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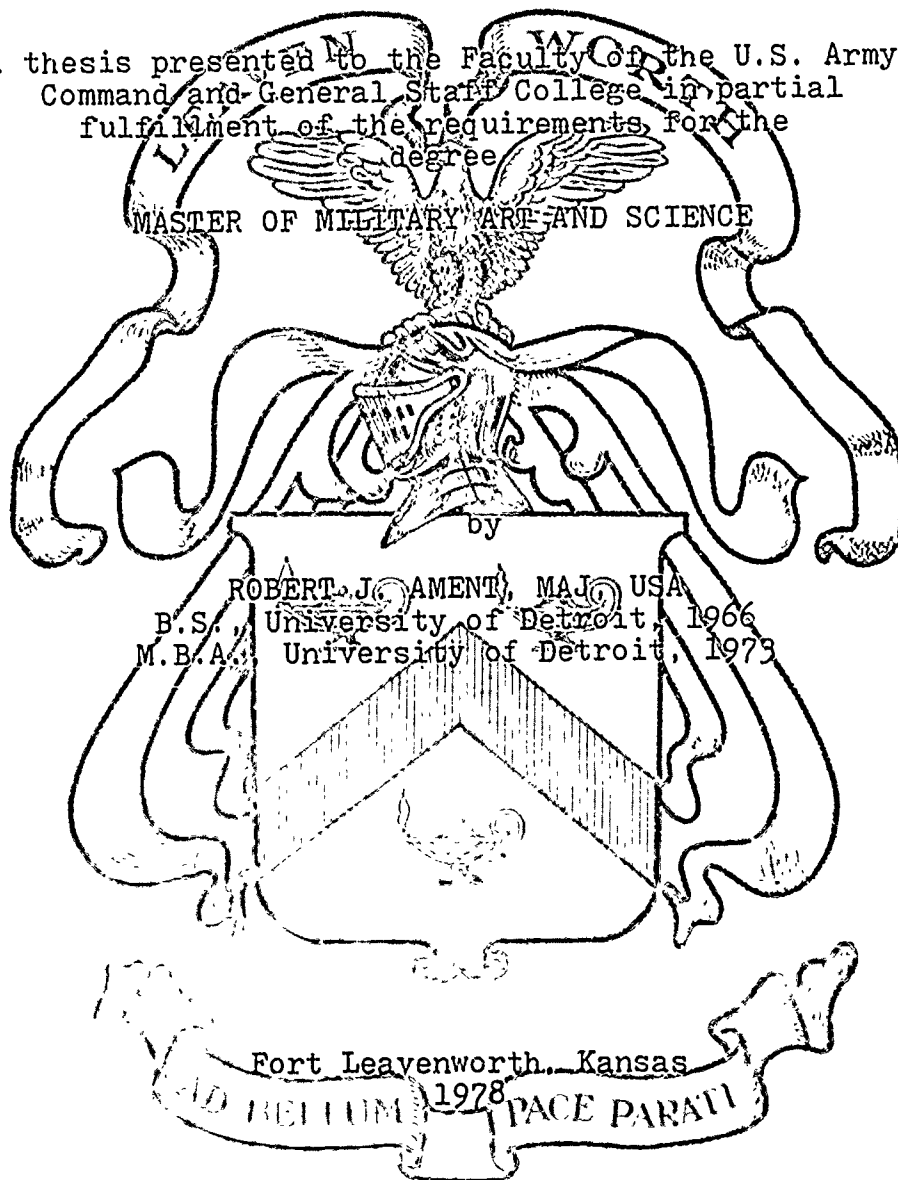
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US MILITARY HAND GUNS: EXAMINATION OF
LITERATURE FOR THE LAST TWENTY YEARS

A thesis presented to the Faculty of the U.S. Army
Command and General Staff College in partial
fulfillment of the requirements for the
degree

MASTER OF MILITARY ART AND SCIENCE



by

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US MILITARY HAND GUNS: EXAMINATION OF LITERATURE FOR THE
LAST TWENTY YEARS

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Name of candidate Robert J. Ament, Major, Ordnance

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ABSTRACT

US MILITARY HAND GUNS: EXAMINATION OF LITERATURE FOR THE LAST TWENTY YEARS, by Major Robert J. Ament, USA

This paper attempts to consolidate and categorize the extensive literature available that relates to US Army military hand guns, and to provide analysis of that information for future studies and decisions.

