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**The Advantages of the 5.56mm/.223 Semi-Automatic Rifle versus the Shotgun or
Pistol Cartridge Carbine for Police Patrol Applications**

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ABSTRACT

Over the past century the use of the 12-gauge shotgun as the patrol officer's primary long-gun has remained constant. In spite of other advances, the mindset persists that the rifle does not have a place in the hands of the basic patrol officer. Law enforcement administration still clings to the mistaken belief that the shotgun is a safer and more effective weapon. While the pistol cartridge carbine offers an improvement in certain situations, they still lack the versatility and effectiveness for general law enforcement use.

The author submits that the 5.56/.223 caliber semi-automatic rifle is a safer, more effective and more versatile weapon for the patrol officer than either the 12-gauge shotgun or the pistol cartridge carbine. The patrol officer would be better served by the issuance and use of the 5.56/.223 caliber semi-automatic rifle for general service.

Research materials consisted of published texts from physicians, academics and professionals in the law enforcement field. Ballistic, penetration and expansion tests are examined and correlations made to law enforcement use. In addition to the written literature, the author also conducted independent testing of the different weapons using a panel of individuals that represented a cross-section of those expected to be found on patrol, or being recruited into, a typical police department in today's society.

Through the literature and testing, the author found the 5.56/.223 caliber semi-automatic rifle to have a distinct advantage over the other types of weapons for use by the basic patrol officer. The 5.56/.223 caliber semi-automatic rifle clearly becomes the superior long-gun for law enforcement use.

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Introduction

For well over a century, the 12-gauge shotgun has been the accepted standard as the police patrol officer's long-gun (Sparks, 1998). Traditionally, emphasis has been placed on officers becoming proficient with the standard duty handgun, with training in the use of the long-gun secondary. Typically, the officer's long-gun has been held in reserve for use in obviously hazardous situations, with specialized teams of officers (i.e. S.W.A.T., warrant teams etc.) or when an overt show of force was necessary. Unfortunately, the 12-gauge shotgun is no longer the panacea nor the "ultimate" weapon that it once was to end difficult deadly conflicts.

Just as the methodology, focus and accountability of the law enforcement community has evolved over the past one hundred years, so must the choice of the lethal force options that officers have at their disposal. Liability has become a major concern for law enforcement administrators from all walks of the profession. With the continuing population growth in most areas, coupled with the ever-increasing resourcefulness of those that would step outside the law, equipment and tactics that served well fifty years ago will no longer stand the test of time.

Due to the increasing numbers of individuals with smaller stature entering into the law enforcement profession coupled with officer survival concerns, the choice of lethal options available to the patrol officer has come under closer scrutiny over the past 10-15 years. The focus has begun to shift to deliberate, precise and controllable methods of delivering lethal force. The inherent difficulties and hazards associated with the use of the 12-gauge shotgun as the general-purpose patrol weapon are no longer acceptable (Ferguson and Lewis, 1991). The effective range of the 12-gauge shotgun with the

typical loading of #00 buckshot is relatively short (10-25 yards). Factor in the inherent inaccuracy, downrange hazard to bystanders, harsh recoil and slow reloading time and the shotgun becomes a poor choice of weapons in many circumstances (Roberts, 1998).

Over the past several years, many departments have experimented with and/or issued carbines or sub-machine guns (SMG's) chambered for pistol cartridges (i.e. 9mm, 40 S&W, .45ACP) for use in the patrol setting. While these carbines and sub-machine guns seem to fill a "niche", they all share one common drawback; they are chambered in calibers that are sub-standard in terminal performance to many of the commonly available rifle cartridges, i.e.: 5.56mm/.223, 7.62 NATO, etc.(Fackler, as cited by Roberts, 1998). This is especially apparent when encountering individuals wearing body armor. In many settings, an officer would be better served by using a semi-automatic rifle chambered for the 5.56mm/.223 cartridge (Fairburn, R., 1994).

