

**The Bill Blackwood  
Law Enforcement Management Institute of Texas**

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**Selection of  
Patrol Ammunition**

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**An Administrative Research Paper  
Submitted in Partial Fulfillment  
Required for Graduation from the  
Leadership Command College**

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## **ABSTRACT**

Without a doubt, officers across the state of Texas risk their lives everyday. The possibility of armed confrontation is as sure as the sidearm in their holster, but are they being provided the best possible tools with which to protect lives? By reviewing literature, conducting a survey and testing ammunition commonly issued to patrol officers, the author was able to distinguish trends in patrol ammunition and determine how it gets to the street level officer. According to the survey conducted, the majority of police agencies do not test their own ammunition for suitability for their own patrol force. Also, current wisdom on the selection of what is proper ammunition for a patrol officer should be closely scrutinized due to the surprising results of terminal performance tests with a conventional bullet far surpassing the performance of it's new hi-tech brethren. There is no doubt that each police agency should research their use of force files, establish a testing protocol for patrol ammunition, and then test various ammunition in a fair and impartial way in order to ensure that the patrol officer has the absolute best ammunition that can be provided.

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## INTRODUCTION

As one can imagine, the proper selection of patrol duty ammunition is a highly important issue that would require the attention of the law enforcement agency that is considering the need for change or upgrade. However, this is one area that seems to be fraught with ambiguity, personal opinion, the manufacturer's desire to make a profit, the law enforcement agency's budget, and a lack of highly accurate information. During the April 11<sup>th</sup>, 1986 Miami Florida shootout, two FBI agents were killed and five more were wounded in a gun battle with Michael Platt and William Matix. During that shootout, the two felons continued to function even after absorbing hits from the agent's weapons that should have been fatal. The Miami shootout is a graphic example of how inconsistent, poor, or non-existent patrol ammunition testing is and illustrates how this can lead to failures to stop the suspects aggressive behavior or other liability issues. Each and every law enforcement agency should evaluate the needs of their department and try to establish the functional parameters of the ammunition that best fits their department's needs.

The author is going to establish criteria for the his police department, locate and/or construct tests that will evaluate ammunition on the aforementioned criteria, and then select the best possible patrol ammunition based on the observed performance during those tests. The author also intends to examine: texts published by the FBI on the effectiveness of ammunition, books written on patrol ammunition issues, materials published by the various ammunition manufacturers on the effectiveness of their ammunition, conduct surveys of various Texas police agencies, and conduct actual ammunition tests. The author believes that a premium grade of ammunition that uses a

bonded core hollow point bullet at a moderately high velocity will provide the best results of incapacitation of violent offenders, versus the problem of over penetrating the body with ammunition. The author believes that the same bonded core bullet will perform admirably well when used against the common obstacles encountered by patrol officers, auto glass, auto body steel, dry wall construction, heavy clothing, and light clothing.

The author believes that providing the patrol officer with the best possible tools to protect the life of him/herself and the lives of the public is of great importance. Saving the lives of innocent people is what the entire law enforcement profession is centered around and such an important decision is best not left up to whim or personal fancy. It is the duty of law enforcement professionals to examine the subject of proper patrol ammunition selection with the objectivity and the science that it deserves. The lives of those who matter most may hang in the balance of such an important issue and no one likes delivering a death message.

## **REVIEW OF LITERATURE**

The dilemma of selecting the proper ammunition for the patrol officer on the job is not new by any stretch of the imagination. The problem is easily traced back to the early users of handguns in violent, military conflict. During the United States Civil War that was conducted between 1860 and 1864, the handgun was used extensively by mounted troops. Combatants reported greater stopping or killing power with the round ball load over the conical load. (Keith, 1955).

During the Philippine/American war that was conducted from 1899 to 1902, troops again saw the use of the handgun as a defensive tool. Unfortunately for the U.S.

troops, the military had just issued the then new double action revolver chambered in .38 long Colt that proved ineffective in stopping the Philippine Moro tribesmen. Reports were so bad that the military re-issued the older 1873 Single Action Army revolver chambered in .45 Colt as a stopgap measure. In 1911, the U.S. Army adopted their first auto-loading pistol, the Model 1911 chambered in .45 ACP (Automatic Colt Pistol). (Keith, 1955).

