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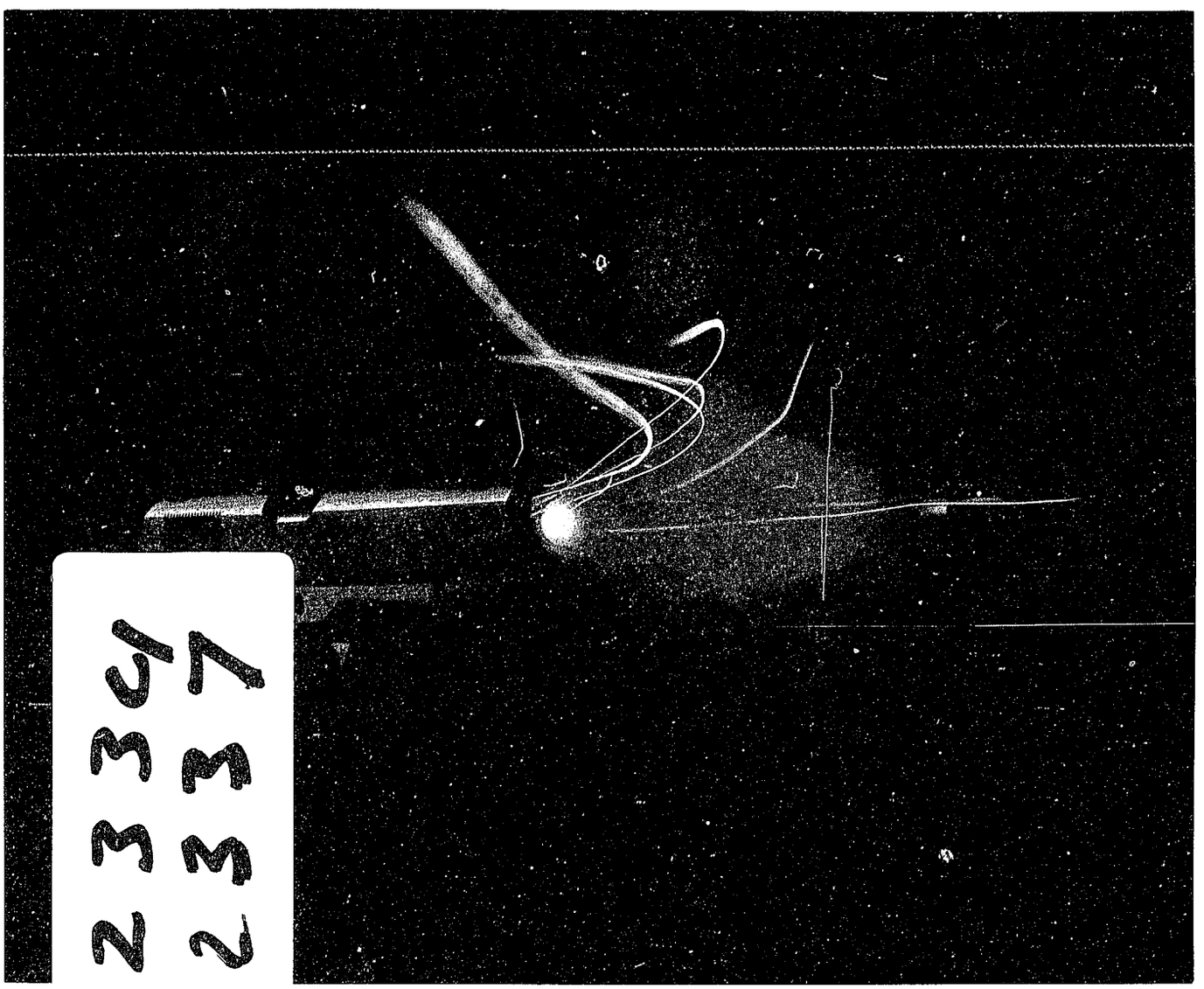

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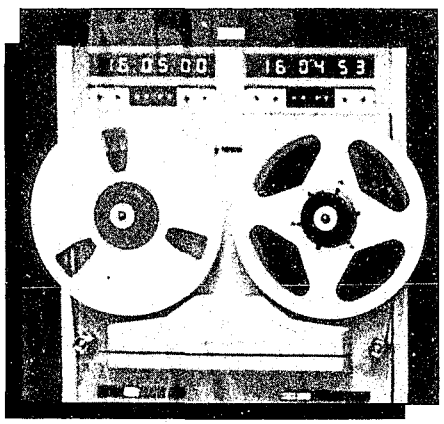