The purpose of this paper is to explore and expound upon the advantages of the 5.56mm/.223 rifle in police patrol applications. A comparison of the 12-gauge shotgun, the pistol cartridge carbine and the 5.56mm/.223 caliber weapons systems will be made. The strengths and shortcomings of each system will be discussed and a correlation to police patrol applications will be made. The author has neither the time, nor the resources, to conduct independent practical experiments in ballistics, wound cavitation or similar avenues in order to collect data. Instead, such data has been collected from written texts prepared by authors with eminently more knowledge and expertise in those areas. To supplement that data, the author used other published materials and references. A brief, informal telephone survey was also used. In addition, the author conducted a

wholly non-scientific experiment in order to assimilate information to support, or dispute, the position of this text.

It is hypothesized that the advantages of using the 5.56mm/.223 rifle in the police patrol setting will prove to outweigh any apparent disadvantages. The superiority of the 5.56mm/.223 rifle in terms of ammunition capacity, downrange ballistics, safety to innocent parties and ease of reloading are quite apparent. It is further hypothesized that the 12-gauge shotgun and the pistol cartridge carbine cannot overcome their disadvantages using the same criteria. Those shortcomings should outweigh any perceived advantages that those types of weapons might have.

The implications of the findings can have a far-reaching impact in the law enforcement community. By convincing law enforcement administrators to break with tradition and commonly held beliefs, the right tools can be placed into the hands of the patrol officer. With the correct tools, the patrol officer will become safer, more effective and increasingly confident. That will translate into greater safety and security for the civilian population who look to law enforcement professionals for protection.

Review of Literature

Community Oriented Policing, pursuit policies and the exploration of less than lethal options have all been discussed ad infinitum. Arming the basic patrol officer with a rifle or carbine, as opposed to the traditional shotgun, has received much less attention. Until recently, there was not an abundance of available literature because other subjects were considered more relevant and “politically correct.”

In February of 1997, the infamous North Hollywood (Los Angeles) bank robbery helped to bring the subject to the forefront and brought about additional texts and studies re-examining the feasibility of arming patrol officers with rifles (Bradley, 1999). It is not the author's intent to discuss this particular event in detail but to propose that the officers were at a distinct disadvantage for several reasons. First, the 9mm handguns and the twelve gauge shotguns (loaded with buckshot and slugs) that the officers used failed to penetrate the body armor of the suspects. Second, the officers were forced to engage the robbers at an extended distance due to the nature of the weapons being fired at them. Third, the officers at the scene did not have the means in which to deliver precise, well-aimed shots into the heads of the suspects. A tactical team, which presumably had the correct weapons to counter the threat, had been summoned to the scene but had a lengthy response time. It was not until the patrol officers managed to secure AR-15 rifles (5.56mm/.223) from a nearby sporting goods store that the battle began to shift.

The North Hollywood incident demonstrated the inadequacy of the common police weapons in certain situations. Accurate, aimed rifle fire would have addressed the situation with a minimal impact and would have ended the felony in a much quicker manner. Handguns and shotguns are no longer adequate weapons for the patrol officer, who is usually the first on the scene of such incidents (Huntington, 1997). In the aftermath of the robbery, the Los Angeles Police Department conducted a two (2) year test plan, which included officers carrying .45 caliber handguns in place of their standard 9mm handguns, and allowing some Sergeants to carry M-16 (5.56mm/.223) rifles in their patrol cars (Malinowski, 1997).

Practitioners such as Dr. Marvin Fackler and Dr. Gary Roberts have both conducted studies aimed at satisfying questions posed by the military when trying to determine the effectiveness of small arms projectiles. Most of Fackler's research was done in a military setting, studying actual wounds, trauma and projectile characteristics. Several of Dr. Fackler's studies have crossed-over into the civilian medical community, as well as having been used as the basis for testing by Federal law enforcement agencies. Dr. Gary Roberts has also attempted to correlate his work with the applicability to law enforcement by comparing the characteristics of many of the commonly used law enforcement small arms. Much of the material comes from members of the law enforcement community that have experience in the use of different weapons in a variety of settings. These authors have had vast experience in the practical applications of different weapons, and the effectiveness of each of those weapons systems.

