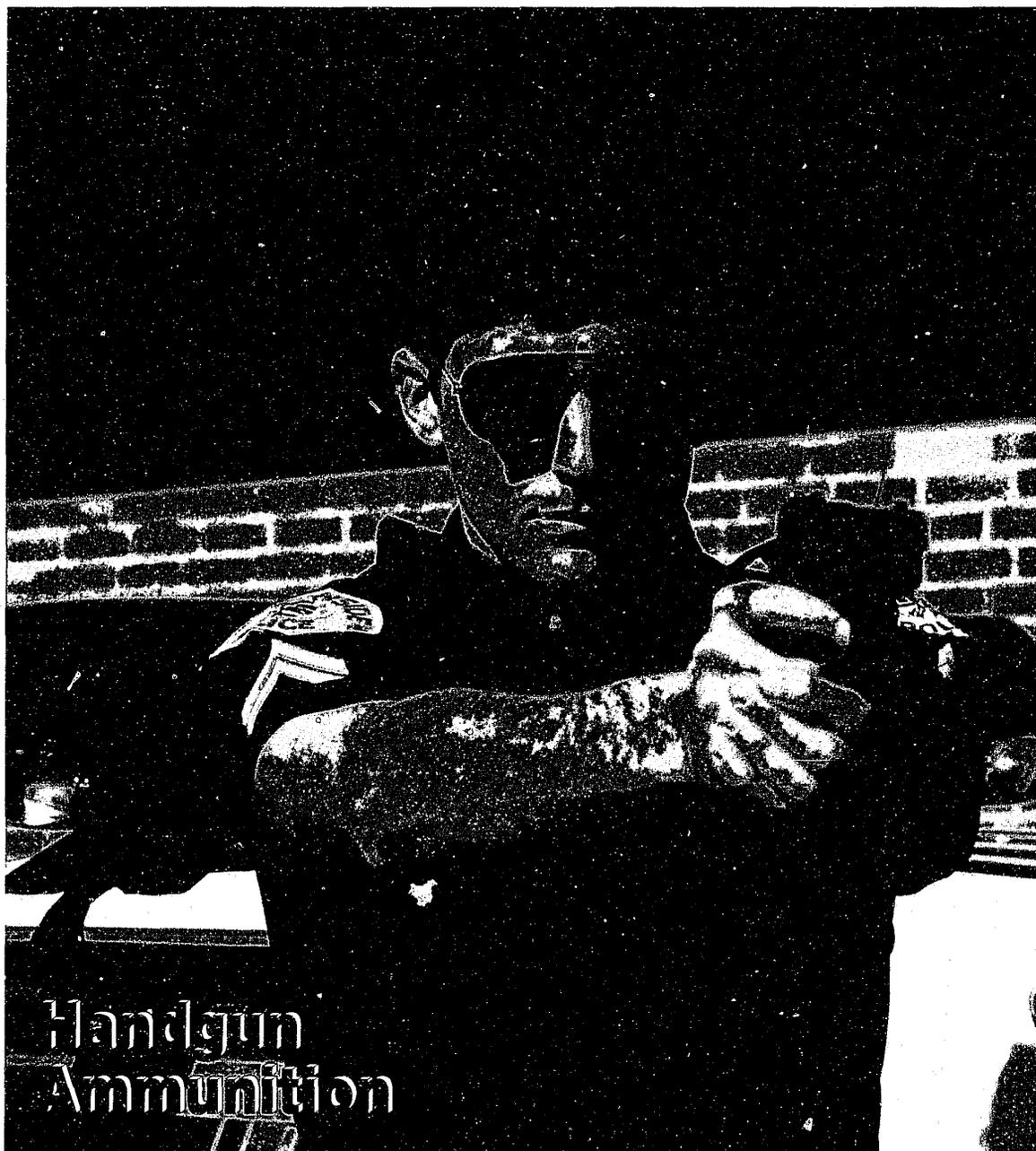
U.S. Department of Justice  
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# FBI Law Enforcement