My literature search reveals that the usefulness of sources listed in priority is as follows: Defense Documentation Center, Air University Index, gun enthusiast magazines, and Readers' Guide to Periodical Literature.

Recommendations include questions for future efforts in the following areas: commercial hand guns, M1911A1 modifications, training, hand gun design, bullet design, manufacturing, multi-projectiles, machine pistols, costs, and microballistics.

ACKNOWLEDGEMENTS

One of the greatest temptations to a graduate student is to attempt to solve all the world's problems with his thesis. Fortunately, my consulting faculty and research faculty advisors, liberally provided their expertise and guidance, and for all their assistance, I thank them. As a result, my end product was within the scope of my capabilities and resources. It should serve as a useful reference in the area of military hand guns.

A special thanks to my wife Mary for her encouragement. Lastly, with the help of my four "cookie monsters" Elizabeth, Joseph, John, and Robert, attainment of this relatively straightforward task became a rather significant challenge.

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CHAPTER I

INTRODUCTION

Numerous materials have been written on military hand guns over the past twenty years, but disagreement as to the optimum weapon still persists. Current government funding for research, development, and testing is austere.

The time has come to sit back and reflect on where we have been. Fresh insight into the past may be helpful to decide where and how we should proceed. This document serves as a reference for future efforts relative to the adoption of a US military hand gun.

The goal is as follows: Consolidate and categorize the extensive literature available that relates to US Army military hand guns, and to provide information that will be useful for future studies and decisions.

The literature search included pertinent documents published on this subject from 1955 to 1978. The majority of material came from three sources: Readers' Guide to Periodical Literature, Air University Index, and the Defense Documentation Center. Most people are familiar with Readers' Guide, and are aware that it lists articles found in popular magazines. In fact, it indexes topics from approximately 155 general interest periodicals. Similar in concept to the Readers' Guide, the Air University Index

lists subjects addressed in 73 military and aeronautical periodicals. The volumes originate from the Air University Library, Maxwell Air Force Base, Alabama. At the Defense Documentation Center (DDC), Cameron Station, Alexandria, Virginia, approximately 1,200,000 technical reports are on file. DDC terminals located at Department of Defense agencies and libraries across the country have computer indexing of almost 900,000 of these documents.

In most general libraries, a person would be fortunate to find one or two books that relate to military hand gun design or testing, because the majority of hand gun books are oriented toward the collector. Therefore, books were not evaluated. Correspondingly, foreign literature was not read. Initial research indicated that little salient additional information would be provided by the inclusion of foreign material.

All together, this paper addresses over 100 documents that appear to be representative of the literature available on this topic. An annotated bibliography is also provided.

In searching for information that would be useful for future US military hand gun design, a variety of headings were investigated. In this area, the Readers' Guide was exceptionally frustrating. Examining over twenty years took almost twenty indexes. In each one, headings

such as pistols, revolvers, firearms, and small arms had to be evaluated. Approximately 400 articles surfaced, but only 45 appeared pertinent. For example, material on hand gun control and legislation was plentiful. Of the 45 articles, only 14 were determined to have relevance for inclusion in the bibliography; qualitatively, they were among the least useful. Because Readers' Guide only claims to index general interest literature, another approach was necessary. Two gun enthusiast magazines were selected: Guns & Ammo*, and The American Rifleman. Most libraries do not store enthusiast type magazines over a year. However, solely by evaluating articles written in 1977, 12 relevant articles were found in Guns & Ammo. A full twenty years of The American Rifleman revealed 23 useful articles. In most cases, the worth of articles found in these two gun enthusiast magazines was greater than those found through Readers' Guide.

As one might expect, military periodicals contained more pertinent information on this subject than civilian publications. Twenty-three writings obtained through the Air University Index are addressed in this paper. Additionally, the International Defense Review was examined. However, it was dropped from consideration after reviewing

*Magazine titles are indicated by underlining while quotation marks are used for articles in the magazines.

microfilm since 1972 without one significant finding.