In the 1970's through the late 1980's the 12-gauge shotgun was still considered the most effective long-gun that the patrol officer had at his/her disposal (Williams, 1977). The shift of opinion among knowledgeable professionals in the field has become steady, with training in patrol rifle tactics increasing each year (Sanow, 2001). Yet, there are still those that believe that the rifle is best left in the hands of specialized units largely due to the perceived hazards of the weapon, and the general reluctance to deviate from tradition (Pilant, 1992). Bucholz (1999) makes reference to the fact that rifles are not necessary for most street officers, and that only SWAT or other certain officers will have use for them. In the same text he then tends to support the pro-rifle faction by recounting the North Hollywood bank robbery. He points out the apparent inadequacy of

the patrol officers' weapons against the suspects' body armor, and then submits that the conflict was not ended until rifles were procured and used by the police.

Over the past few years, there has been an increased awareness that criminals are using larger, more powerful, weapons. The law enforcement community has also seen a rise in the numbers of felons using body armor during the commission of their crimes, and it is predicted that law enforcement will continue to see an increase in confrontations with felons wearing body armor. The ability to penetrate body armor designed to defeat handgun and shotgun projectiles will become a significant factor (Fackler, 1984). Studies have repeatedly shown that pistol cartridge and shotgun projectiles (buckshot or slugs) will not usually penetrate soft body armor at combat ranges, however the 5.56mm/.223 has been proven to reliably penetrate soft body armor in most circumstances (Roberts, 1998 and Taubert, 1993,1994). Accordingly, possessing the means to penetrate body armor worn by an adversary is obviously desirable. This becomes especially true when the adversary happens to be firing at officers with a large weapon, from a distance somewhat greater than the effective range of the standard duty handgun or shotgun.

The ammunition capacity of each type of weapon also becomes a pertinent factor in this type of engagement. The standard police shotgun has an ammunition capacity of 4-6 rounds, meaning that having to reload in an extended engagement is common. On the other hand, the capacity of the pistol cartridge carbine and the 5.56mm/.223 semi-auto is typically from 10-30 rounds, both being magazine fed. This allows for a longer time-of-engagement, plus makes reloading much quicker and easier, especially under pressure (Farnam, 2001).

In the past, it was not at all uncommon for a police recruit to have had previous experience with firearms, either in the military or the hunting fields. The shotguns commonly used in the police setting at the time were quite familiar to them, albeit with shorter barrels (Ferguson and Lewis, 1991). The profession has become much more diverse in recent years and the typical police recruit (male or female) has had little or no experience with any kind of firearm, let alone a shotgun or rifle. Because of this, law enforcement agencies have also seen a rise in the liability issues related to police firearms training, or specifically a lack of proficiency by officers with a given weapon. The rifle, or carbine, has started to become an attractive alternative to the shotgun because many officers are more comfortable with the rifle since it allows more precision, while at the same time delivering a powerful blow without abusing the shooter (Fairburn, R, 1994). Cascio (1996) points out that many police officers “take offense” at the stout recoil of a load of buckshot being fired from a shotgun, which is roughly equivalent to that of a .375 H & H rifle. To get them to fire the number of rounds needed to gain proficiency, on a regular basis, is all but impossible. Both the pistol cartridge carbine and the 5.56mm/.223 rifle offer greatly decreased recoil when compared to the shotgun.

When deadly force is used by a police officer the primary goal is the immediate incapacitation of the aggressor, this is accomplished by two means. The first being a psychological incapacitation, i.e.: the reaction to being shot. The second is physiological incapacitation from the wounds themselves. Permanent (crush) cavities and temporary (stretch) cavities cause damage to the major organs of the body causing blood loss and interruption of the nervous system. When enough vital areas are affected, or the central nervous system is damaged, incapacitation and/or death follow quickly. A study of one

hundred and eighty (180) police-involved shootings done over a three (3) year period of time showed that many felons continued to pose a threat to officers after being hit by small arms fire. This indicates the importance of being able to place a shot at the points of the anatomy that will incapacitate the aggressor quickly; primarily into the major organs of the thorax (heart, lungs, large blood vessels) and into the central nervous system, i.e. the head/face (Fairburn, D., 1993).