B ♦ U ♦ L ♦ L ♦ E ♦ T ♦ I ♦ N



Handgun  
Ammunition



# FBI Law Enforcement

B ♦ U ♦ L ♦ L ♦ E ♦ T ♦ I ♦ N

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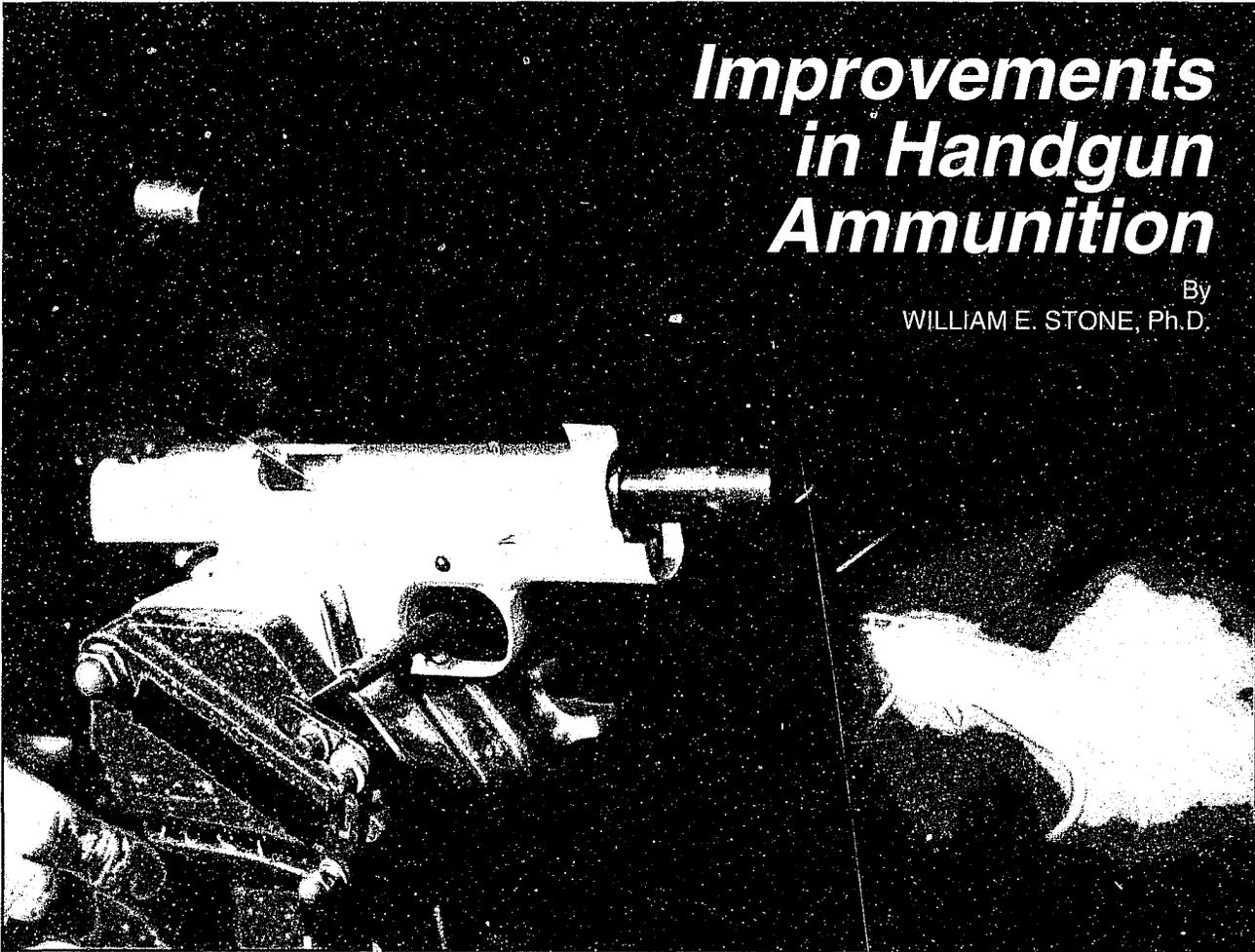
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# Improvements in Handgun Ammunition

By  
WILLIAM E. STONE, Ph.D.



**T**he search for the most effective police handgun cartridge is not a new one. For years, firearms experts attempted to determine the caliber, velocity, and bullet type best suited to the wide range of law enforcement needs. Many different recommendations surfaced over the years, each touted as the answer to law enforcement's prayers. Yet, only the most foolhardy would attempt to name the winner for the title of best police handgun cartridge from among the many contenders.

The inability to decide on the best available cartridge resulted, in large part, from a lack of empirical

research on handgun cartridge effectiveness. In the first stage of quality research, researchers must decide how to measure the item being studied. In this case, the actual characteristics of an effective police handgun cartridge had never been determined, so no yardstick with which to measure cartridge effectiveness existed until recently.