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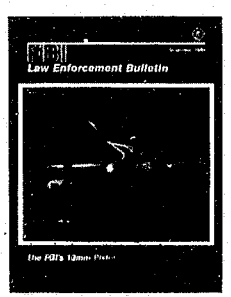

The Cover: *The 10mm semiautomatic pistol has been selected as the standard issue firearm for all FBI Agents. See article on page 2. All weapon photos in this issue are courtesy of Larry Wallery and Dennis Keener.*

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The FBI's 10mm Pistol

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For several decades, FBI Agents carried the .38 caliber revolver as a standard firearm. Now, after extensive testing and evaluation, the FBI is converting to a new semiautomatic pistol. The new pistol, built to FBI specifications and chambered for a new cartridge—the 10mm, will be issued to all FBI Agents to replace existing revolvers. This article describes the process that led to this decision.

BACKGROUND

The authority for FBI Agents to carry firearms was first granted in 1934. Although pistols were sometimes issued or permitted on a limited basis, the revolver predominated as the FBI sidearm. The first significant shift occurred in 1981, when Special Weapons and Tactics (SWAT) teams were equipped with large capacity 9mm pistols. Since then, 9mm pistols have also become the issue weapons for the FBI's Hostage Rescue Team (HRT) and special surveillance teams.

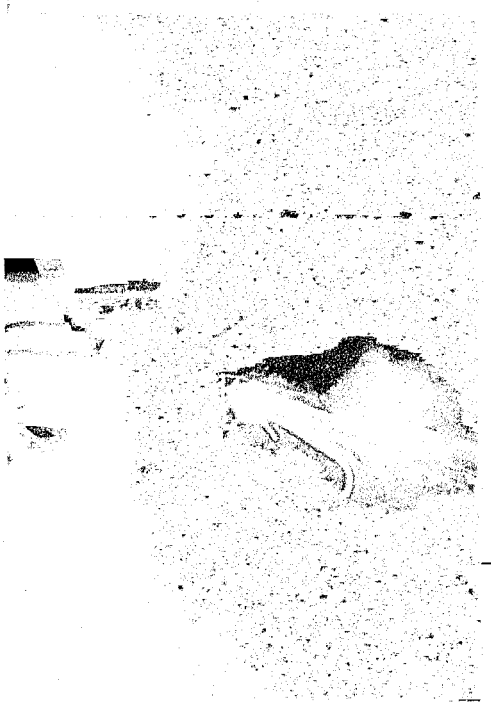
For the general Agent population, however, revolvers remained the issue weapon, though the increasing use of pistols reflected a growing recognition that the modern pistol provides certain advantages over the revolver. Primarily, pistols are generally more compact and portable and provide a larger ammunition capacity. They are also quicker and easier to reload. Moreover, experience has shown that pistols are generally easier to shoot quickly and accurately due to the self-cocking operation of the slide following each shot and the more efficient transmission of recoil. What is most important, however, is that pistols have proven to be durable and reliable.

Undoubtedly, interest in pistols intensified when innovative designs of the weapon began to appear on the market during the early 1980s. Whereas the basic revolver design remains much as it was at the turn of the century, the pistol has been virtually refashioned in recent years, providing a wide range of such innovative features as double-stacked large capacity magazines, double-action triggers, ambidextrous controls, multiple safety devices, and endless varieties of shapes and sizes.

Meanwhile, other events entered into the picture. Instances where law enforcement officers were confronting more violent, heavily armed subjects appeared to be on the rise. The increasing use of semiautomatic and even fully automatic weapons by certain segments of the criminal element began to raise concerns about the adequacy of law enforcement armament.