Most shotgun or handgun projectiles (even fired from a carbine) do not provide the consistent performance needed to insure a large permanent or temporary wound cavity in soft tissue (flesh). However, the performance in soft tissue by 5.56mm/.223 caliber rounds suitable for law enforcement use has shown to be excellent in most cases. The 5.56mm/.223 projectile penetrates less than either the shotgun or handgun projectile and fragment upon striking soft tissue creating many wound channels, affecting several organs of the body. The separate missiles created by the fragmenting projectile often increase the areas affected by the permanent wound cavity (Roberts, 1998). Shotgun and handgun projectiles have shown to penetrate greater distances in soft tissue and over-penetration becomes a concern with the projectiles exiting the body and becoming a hazard downrange. The decreased penetration of the 5.56mm/.223 projectile can actually become an advantage because the projectile (and kinetic energy) stays within the body of the adversary.

At best, the shotgun is an intermediate range weapon (10-25 yards). Past that point the buckshot begins to spread past the desired optimal pattern. One cannot guarantee that all of the nine pellets of the standard 2 ¾" loading will stay within the torso of the intended target. Projectiles that do not strike the intended target become a

hazard down-range. Slugs offer a bit of an advantage in the range of engagement (25-75 yards), but the crude sights on many police-issued shotguns prohibit precise aimed fire past 50 yards (Ferguson and Lewis, 1991). Rifled barrels are available for specific use of slugs in shotguns. Much like the rifling in the barrel of a pistol or rifle, the lands and grooves inside a rifled barrel impart a spin on the slug to stabilize it in flight. Coupled with good sights this helps to increase the effective engagement range to 75 yards. The drawback is that buckshot and specialty munitions perform quite poorly when fired from a rifled barrel. Buckshot has a tendency to “fly” to the outside of the pattern, leaving nothing in the center where it's needed. The pistol cartridge carbine is also an intermediate range weapon. Keeping in mind that the projectile is being launched from a pistol cartridge, the effective range still only stretches to 75 yards. On the other hand, the 5.56mm/.223 caliber rifle has an effective range by the average user of 75-125 yards. In the hands of a seasoned shooter, the range can be extended to 200 yards with iron sights (Farnam, 2001).

There are others that favor carrying both a shotgun and a rifle in each patrol car. While the rifle offers a distinct advantage over the shotgun in many circumstances, shotguns have proven to be reliable, versatile and, maybe most importantly, available (Dorman, 2001). The major attribute of the shotgun lies in the area of specialized munitions. Most of the literature agrees that the shotgun has a place in the patrol car for those instances when the delivery of specialized projectiles is called for. The 12-gauge shotgun can deliver baton rounds, “Bean Bag” rounds, “Door Busters” and Oleoresin Capsicum projectiles. A rifle or pistol caliber carbine cannot hope to match the versatility of the shotgun in this arena (Sanow, 2001).

While much attention has been devoted to the 12 gauge vs. 5.56mm/.223 rifle debate, the pistol cartridge carbine has been largely ignored in a majority of the literature. Much of the support for the pistol cartridge carbine comes from those that believe that the 5.56mm/.223 is “too powerful”. Translated that means “too much penetration” (Fairburn, R., 1994). The option of a lesser-powered weapon, sometimes using the same ammunition as an officer's primary weapon also becomes very attractive to some. This is especially true in the urban settings where there’s fear of a rifle projectile traveling for miles if it misses its intended target (Pilant, 1992). Both Roberts (1998) and Taubert (1993, 1994) have shown (in numerous tests) that the 5.56mm/.223 caliber actually penetrates less in mediums such as sheetrock, wood or tissue. On the other hand, the same tests have shown that pistol cartridges and shotgun projectiles (buckshot and slugs) fail to expand in many of those mediums and penetrate far more than the 5.56mm/.223 caliber projectiles. The 5.56mm/.223 caliber projectiles will also fragment upon striking many of the surfaces found in the area of use, while shotgun and pistol projectiles will retain most of their weight and travel downrange (Roberts, 1998).