Handgun ammunition that fails its user is hardly limited to military duty. In the 1950s the standard police load at the time was a round nose lead bullet that had little or no shock effect. (Keith, 1955). In 1983 Officer David Martyn shot a robbery suspect at a Bank Robbery in Victoria, Texas. Officer Martyn was armed with .38 special ammunition and he shot the robber in the side of the head at a distance of about six feet. Martyn stated that the bullet failed to penetrate the suspect's skull and the suspect was merely incapacitated for about 10 seconds during which time he was cuffed and able to exit his vehicle under his own power. (D. Martyn & L. Mitchell, personal communication, September 7, 2005). In April 1986 the FBI was involved in a shooting in Florida that left two agents dead and five more wounded. The offenders were ultimately killed, however, early on in the struggle they had received wounds that would have incapacitated them had the ammunition been more effective.

The above shooting involving the FBI was enough to prompt that agency into re-evaluating its ammunition and the handgun that fired it. (Smith, 2002). They began to approach the matter from a scientific standpoint and they asked noted individuals from the scientific and medical communities how to identify the performance criteria that would most likely inflict incapacitating wounds on a human target. They found that

incapacitation occurred in two ways, damage to the central nervous system or the significant loss of blood. They deduced that a bullet *must therefore be capable of penetrating the body sufficiently in order to disrupt the central nervous system or major blood vessels*. (Hall, 1989). This goes hand-in-hand with the observations of Elmer Keith who found that in shooting game animals, a full caliber hole that lets more blood out and more cold air in will incapacitate an animal quicker than a round nose bullet that merely opens small holes. Keith also noted that the initial shock that an animal gets from being struck by a projectile is of primary importance and that to be safe you should shoot again. His theory was that once an animal recovers from the initial shock, if he isn't bled out or spine shot, he may carry on for some time. Keith (1955) explains further:

One man or animal will carry on with seemingly impossible wounds until literally shot to pieces and another will drop dead from a tiny .22 bullet. Placing of the first shot is of vital importance in all game shooting or in a gunfight. Hit an animal right with the first shot and the job is done, but wound him with a badly placed first shot and you can then literally cut the beast to pieces and unless the brain or spine is hit he will carry on. (p. 125)

This would concur with the FBI's unfortunate experience in Florida in 1986.

The FBI then set about designing and constructing a set of tests that would evaluate bullet penetration and wound size, also known in the firearms industry as terminal ballistics. Given adequate penetration, the only way to increase effectiveness was to increase the wound size. This is normally accomplished by the use of larger caliber or expanding bullets and/or the combination of both. This is demonstrated by

the use of the round ball load in the civil war (higher speed expanding bullet) and by the use of the .45 caliber weapons in the Philippine war (larger caliber). The higher speed, larger caliber bullet had yet to be devised for standard defensive use in modern handguns. The FBI needed a validated test media to use in the evaluation of the bullet's effectiveness on a live human target, as shooting animals would probably be inconsistent. Based on the research of Dr. Martin Fackler, the 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. (Hall, 1989).

The FBI then went a step further in a logical direction. They figured that suspects are seldom naked and out in the open when in a violent encounter and therefore they devised a series of eight tests to more closely simulate a real world encounter: bare Gelatin (naked suspect) @ 10 feet, heavy clothing @ 10feet, 20 gauge sheet steel (car doors) @ 10 feet, wallboard (home interiors) @ 10 feet, plywood @ 10 feet, auto windshield glass @ 10 feet, light clothing @ 20 yards, and auto Glass @ 20 yards. The FBI then set about testing various loads in various calibers with a strong emphasis on ammunition for auto loading pistols as they felt that the pistol was a much more viable platform than that of the revolver. The FBI tested and liked the performance of the 10mm Auto cartridge (10mm is also .40 in caliber) in its commercial form but the agents objected to the commercial load's recoil and muzzle blast. The FBI's firearm's training unit's staff hand loaded some 10mm ammunition down to the level of commercial .45 auto and 9mm rounds and found that the lower velocity actually increased the amount of penetration in gelatin by reducing the amount of initial expansion of the hollow-point bullet. The testing revealed that the FBI reduced 10mm



load with the 180 grain hollow point bullet had a success rate in their tests of 97.5%. (Hall, 1989). Soon thereafter, Winchester Ammunition Company and Smith and Wesson (handgun manufacturer) realized that the 10mm light (FBI reduced load) would fit in a drastically shortened case and still deliver the same muzzle velocity or performance. This was the birth of a new cartridge known as the .40 Smith and Wesson or .40 S & W.