SELECTION OF A NEW HANDGUN

In 1987, new impetus was given to the FBI's ongoing evaluation of firearms and ammunition. The Firearms Training Unit, located at the FBI Academy in



Special Agent Hall

> ***"The best performing round within the parameters of the FBI's test protocol was the 10mm."***

Quantico, VA, set out to identify the best possible handgun for FBI Agents. Firearms training experts undertook a major testing project to evaluate a variety of 9mm and .45 caliber pistols then on the market. While several of the pistols tested were effective, none possessed all of the features desired in a general issue FBI weapon. The challenge was to develop a pistol that met the needs of the FBI.

In the meantime, as a response to a growing perception within Agent ranks that a pistol was preferable to the revolver, the Director of the FBI authorized Agents to use personally owned pistols, either 9mm or .45 caliber, as long as the weapons were of approved manufacture and design and the training and qualification standards were met.

A Question of Caliber

The most critical, and controversial, issue relating to the selection of a new FBI handgun was that of caliber. Questions have been raised not only about the adequacy of some weapons but also about the wounding effectiveness of some ammunition. Case accounts of shootings document the fact that subjects receiving fatal, but not incapacitating, wounds have been able to return fire and inflict further damage.

Wound Ballistics

As a means of resolving the problem, the FBI convened a Wound Ballistics Seminar at the FBI Academy in September 1987. The participants included noted individuals from the scientific and medical communities from throughout the Nation who possessed relevant expertise in the field of wound ballistics. One of the primary purposes of the seminar was to identify the performance criteria of a bullet most likely to inflict an incapacitating wound on a human target.

A second purpose of the seminar was to determine, if possible, which of the two calibers, the 9mm or the .45, was likely to be most effective in accomplishing that goal. And, although the seminar was unsuccessful in conclusively resolving the caliber question, it did identify the desirable performance criteria of an effective bullet.

Incapacitation, in the law enforcement context, may be simply described as bringing about the immediate cessation of hostile or threatening activities. Incapacitation may result from psychological or physiological factors. Psychologically, some individuals are predisposed to fall down at the sound of gunfire, while others may continue to fight even though they are seriously—even fatally—wounded. Because a particular person's psychological response to a gunshot wound cannot be predicted, ammunition performance must be viewed from the perspective of physiological incapacitation.

The seminar participants unanimously concluded that physiological incapacitation can be accomplished in one of two ways—damage to the central nervous system (the brain or upper spinal column) or significant loss of blood. Because the placement of a shot in the relatively small, highly mobile target area of the brain cannot be counted upon in an armed confrontation, a bullet must therefore be capable of penetrating the body sufficiently to pass through major arteries and blood-bearing organs to ensure timely physiological incapacitation. Without adequate penetration, physiological incapacitation cannot be attained. Given adequate penetration, the only reliable way to increase the effectiveness of the wound is to increase its size, thus

increasing the amount of tissue damage and the rate of hemorrhage. Thus, the FBI's test program was designed to evaluate bullet penetration and wound size.

Ammunition Test Design

With the performance criteria acquired from the Wound Ballistics Seminar, the next step was to design and construct a series of ammunition tests to measure the performance of different rounds against those standards. For that purpose, the Firearms Training Unit established a working group which included personnel from the Special Operations and Research Unit, the Hostage Rescue Team, and the Institutional Research and Development Unit.

The tests were designed to simulate factors realistically. Therefore, if the effects of bullets upon human tissue were to be realistically measured, a substance that would duplicate human tissue was needed. Based upon the research of Dr. Martin Fackler, Director of the Army's Wound Ballistics Laboratory, at the Letterman Institute in San Francisco, 10% ballistic gelatin was selected to simulate soft human muscle tissue. Eight separate penetration tests were conducted by firing bullets into this substance.

> ***"... the FBI's test program was designed to evaluate bullet penetration and wound size."***

Also, since experience demonstrated that bare tissue is seldom visible on a target in a violent confrontation, seven of the eight tests included covering the gelatin with typical clothing material (cotton T-shirt material, flannel shirt material, 10 oz. down in a nylon carrier, and denim). To assure validity and standardization, clothing manufacturers were consulted to determine the average thread count in typical underclothing, shirts, and jackets.

Other factors were then considered. Because FBI Agents frequently confront subjects in vehicles, behind doors or walls, and at various distances, clothed gelatin was placed behind windshield glass, car door metal, plaster board and plywood. Again, manufacturers in the construction and automobile industries were consulted to assure that the materials used replicated substances that bullets would have to pass through in real-life situations. While most of the test shots were fired from a distance of 10 feet, some of the tests were conducted at 20 yards to assess the effects of distance and velocity loss on penetration potential.