One of the main reasons that law enforcement administrators are reluctant to part with the 12-gauge shotgun is because they already have them in their inventories. A recent study showed that the Colt AR-15 was the most popular rifle in the departments that chose to issue rifles (Huntington, 2001). Each of these rifles can cost \$650.00-\$950.00 each. This figure can become quite daunting to a police administrator already trying to squeeze every nickel from their budget. Ruger, Heckler and Koch, Bushmaster etc. all make 5.56mm/.223 caliber rifles that will work well for police service. The price tags for these rifles will vary. Pistol cartridge carbines are available from Ruger, Marlin,

Colt and others. These carbines can be had from prices starting at around \$200.00 up to approximately \$650.00 for the Colt M-4 (Pollack, 2001). For a department already equipped with 12-gauge shotguns the initial cost can be somewhat dissuading. While it is true that the addition of the 5.56mm/.223 rifle will require a sizeable amount of the budget, the savings in the long-run can well prove many-fold greater. Decrease in training time, lower ammunition costs, improved chances for officer survival and decreased liability from lawsuits associated with injured bystanders can prove to be an excellent return on the investment.

Ammunition costs can also be a factor. Shotgun ammunition can cost up to \$1.25 per cartridge for buckshot or slug loads. Extensive practice with these rounds can be very costly. The pistol cartridge carbine offers a bit more of cost break. Most of the pistol ammunition needed to fuel these weapons can be purchased for less than twenty (20) cents per round. The higher cost duty ammunition need not be used for extended practice. On the other hand, thousands of rounds of 5.56mm/.223 caliber ammunition can be found on the surplus markets. When bought in bulk, the cost per round can be as low as 7.5 cents per round.

Methodology

Has the 12-gauge shotgun outlived its usefulness as the standard long-gun for police patrol applications? Does the 5.56mm/.223 caliber semi-automatic rifle offer distinct advantages over the 12-gauge shotgun or pistol cartridge carbine for the patrol officer? It is the opinion of the author that the material presented in this text will clearly

indicate so. The author believes that the data shows that the 5.56mm/.223 caliber semi-automatic rifle offers many advantages over either of the other two weapons systems.

Published data was primarily used for the preparation of this text. In addition to the published material, two (2) other instruments were used to help compile information relevant to the work. The first was an informal telephone survey of police administrators or firearms instructors from law enforcement agencies of various sizes. The survey was aimed at developing an idea of the general feeling towards the use of the 5.56mm/.223 semi-automatic rifle for patrol officer's use (a sample survey questionnaire is shown in Appendix I).

The second instrument used was a wholly unscientific test conducted by the author. A panel of participants was asked to shoulder and fire each type weapon being compared in this text. The specific weapons used were a Colt AR-15A3 5.56mm/.223 caliber semi-automatic rifle, a Marlin .45 ACP "Camp Carbine" and a Remington 870 12-gauge pump action shotgun. The panel consisted of five (5) participants that had no background in law enforcement. The participants included two (2) females and three (3) males. The ages of the females were 22 and 37 years old. The ages of the males were 20, 26 and 36 years old. All of the participants had at least a passing familiarity with some sort of weapon, ranging from firing a .22 caliber pistol to occasional hunting with a larger shotgun or rifle. The intention of the experiment was to gather a "cross-section" representation of the types of individuals that would be found on patrol duty, or newly recruited, in a typical police department. While there are older individuals found on patrol, it has been shown that most officers assigned to routine patrol are under the age of forty.