Does this mean that a police department should accept the test results of the FBI in 1989 and run out and purchase weapons chambered in 10mm light or .40 S& W? Well, perhaps not. The National Firearms Unit (NFU) of the Immigration and Naturalization Service (INS) looked at the FBI tests and decided that some of the FBI tests did not correlate with the uncontrolled scenario of an officer involved shooting. The NFU changed the angle of the windshield test and dropped the plywood test, as it seemed to be a duplicate of the wallboard test. Secondly the NFU noted that the FBI tests were all weighted equally and therefore favored projectiles that would have to pass through barriers 63% of the time. The NFU checked Border Patrol's record's and found that barriers were not encountered at anywhere near that rate. The NFU reviewed the files of their officer involved shootings and developed test criteria to try to match the real world shooting as closely as possible. The NFU testing favored and they eventually settled on a .40 S&W but with the 155 grain hollow point bullet instead of the FBI's 180 grain. (Sanow, 2000).

Does this mean that your agency should go out and use what the Border Patrol uses? While trying to serve a search warrant on a drug dealer's house, Marion County Indiana SWAT had a suspect attempt to run down team members and therefore the

suspect was fired upon. Both .223 rifle rounds and 165 grain .40 S&W ammunition failed to penetrate the windshield and or neutralize the suspect. Some of the bullets were actually deflected by the glass and this caused Marion County to test ammunition against automotive windshield glass. (McCardia, 2002).

Marion County Indiana SWAT found that in the .40 S&W the 155 grain bullets have the highest velocity and energy and the 180 grain bullets have the lowest velocity and energy with the 165 grain loads being in between. Their tests revealed that the handgun rounds with the highest energy penetrated the windshield glass with the least amount of deflection and the greatest potential for striking a suspect behind the glass. Also the tests showed that bonded and plated bullets do better against and after passing through glass than do conventional bullets. McCardia (2002) of the Marion Co. Sheriff's office stated "testing ammunition is critical to know what it can and cannot do; research other testing; but be sure that the testing is conducted by someone who does not have a personal or financial interest in the outcome of the testing" (p. 60). The FBI had already mentioned in earlier work that no one study can provide all the answers that could be asked about a particular subject. Many times, practical field experience and expert judgment will have to be included in the mix. (Sheers & Band, 1989).

It is important to consider where a small agency gets the data that is needed in this cost conscience day and age. This author has attended the Ammunition Performance Testing and Wound Ballistics Workshop when it was hosted by the San Antonio Texas Police Department on March 30, 2005. Agencies could attend for a nominal fee. The workshop was conducted by ATK, which is the parent company for the ammunition manufacturers, Federal, CCI, and Speer. ATK provided the ballistic

gelatin and needed equipment such as: clothing, glass and other barriers to shoot through before the bullet hits the test media. Attending a workshop is very helpful and cost effective if the hosting agency is not too far away. However, as stated earlier, it is better if the person testing the ammunition does not have a financial or personal stake in how the results turn out. Also a smaller agency may not have the drawing power of a lucrative ammunition contract that would cause a manufacturer to sponsor a workshop in close proximity.

Ideally, any agency, no matter how big or small, should be able to review their files and come to conclusion about what tests are relevant to their own unique situation and test ammunition themselves. The biggest stumbling block to conducting a terminal ballistics test has been the test media or simulated tissue. Ballistic gelatin is normally used and it has its drawbacks. It must be mixed properly and allowed to set up in large molds in a large refrigerator at 40 degrees Fahrenheit. Once removed from the refrigerator, it must be used within 20 minutes. It has a limited shelf life and will spoil as it is an animal product. (Price, 2005). There is an alternative. An agency can build a "Fackler box" (Smith, 2002) for a minimal cost. The box uses water as a test media and a simple formula to compare the results to ballistic gelatin. Once the Fackler box is completed, then the agency can tailor the barriers or lack thereof into their own unique test. (Smith, 2002).