Five shots were fired in each of the 8 penetration tests, providing a total of 40 shots for each caliber or bullet type tested.

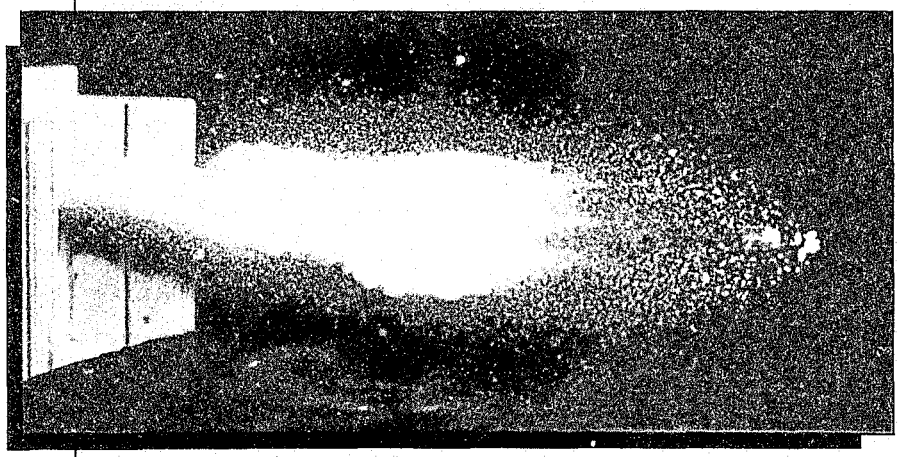
FBI BULLET PERFORMANCE CRITERIA

1. Penetration
   a. Minimum Acceptable—12"
   b. Maximum Desirable—18"

2. Size of the Wound (Volume)
   a. Frontal Area of Bullet
   b. Depth of Penetration

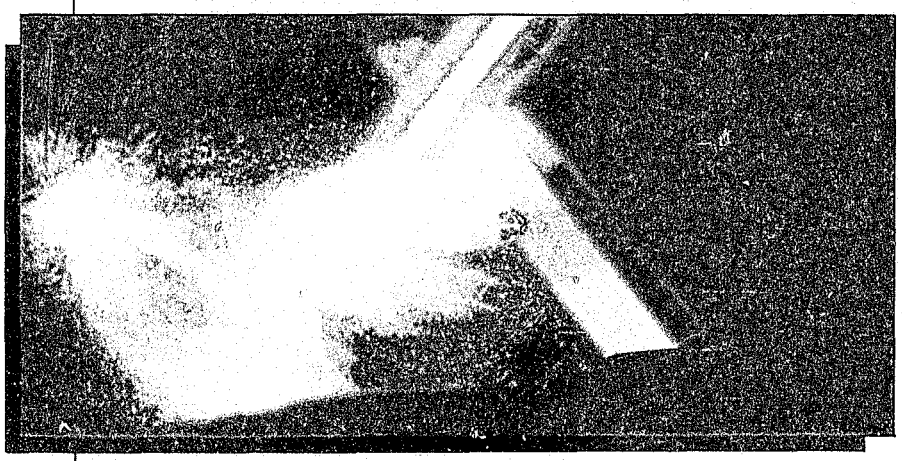
FBI STANDARDIZED AMMUNITION TESTS

Test 1 — Bare Gelatin @ 10 feet
Test 2 — Heavy Clothing @ 10 feet
Test 3 — 20 gauge Steel @ 10 feet
Test 4 — Wallboard @ 10 feet
Test 5 — Plywood @ 10 feet
Test 6 — Auto Windshield Glass @ 10 feet
Test 7 — Light Clothing @ 20 yards
Test 8 — Auto Glass @ 20 yards



An ammunition test shot being fired into wallboard.

An ammunition test shot being fired into plywood.



An ammunition test shot being fired into auto windshield glass.

The Competing Calibers

Once the tests were designed, a decision had to be made regarding the calibers to be tested. In pistol cartridges, the two most obvious contenders were the 9mm and .45 caliber. The 9mm round tested was the 147 grain subsonic hollow point round produced by Winchester; the .45 round selected for the test was the Remington 185 grain hollow point. The selection of these particular cartridges for testing was based, in large part, on the consensus of the Wound Ballistic Workshop participants that these bullets should provide superior penetration over other hollow point bullets in their respective calibers.