The test consisted of each participant firing each type of weapon at a standard “B-27”-type target from a distance of twenty-five (25) yards. The participants were shown how to manipulate the working mechanisms of each weapon and had a chance to handle and test fire the weapons prior to the test. Each participant fired two (2) shots in rapid succession from each weapon in a simulated combat scenario. This was done three (3) times for a total of six rounds being fired from each weapon at the target. Ammunition used for the 12-gauge was a standard 2 ¾” buckshot loading commonly found in use by law enforcement agencies. Ammunition for the 5.56mm/.223 and the .45 ACP were also commonly used types. For safety purposes, each participant was required to wear eye and ear protection. The participants were then asked to reload each weapon five times, starting with an empty weapon and charging the weapon to its full capacity. In the case of the shotgun this meant loading five (5) rounds into the magazine tube. For the Marlin and the Colt this was a matter of ejecting the empty magazine and inserting a loaded magazine.

Data recorded during the test fell into four categories. The categories were: 1) the average time between the first and second rounds fired for each type weapon, 2) the average time to reload the weapon, 3) the number of projectiles outside of the “7 ring” of the target and 4) the general confidence level when using each kind of weapon. While the last category is purely subjective, it is important in order to assess whether being “comfortable” with a weapon plays a role in its use. The use of the “7 ring” of the target as a boundary was based on the author’s belief that any projectiles outside of that area of the target would probably translate to a “miss” on a human target. This becomes

especially true if the “target” being fired upon is standing at an angle to the shooter, or is moving.

Findings

Performance testing conducted by Roberts (1998) using 10% Ordinance gelatin showed that many of the commonly used 9mm, .40 Smith and Wesson, .45 ACP and 12-gauge projectiles penetrated and expanded satisfactorily. The lighter weight (less than 55 grain) 5.56mm/.223 projectiles did not penetrate reliably and fragmented prematurely. However, many of the 5.56mm/.223 caliber projectiles weighing 55 and 60 grains penetrated reliably and then fragmented, creating a diffuse wound cavity. The observations of the 5.56mm/.223 conducted by Fackler (1984) produced almost the same results. The wounds created by the fragmenting 5.56mm/.223 round proved to cause severe damage to the area of entry, without excessive penetration. However, several of the shotgun slugs showed a tendency to over-penetrate creating a potentially hazardous situation.

The ammunition was then test fired into replicas of interior walls (2x4's, and ½" sheetrock). All of the 9mm, .40 Smith and Wesson and .45 ACP projectiles failed to expand and exhibited excessive penetration. The hollow points of the pistols rounds plugged with the building materials and performed nearly identically to full metal jacket projectiles. The terminal performance of the 12-gauge buckshot and slug projectiles did not appear to be altered and the expansion and penetration of those rounds appeared to be nearly identical to being fired into the gelatin. Several of the 5.56mm/.223 caliber rounds that were fired through the interior wall replicas showed significant differences in

terminal performance as compared to the gelatin testing. Many fragmented upon striking the interior wall, or began to show signs of deformation that reduced their penetration (Roberts, 1998). All of the 5.56mm/.223 caliber projectiles showed to have significantly less penetration than either the pistol or shotgun rounds. The 5.56mm/.223 caliber bullets would seem to offer a reduced risk to bystanders if a stray round misses the intended target and strikes an interior (or exterior) wall (Taubert, 1993,1994).

As discussed previously, the penetration of body armor could well become a significant factor in evaluating the effectiveness of a weapon carried by the patrol officer. As expected, testing has shown that all of the 9mm, .40 Smith and Wesson and .45 ACP ammunition commonly used by law enforcement agencies failed to penetrate NIJ Level IIA body armor (Fairburn, R., 1994 and Roberts, 1998). Standard 12-gauge buckshot projectiles also failed to penetrate the body armor and shotgun slugs exhibited variable performance, with some slugs failing to penetrate and others penetrating the armor easily. All of the 5.56mm/.223 caliber projectiles reliably penetrated the body armor (Roberts, 1998).