## **METHODOLOGY**

The selection of proper patrol ammunition is something not to be taken lightly and should be carefully considered as the lives and safety of the officers and public are at stake. The first research question to be considered will examine whether or not a

bonded core bullet at a moderately high velocity will be the best choice. To address this question, the author will attend a Wound Ballistics Workshop hosted by the San Antonio Police Department in order to get an overview of how different ammunition will perform in a controlled testing environment. Once the bullets have been fired into the test media, the depth of their penetration will be measured. After the penetration has been recorded, the bullet will be recovered and its fired diameter measured. These variables will be plugged into the following formula that will determine the bullets permanent cavity or crush cavity:  $(\pi) (R^2) (P)$

Where:  $\pi = 3.1416$

$R = \frac{1}{2}$  the diameter of the fired bullet

$P =$  penetration of the bullet in inches

The crush cavity is a fair representative of a bullet's ability to damage an animate object. That is, bullets that disrupt the most amount of tissue in an effort to cause incapacitation by hemorrhaging or disruption of the central nervous system are likely to be the most effective. (Price, 2005). These results will be tabulated and placed on a chart.

The second research question deals with the opinion of this author that patrol ammunition selection at most agencies in the state of Texas is done in a haphazard way and/or is done with little or no testing of the ammunition with thought given to the manner in which the ammunition will be used. Due to the inability to get accurate or even coherent results from a web-based survey of agencies, the author opted for a more hands-on approach to the study. The author will distribute a survey among his 18 peers at the LEMIT module II in order to get information on how different agencies

select their ammunition. The survey (attached as Appendix 2) is a 17 question written survey including both multiple choice and essay questions. Once the information is retrieved, the multiple choice results will be calculated into percentiles and placed on a chart. The essay answers will be assessed to make any necessary modifications in the survey instrument.