In the meantime, a separate research and development project had been undertaken with the 10mm cartridge to assess its application to law enforcement work. Although the 10mm (.40 caliber) is a relatively new cartridge, with few weapons presently chambered for it, its unique size, halfway between the 9mm (.35 caliber) and the .45, appeared to offer the possibility of a third viable law enforcement pistol cartridge. In addition, unlike its competitors, the potential of the new cartridge was virtually untapped.

Samples of commercially available 10mm ammunition were acquired and preliminarily evaluated as to suitability for law enforcement use. The high chamber pressures generated by the commercial loadings, with the resultant heavy recoil and muzzle blast, tended to offset the otherwise excellent performance of the

round. Therefore, the FBI Firearms Training Unit decided to create a new loading for the 10mm, one with velocities comparable to those of the competing 9mm and .45 cartridges. A 180 grain hollow point bullet was acquired and handloaded to a velocity of 950 feet per second. This loading not only matched the velocities of the other two cartridges, but it also dramatically reduced recoil and muzzle blast.

In the absence of factory ammunition built to the desired specifications, the 10mm rounds initially subjected to the test protocol were those handloaded by the Firearms Training Unit staff. Subsequently, factory-loaded 10mm ammunition was acquired and built to the desired specifications, which actually met or surpassed the performance of the handloaded test ammunition.

The Test Procedures

Because the objective was to test ammunition and not weapons, the initial tests were conducted with industry standard test barrels. These barrels are built to standards established by the Sporting Arms and Ammunition Manufacturing Institute (SAAMI) and are tailored to optimize the ballistic efficiency of each caliber. Test barrel length is determined by the internal ballistics of the caliber. Consequently, the barrel lengths vary with each caliber. For example, the optimal test barrel for the 9mm is 4″ in length, while those of the 10mm and .45 are 6″.

The immediate concern was the possibility that the longer test barrels for the 10mm and .45 would provide an advantage by increasing their velocities. In reality, it was discovered that increased velocity actually diminishes the penetration performance of hollow point bullets in gelatin by increasing the rate and degree of expansion. It was noted, for example, that both the 10mm and .45 achieved lower velocities, but greater penetration, when fired from shorter pistol barrels than when fired from the longer test barrels with somewhat higher velocities. Thus, the longer test barrels used with the 10mm and .45 worked as a handicap for those two calibers by lessening the degree of penetration. That handicap would have been eliminated by using test barrels of equal lengths, and the disparity between the penetration performance of the 9mm and the two other calibers would have been even greater than that actually attained. Since the longer test barrels were not giving any advantage to the 10mm and the .45 caliber (quite the contrary), the tests were continued with existing equipment.

After initial tests to measure velocity and accuracy, 40 rounds of each caliber were fired by FBI firearms personnel to measure penetration and wound volume. Following each shot, red dye was injected into the wound channel created by the passage of the bullet into the gelatin, and a photograph was taken. Then a separate team from the Institutional Research and Development Unit conducted the measurements to ascertain penetration (measured in inches), bullet expansion, and retained bullet weight. Finally, the volume of tissue displaced (wound size) by the passage of the bullet was computed in cubic inches and recorded.

> ***“Although penetration and wound size govern handgun wounding effectiveness, penetration is the more critical element.”***