The studies conducted by Roberts and Fackler would seem to support the theories proposed by several of the law enforcement professionals, though by way of different results. Roberts and Fackler used terminal ballistic data, penetration tests and wound cavitation data to support their conclusions. Law enforcement authors base their conclusions on past experience as well as the studies and observations of police officers and the deadly force encounters they face.

Tests designed and administered by the author were used to supplement the data compiled by the professional authors and physicians. The data collected measured

specific qualities of each type of weapon in practical “real-world” applications. Using the five participant panel, information was gathered in regards to the performance of the three different weapons in the hands of a diverse group of individuals. While the results are by no means all conclusive, they did provide insight into the advantages and disadvantages of each type of weapon. The results are listed in Table I (see below).

Table I: Panel Testing of Different Weapons Systems

Participant #	12 gauge shotgun			AR-15 Rifle			.45 ACP Carbine		
	Avg. time to 2 nd shot	Avg. time to reload	# of project. outside target	Avg. time to 2 nd shot	Avg. time to reload	# of project. outside target	Avg. time to 2 nd shot	Avg. time to reload	# of project. outside target
#1	1.57 secs.	7.75 secs.	5 = 9.25%	0.54 secs.	2.16 secs.	0	0.55 secs.	2.41 secs.	0
#2	2.35 secs.	8.41 secs.	8 = 14.81%	0.68 secs.	2.41 secs.	0	0.66 secs.	3.25 secs.	0
#3	1.25 secs.	6.50 secs.	1 = 1.85%	0.44 secs.	1.83 secs.	0	0.46 secs.	1.97 secs.	0
#4	2.70 secs.	8.55 secs.	8 = 14.81%	0.72 secs.	2.68 secs.	0	0.74 secs.	3.31 secs.	0
#5	1.41 secs.	7.93 secs.	3 = 5.50%	0.48 secs.	2.21 secs.	0	0.48 secs.	2.75 secs.	0

Making comparisons between the different weapons can further summarize the data. The average time needed to reload the 12-gauge shotgun by all five participants was 7.82 seconds. Compared to the average of 2.25 seconds used to reload the AR-15 and 2.71 seconds needed to reload .45 ACP carbine, it took between 5.11 and 5.57 seconds longer to reload the shotgun. This translates to a 55-59% decrease in the average time to reload the rifle or the carbine. Time-to-second shot averaged 1.85 seconds with the

shotgun, compared with the 0.57 seconds for both the AR-15 and the .45 ACP carbine, an improvement of 69%. As noted in Table I, none of the 5.56/.223 or .45 ACP projectiles strayed outside of the target area. Using the shotgun with buckshot loads the group managed to land 25 out of a total of 270 projectiles out of the target area. While individual percentages for each participant varied, as a group the total equated to a 9.25% combined miss rate.

Each participant was also asked to provide subjective data regarding all three of the different weapons. Four members of the group considered the blast and recoil of the shotgun to be somewhat intimidating and painful. The one remaining member considered the shotgun “unpleasant” to shoot with the buckshot loads, but the previous hunting experience of this participant helped to overcome the detrimental effects of the noise and recoil. The group as a whole agreed that the recoil and blast of the shotgun contributed significantly to the slow time-to-second shot as well as the numerous target misses.

The entire group agreed that the AR-15 was the easiest weapon to reload. Many considered the smaller magazines and controls of the Marlin Camp Carbine to have been a factor in the slower reload time. All said that they had gotten somewhat “flustered” when trying to reload the shotgun against the clock. This was attributed to the cumbersome loading mechanisms of the shotgun as well as the large size of the individual cartridges having to be manipulated into the loading port.

In terms of the overall handling characteristics of each of the weapons the unanimous conclusion was that the shotgun was the least desirable to handle and use. In regards to the other two weapons the group was somewhat split. Two (2) of the members considered the Camp Carbine to be the easiest to handle and shoot. The remaining three

(3) participants thought the AR-15 to be the most conducive to better marksmanship because of the different weight and balance. Two (2) of the participants considered the iron sights of the Marlin to be a hindrance, as compared to the iron sights of the AR -15.