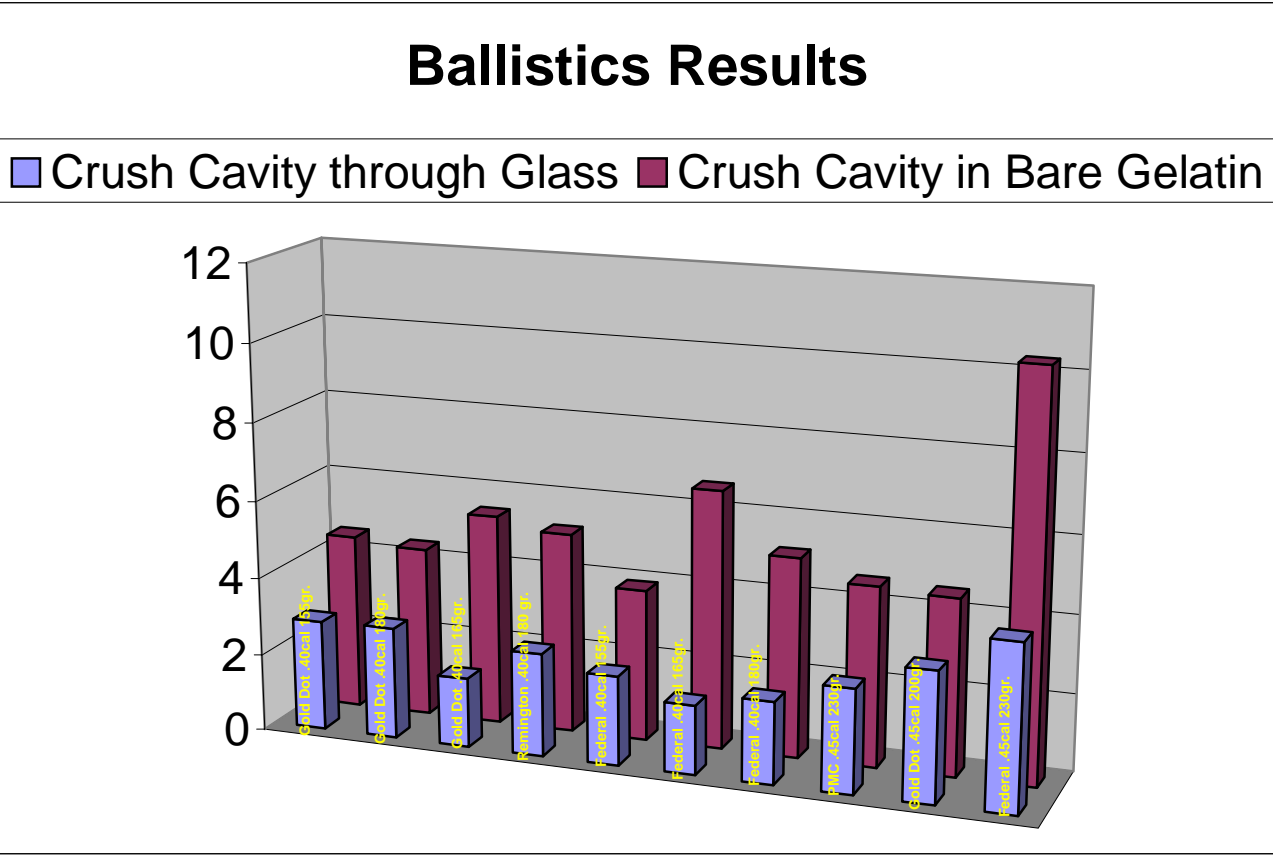
## **FINDINGS**

During the Wound Ballistics Workshop that this author attended in March of 2005, only the test events of bare gelatin and auto glass at 10' were conducted due to time constraints. Ten different rounds from four different manufacturers were tested. Of the ten rounds tested only one passed the FBI protocol of 12 inches of penetration in bare gelatin. A second round came extremely close to the 12 inch requirement and it should be noted that both of these successful rounds had standard jackets and not the bonded core.

Just because a bullet does not make 12 inches of penetration, does not necessarily take it out of the running as a successful design. One cannot say that if a round penetrates 11.75 inches, it is a failure and if it penetrates 12.25 inches, it is much better than the aforementioned 11.75 inches. (Price, 2005). However, as noted in the earlier review of literature, a bullet must penetrate deep enough to get to either the major organs, blood vessels, or the central nervous system. One should also take into account that in a dynamic, real world event, a bullet may have to pass through an offender's arm before entering the body. Again, this should be criteria set out by the individual agency that is conducting the test.

In the auto glass test, the bonded core bullets again failed to make the FBI requirement of 12 inches of penetration. Most of the bonded core rounds did well. However, penetration was generally greater and the expanded diameters much less. This proves the theory that expansion generally limits expansion by greatly increasing the amount of work that a bullet has to do to get to a given depth in body being penetrated. It is important to note that the standard hollow points that did well on bare gelatin, also did well on auto glass by meeting or almost meeting the FBI requirement of 12 inches of penetration.