The Results

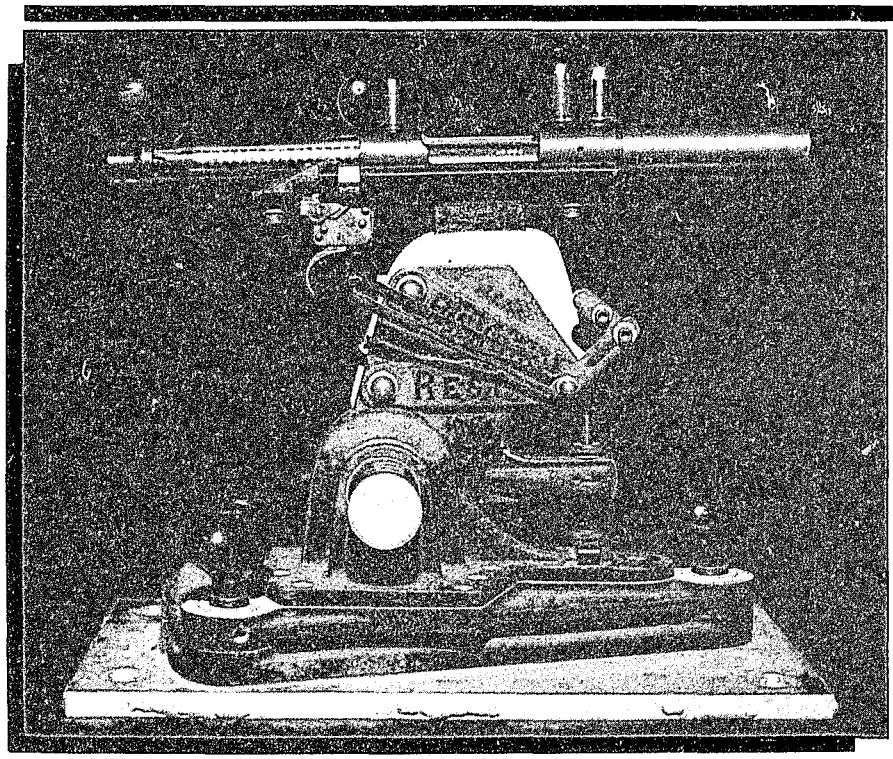
Although penetration and wound size govern handgun wounding effectiveness, penetration is the more critical element. Therefore, a minimum standard of 12″ of penetration in the gelatin was established. The following penetration results indicate the number and percentage of rounds in each caliber that met or exceeded the 12″ minimum:

10mm-39 shots out of 40 (97.5%)

.45-37 shots out of 40 (92.5%)

9mm-27 shots out of 40 (67.5%)

As a point of reference, the standard issue .38 Special, 158 grain lead hollow point round was fired through the battery of tests. Although the .38 was not a “test” round, and therefore not fired



Initial ammunition tests were conducted with industry standard test barrels.

under the same strict test controls, the penetration performance was similar to that of the 9mm, producing acceptable penetration 67.5% of the time.

It should be noted that no maximum penetration standard was established. This reflects the judgment that underpenetration of a handgun bullet presents a far greater risk to the law enforcement officer than overpenetration does to an innocent bystander. Considering that approximately 80% of the rounds fired by law enforcement officers engaged in violent encounters do not strike the intended targets, it was deemed somewhat unrealistic to attach too much significance to the potential risks of overpenetration on the part of those that do. Nevertheless, in assessing the potential volume of wounds created by the test bullets, greater attention was given to the potential tissue displaced up to a depth of 18″. For practical purposes, penetration beyond that range would most likely carry the bullet outside the body.

> ***"Once the tests were designed, a decision had to be made regarding the calibers to be tested."***

Averaging the volumetric results over all eight test events, the 10mm and .45 displaced similar volumes of tissue within the desirable penetration range of 18″—4.11 and 4.22 cubic inches respectively—well beyond that displaced by the 9mm and .38—which respectively measured 2.82 and 2.16 cubic inches.

As an additional consideration, the 10mm was by far the most accurate round tested, consistently providing one hole 10-shot groups at 25 yards of less than an inch (0.77″ average) with both handloaded and factory ammunition built to FBI specifications. By contrast, the 9mm averaged 2.3″ and the .45 averaged 2″.

CONCLUSION

The conclusion was obvious. The best performing round within the parameters of the FBI's test protocol was the 10mm. Accordingly, the Director of the FBI approved the recommendation that the new 10mm cartridge be adopted as the standard caliber for a new FBI pistol, and that the new pistol be procured in sufficient quantities to replace existing revolvers.

The tests that led to this decision by the FBI are available, on request, to interested law enforcement agencies. Moreover, ammunition testing will continue and extend to other calibers and bullets available for law enforcement use. As additional test results are compiled, quarterly updates will be automatically mailed to recipients of the original test report. Requests for the test report entitled **"Ammunition Test Results"** should be mailed to:

Firearms Training Unit
FBI Academy
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FBI