Out of twenty (20) departments surveyed a total of six (30%) either issued the 5.56/.223 semi-automatic rifle to each patrol officer, or allowed for officer-owned rifles to be carried. Three (15%) allowed only certain officers to carry a rifle on a case-by-case basis. Eleven (55%) out of the twenty departments considered the 12-gauge shotguns as standard equipment in each patrol unit.

Discussion/Conclusion

Has the 12-gauge shotgun outlived its usefulness as the general-purpose law enforcement long-gun? Do the inherent hazards associated with the use of the shotgun in many settings outweigh the advantages that the weapon might possess? Could another type of weapons system replace the shotgun in a role held for over a century and fulfill the task safer and more effectively? The purpose of this study has been to explore those questions and explore the options available to law enforcement; specifically by making comparisons of the shotgun, pistol cartridge carbine and the 5.56mm/.223 semi-automatic rifle. From the onset of this endeavor the author hypothesized that the study and testing of the three different weapons would support what many professionals have believed for several years; that the 5.56/.223 semi-automatic rifle has distinct advantages over both the 12-gauge shotgun and the pistol cartridge carbine in the patrol setting.

The data gathered indicates that the 5.56mm/.223 semi-automatic rifle is clearly an effective and versatile weapon. The 5.56/.223 semi-automatic rifle is capable of

serving as a short, intermediate and long (100+ yards) weapon, giving the patrol officer the adaptability needed to confront most threats. The bulk of the testing conducted by professionals, as well as the author's own independent tests, appear to draw several similar conclusions, which can be summarized by weapon type. The 12-gauge shotgun has limitations and drawbacks in its use, the most prevalent being:

- Short effective range (10-25 yards) with buckshot
- Severe recoil
- Slow reloading time
- Hazard to bystanders due to poor control of projectiles to target
- Excessive penetration in urban settings
- Cannot penetrate body armor

The shotgun does have the decided advantage in the delivery of specialized munitions.

Pistol cartridge carbines also have limitations that hinder their use:

- Limited incapacitation potential when compared to the shotgun or 5.56mm/.223 rifle
- Short range of engagement (25-75 yards)
- Excessive penetration in urban setting
- Cannot defeat body armor

The pistol cartridge carbine has an advantage of reduced recoil and faster reloading time, when compared to the shotgun.

The 5.56mm/.223 caliber rifle can offer significant advantages over the other types of weapons:

- Greater incapacitation potential than pistol or 12-gauge projectiles

- Greater range of engagement (up to 200 yards)
- Reduced penetration in urban areas, and reduced hazard from ricochet
- Reduced recoil
- Faster reloading
- Penetration of body armor

Though not without its limitations, the 5.56mm/.223 semi-automatic rifle in the hands of the patrol officer can be an effective weapon in many situations. With the correct ammunition the 5.56/.223 rifle is capable of being used for perimeter containment, close quarter battle, hostage rescue, sharpshooter support and general patrol duties (Roberts, 1998). This equates to versatility that neither the shotgun nor the pistol cartridge carbine cannot hope to match.

Delivery of deadly force by law enforcement is an area fraught with litigation. The choice of weapons that are used to deliver deadly force must be an informed and conscientious decision. The role of the patrol officer has become more diverse, with officer's being called upon to face new challenges while protecting the safety of the public. By honestly and objectively evaluating the needs of those officers law enforcement can place the correct tools in the hands of those that need it most. Having the correct tools will help improve officer confidence, making the officer safer and more effective. This will translate to enhanced safety for the public.

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APPENDIX

A.R.P. Telephone Survey Questionnaire

Name: _____ Agency: _____

1. Does your agency issue rifles for use by all patrol officers? _____

2. Does your agency allow officer-owned rifles to be carried? _____

3. Does your agency use shotguns as standard equipment in each patrol unit?