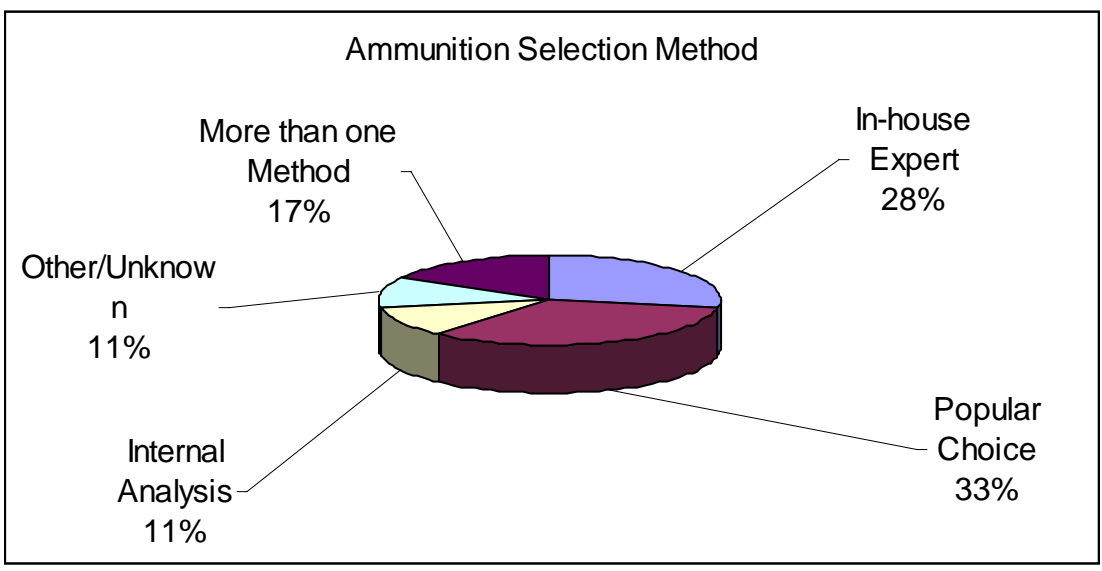
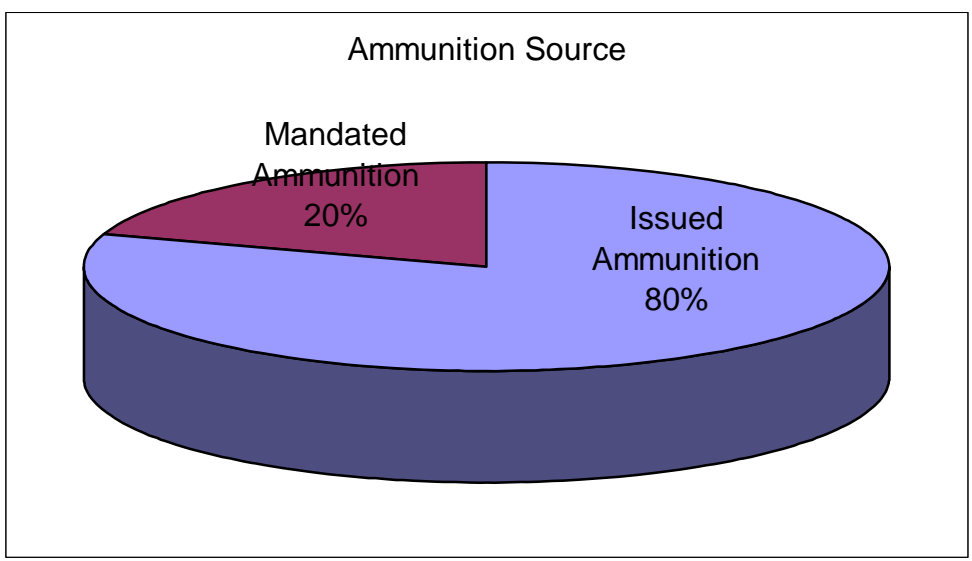
The average (bare gelatin and auto glass) permanent wound cavity or crush cavity produced by the .40 caliber bonded core bullets was 3.63 cubic inches. The average permanent crush cavity produced by the .40 caliber conventional construction rounds was 3.70 cubic inches with a difference of 2% being recorded in favor of the conventional core. The average crush cavity produced by the .45 caliber bonded core round was 3.93 cubic inches. The average crush cavity produced by the .45 caliber conventional rounds was 5.47 cubic inches with a difference of 48% being recorded in favor of the conventional core. The surprise of the whole test was that on the average a .45 caliber 230 grain fired at a moderately high velocity produced a crush cavity that was 85% larger than its nearest competitor. It was also the most reliable in the penetration category scoring an average depth of 11.625 inches putting it very close to the FBI's desired depth of 12 inches.



In keeping with the idea that agencies should know what their ammunition can and cannot do, a poll was conducted on LEMIT module II class #65 in order to ascertain how ammunition selection was conducted in their agencies. Of the agencies polled, 80% issued ammunition to the officer and the other 20% told the officer what ammunition they could use. Fifty-three percent used an in-house expert and 40% reported using what other agencies in the area used. Some of the reporting agencies used a combination of an in house expert and using what others in the area used. Only 13% of the reporting agencies cited research and testing as the deciding factor in choosing which ammunition to use. (See Table Below). The author believes that this is a hazardous trend when considering the safety of our officers and the public. The

author also asserts that it could also expose an agency to needless litigation when the selection of ammunition cannot be validated by accurate research.

Table 1





## **DISCUSSION/CONCLUSIONS**

The author feels that it is extremely utmost that proper ammunition be selected be selected for the patrol officer on the beat. Generally speaking these officers are relying on their departments to get them the best possible tools with which to do their jobs. As one can see in the case of the FBI Miami shoot out, that many times the lives of good people may hang in the balance. A failure to provide proper ammunition may have far reaching effects that no one intended. The family of an officer could be shattered by the loss of a loved one. A failure to stop an active shooter as in the case of the Columbine High School incident could cost the lives of non-combatants as well. Police administrators everywhere owe it to their personnel to get the best possible tools with which to do the job. This author's hypothesis was that most agencies in the state of Texas do not test ammunition prior to issuing it to their patrol officers and that a bonded core bullet fired at a moderately high velocity would do the best job of penetration, expansion, defeat commonly encountered barriers.