## Cartridge Effectiveness

In 1989, the FBI's Firearms Training Unit released a report that provided law enforcement with the first meaningful operational definition of cartridge effectiveness.<sup>1</sup> This report represented the first major

attempt to apply the scientific method to evaluate handgun cartridges. Other research predated this report;<sup>2</sup> however, the earlier studies generally lacked the rigor contained in the 1989 report and could be described better as preliminary research or informed opinion than as quality empirical research.

The issues identified in the FBI's report subsequently were translated into testing procedures.<sup>3</sup> These procedures required a cartridge to perform well, even after penetrating various substances that might be found in a law enforcement shooting situation, such as plasterboard, windshield glass, car



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door metal, and other commonly encountered barriers. Not surprisingly, the report on this controversial subject received a rather hostile reception in some quarters. Some experts continue to assert that only field analysis of actual shooting incidents will provide an accurate answer to the question of cartridge effectiveness.

Although debate continues on the merits of field versus laboratory study procedures, laboratory procedures have at least one distinct advantage—ammunition manufacturers can duplicate the test procedures in their own laboratories for the purposes of product development and improvement. While the relative merits of the FBI's testing procedures may be debated, it generally must be conceded that the testing procedures provide a useable yardstick for ammunition manufacturers. The obvious question, then, is: What have manufacturers done with this available yardstick for measuring police handgun cartridge effectiveness?

**Table 1**  
**.45 Auto Cartridge**  
(Comparison of 1989 and 1992 test results)

Year	Ammunition Type	Wounding Value	Average Expansion (in inches)	Accuracy Index
1989	Federal 230 grain HydraShok	2.49	0.621	3.49
	Remington 185 grain Jacketed HP	1.94	0.540	2.04
	Federal 185 grain Jacketed HP	1.77	0.588	4.80
Average		2.07	0.583	3.44
1992	Federal 230 grain Jacketed HP	3.60	0.618	2.43
	Speer 230 grain Gold Dot HP	3.47	0.639	2.34
	Winchester 230 grain Black Talon	3.06	0.649	4.73
Average		3.38	0.635	3.17

### Study Method

A simple examination of several years of the FBI's tests reveals the progress made by manufacturers in developing effective police handgun ammunition. For the purposes

of this article, the results of the test from 1989 and the most recent one (1992)<sup>4</sup> were compared. By examining these findings, which represent a 3-year period for ammunition development and refinement,

it is possible to discern improvements in the ammunition available to law enforcement.

To minimize confusion, the comparison will be limited to three common cartridges—the .45 Auto, the 10mm Auto, and the 9mm Auto. The selection of these cartridges in no way serves as an endorsement. Rather, it simply reflects their common use by law enforcement. Improvements in these commonly used cartridges probably will be representative of general improvements in the range of available cartridges.

To examine the relative improvement in cartridges, the three best ammunition types per caliber were selected from each test year based on their wounding value (W). An average wounding value per caliber and test year was then computed for each cartridge. Wounding value is a relative indicator of the cartridge's ability to incapacitate an assailant under a wide range of conditions. The greater the wounding value, the more effective and reliable the wound inflicted by that round.<sup>5</sup>

Some additional cautions must be considered. First, many variables affect cartridge performance; a cartridge that tested well will not necessarily meet the needs of a specific department. Second, wounding values do not provide an effective way to compare different calibers. The fact that a .45 Auto has higher wounding values than a 10mm Auto does not make it a better cartridge. Wounding values are significant only within a caliber, and small differences, such as comparing values of W=2.40 and W=2.55, are essentially meaningless. Third, when a test round's

**Table 2**  
**10mm Cartridge**  
(Comparison of 1989 and 1992 test results)

Year	Ammunition Type	Wounding Value	Average Expansion (in inches)	Accuracy Index
1989	Norma 170 grain Jacketed HP	2.63	0.562	4.12
	Federal 180 grain Jacketed HP	2.08	0.536	2.64
	Winchester 180 grain Jacketed HP	1.78	0.526	6.44
Average		2.16	0.541	4.40
1992	CCI 180 grain Plated HP	3.81	0.631	2.18
	Winchester 200 grain Black Talon	3.28	0.596	2.54
	Federal 180 grain Jacketed HP	2.21	0.527	3.30
Average		3.10	0.585	2.67

performance varied by lot or gun, only the best performance was used.