This study found that most agencies that responded to the survey do not test their own ammunition despite the fact that ammunition testing is neither difficult nor expensive. One should consider that the survey instrument that was employed only reached 18 agencies and perhaps a larger scale survey should be conducted in order to find out if the results hold true. It has been this author's experience in police work that many times no science or junk science is employed in the selection of police equipment and nowhere is this more prevalent than in the selection of weapons. It is the author's belief that because weapons and firearms in particular are used on such an infrequent

basis that little or no real consideration is given until something particularly bad happens.

Regarding the original hypothesis of the bonded core bullet being a superior performer in terminal ballistics, the author found that this is not necessarily so. In fact a .45 caliber conventional bullet fired at a moderately high velocity was an outstanding performer and clearly outstripped its nearest competitor. The conventional round was so effective that it skewed the averages on the crush cavity volume heavily in favor of the .45 caliber rounds that it was averaged in with. Again, more testing would be advisable with more manufacturers products being represented being the ideal situation.

This study proves that testing is highly necessary for individual agencies and the officers that they support and represent. Only with up-to-date testing can one be sure that the officers on the street have the absolute best equipment with which to protect their lives and the citizens that they are sworn to protect. As both ammunition manufacturers and the larger police laboratories regularly perform ballistics tests, this information is not difficult to obtain with moderate research effort. Police administrators should take note, research what their particular needs are, test ammunition under their own protocol, and select the best possible ammunition for their officers in their jurisdiction.

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## APPENDIX

### Appendix (1)

#### LEMIT ADMINISTRATIVE RESEARCH PAPER SURVEY ON PATROL AMMUNITION

The following survey is from Lieutenant Michael Beyer of the Victoria Police Department. It is needed to help fulfill the requirements of his Administrative Research Paper. On multiple choice questions merely circle or check the correct answer. Please feel free to make any comment that you like on your survey.

**Promptness is appreciated, but please, not at the expense of accuracy!**

Your assistance is greatly appreciated in advance.

#### PATROL AMMUNITION SURVEY

**I. Name of Department** \_\_\_\_\_

**A. Number of Sworn Officers** \_\_\_\_\_

**B. Primary Service Area?**

1. Rural
2. Urban
3. Both

**II. Departmental Weapons**

**A. Sidearm**

1. Does your department issue sidearms? Y/N
2. Does your department issue sidearm ammunition? Y/N
3. If ammunition is not issued, does the department mandate type and caliber? Y/N

Comments?

**B. Shotgun**

1. Does your department have shotguns available to patrol?  
Y/N
2. Does your department issue ammunition to those shotguns? Y/N
3. If ammunition is not mandated is type and gauge mandated? Y/N

Comments?

**C. Rifle**

1. Are rifles available on patrol? Y/N
2. Is rifle ammunition issued? Y/N
3. If ammunition is not issued, is type and caliber mandated? Y/N

Comments?

**III. Ammunition Selection**

**A. If your department issues ammunition and/or mandates caliber and type, please choose from the following and make any comments that you wish.**

1. After careful testing we decided to use \_\_\_\_\_

Because...\_\_\_\_\_

2. We have an officer who knows ammunition very well and we took his suggestion

3. We looked at other agencies (local, state, federal?) and just used what they are using.

4. We had a situation where a bullet failed to perform as expected and as a result we went to something different.

5. No one knows how we got our guidelines

**B. How often is ammunition re-evaluated by your department?**

1. Annually
2. Never
3. 2-4 years

4. 5-7 years
5. 7-10 years
6. Unknown

**IV. Terminal Bullet Performance**

- A. Has your agency ever experienced a bullet not performing as expected? Y/N**

**Check all that apply.**

1. Failed to penetrate a barrier\_\_\_\_\_
2. Over penetrated a barrier\_\_\_\_\_
3. Failed to stop a suspect after a good hit\_\_\_\_\_
4. Failed to euthanize an animal after a good hit\_\_\_\_\_

- B. If you had a failure, what was done afterwards?**

1. Nothing
2. We tested our ammunition
3. We went to different ammunition
4. Not Applicable

**V. Comments**

- A. Write down any comments you might have. This is your survey, feel free to be verbose!**

**Thank you for your participation!**

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