**Test Results**

The average wounding value of the three best .45 Auto cartridges

improved by 63 percent over the 3-year period from 1989 to 1992, increasing from W=2.07 to W=3.38. Table 1 shows that the improved performance in wounding value resulted primarily from

**Table 3**  
**9mm Auto Cartridge**  
 (Comparison of 1989 and 1992 test results)

Year	Ammunition Type	Wounding Value	Average Expansion (in inches)	Accuracy Index
1989	Federal 147 grain HydraShok	1.65	0.506	2.17
	Federal 147 grain Jacketed HP	1.18	0.502	2.62
	Federal 124 grain Jacketed HP	1.14	0.485	2.34
Average		1.32	0.498	2.38
1992	Remington 147 grain Jacketed HP	1.65	0.498	2.65
	Winchester 147 grain Black Talon	1.55	0.515	1.93
	Speer 115 grain Gold Dot HP	1.48	0.488	4.39
Average		1.56	0.500	2.99

improved expansion under a wide range of test conditions.

The accuracy indexes, which measure the group dispersion of test rounds fired, also improved somewhat between 1989 and

1992. When comparing accuracy indexes, smaller numbers reflect tighter firing patterns. In effect, the three best .45 Auto cartridges available to law enforcement in 1992 produce better wounds and are

more accurate than their 1989 counterparts.

An examination of the data for the 10mm Auto shows very similar results. In the case of the 10mm, the wounding value increased over 43 percent (W=2.16 to W=3.10) over the 3-year period. The data in table 2 reveal that the improved expansion characteristics of the 10mm cartridges in the 1992 tests produced most of this increase. Again, the accuracy index of the 1992 cartridges also improved. In fact, the accuracy improvements of the 10mm are much more significant than the improvements of the .45 caliber.

The trend found in the .45 and 10mm calibers also is present in the 9mm Auto. A comparison of the average wounding value of the 9mm from 1989 to 1992 shows an almost 20-percent increase (W=1.32 to W=1.56). While the change is not as significant as that of the .45 and 10mm, it still clearly indicates cartridge improvement.

The 9mm tests do not show as much improvement as the others primarily because of the presence of the 9mm 147 grain HydraShok bullet in the 1989 tests. This cartridge was dramatically superior to the other cartridges and biased the 1989 test average upward. The 147 grain HydraShok continued to test well in subsequent years, but slight changes in the cartridge and significant improvements in other 9mm cartridges edged it out of the top three ranking for the 1992 tests, as shown in table 3.

### Conclusion

The evidence from all three cartridges reveals the significant improvements in handgun cartridges

over the past 3 years. The best ammunition available today performs considerably better than the best ammunition available in 1989. The credit for these improvements should be attributed to two main factors. First, the work of the FBI's Firearms Training Unit set the stage for the evolution of better-performing handgun cartridges by developing a useable testing procedure. In fact, one of the cartridges improved by this program had been in service for almost 90 years with only minimal refinements to its capabilities. Only when a workable standard was established did the manufacturer significantly improve its quality.

Second, credit should be given to ammunition manufacturers. A number of manufacturers, including some not referenced in this article, responded to the challenge presented by the FBI's testing procedures and produced a higher quality product. As a result of the combined efforts of the manufacturers and the FBI, law enforcement officers today have significantly better quality ammunition available to them than they did just a few years ago. ♦

#### Endnotes

<sup>1</sup> Urey W. Patrick, *Handgun Wounding Factors and Effectiveness* (Quantico, VA:

Federal Bureau of Investigation, Firearms Training Unit, 1989).

<sup>2</sup> For other research predating the FBI report, see W. J. Burchey and D. E. Frank, *Police Handgun Ammunition Incapacitation Effects* (Washington, DC: National Institute of Justice Report 100-83, U.S. Government Printing Office, 1984) vol. 1; and R. C. Dobbyn, W. J. Burchey, and L. D. Shubin, *An Evaluation of Police Handgun Ammunition: Summary Report* (Washington, DC: Law Enforcement Standards Program, Report 0101.01, U.S. Government Printing Office, 1975).

<sup>3</sup> *1989 Ammunition Tests* (Quantico, VA: Federal Bureau of Investigation, Firearms Training Unit, 1990).

<sup>4</sup> *1992 Ammunition Tests* (Quantico, VA: Federal Bureau of Investigation, Firearms Training Unit, 1993), vol. 4.

<sup>5</sup> For additional information on wounding value, refer to the introductory section of any of the FBI's *Ammunition Tests* reports.

## Unusual Weapon

### Perilous Pen

An executive-style pen neatly conceals this deadly dagger. The triangular, carbon steel blade measures 2 1/4 inches and can be accessed easily by pulling off the top portion of the pen casing. When the blade is concealed in the casing, the pen can be used as a standard writing instrument.

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Submitted by Rev. Lawrence Au, FBI  
Chaplain, San Francisco, California.

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