The best source of information came from the DDC. Unlike the subjective articles, the technical reports offered objective and validated information that could be used to test opinions provided in the other articles. Thirty-one of these reports are included. The DDC terminal has two significant advantages over the Readers' Guide and Air University Index. Besides the title and standard bibliographical information, the DDC terminal offers an abstract of the document. Second, the DDC terminal provides all related works to a topic regardless of the year. Using the Readers' Guide or Air University Index, the researcher is required to look through a number of volumes to cover any substantial length of time.

CHAPTER II

BACKGROUND

Obviously, literature relating to US military hand guns devotes a substantial amount of time discussing John M. Browning's 1892 design Colt .45 caliber automatic* pistol. The Colt Arms Company began production in 1909 and two years later, it was introduced into the active Army as the M1911.¹ Six minor modifications in 1921 created the M1911A1 which is still used by our military today almost seventy years later.²

The literature search divided into four main attitudes toward the M1911A1 pistol. The first school of thought advocated the retention of the current M1911A1. It is argued that the Colt .45 will adequately perform and that no alternative can justify the cost of replacement. A second school was to modify the M1911A1 to improve its performance characteristics. Improvements in accuracy and a double action** trigger configuration are most often advocated. Rather than wait many years for the "hand gun

*Although referred to as an automatic, the "45" is actually a semiautomatic. One round is fired each time the trigger is pulled.³

**Double action allows the first round to be fired by merely pulling the trigger. The current single action requires the first round to be manually cocked.⁴

of the future", a third concept suggests that we should push for the best hand gun available today for our military forces. The trend is toward the 9mm parabellum* pistol which uses the standard NATO round. Popular "off-the-shelf" military hand guns include the lightweight Colt Commander, the Smith and Wesson Model 39, and the 1935 Browning Hi-Power.** The last alternative is to accelerate research and develop the "hand gun of the future" now.

The literature relating to US military hand guns covers many sub-topics which are discussed in the next chapter arranged by volume of material available: history of US military hand guns, testing, commercial hand guns, M1911A1 modifications, training, hand gun design, automatics versus revolvers, stopping power, bullet design, manufacturing, rocket guns, costs, holsters, tunnel weapon,

*Parabellum relates to the ammunition and it literally translates as "for war". This cartridge was introduced by the German Arms and Ammunition Co., Inc. in 1902 for use in the Luger pistol. It was more powerful than the standard 9mm round used at that time. In 1908, the German Army adopted the Luger chambered for the parabellum cartridge.⁵

**The Colt Commander offers a 12.5 ounce weight savings over the standard M1911A1 (26.5 versus 39 ounces). It is also single action and either carries the standard 7 rounds of .45, or 9 rounds of 9mm parabellum. The Smith and Wesson weighs the same as the Colt Commander, but has the advantage of a double action trigger. The magazine holds eight 9mm parabellum rounds. Weighing 32 ounces, the single action Browning Hi-Power comes with an adjustable rear sight. Most noteworthy, the magazine carries thirteen 9mm parabellum cartridges.⁶

multi-projectiles, machine pistols, microballistics,
and silencers.

It should be pointed out that the subjects addressed
and the literature referenced are representative of the
unclassified information on this subject, and are readily
available to most Department of Defense (DoD) organiza-
tions.

CHAPTER III

DISCUSSIONHISTORY OF US MILITARY HAND GUNS

The best historical work found was a 1955 article written by Singleton Keesler in the Infantry School Quarterly. In addition to the famous story of the Philippine Insurrection* at the turn of the century, the author presents a factual account of the original tests that led to the adoption of the .45 caliber bullet.

Another historically oriented article written in 1955 authored by Roger Marsh was in the Marine Corps Gazette. He discusses the actual comparison testing of various weapons during the 1907 Springfield Armory tests.**

*It was found that the Colt New Navy .38 caliber revolver with its light 150 grain bullet lacked stopping power, as Moro warriors would often continue to charge even when hit more than once. The solution was the introduction of the .45 caliber with its heavy 230 grain bullet.⁷

**All candidates, automatics and revolvers, were submitted for test in .45 caliber configuration. Comparison testing began in March 1907 and included the Colt, Smith and Wesson double action revolvers, the Webley-Fosbery automatic revolver, the Colt, Luger and Savage single action automatics, the double action Knobles and White-Merrill automatics, and the Bergmann pistol. Parameters evaluated were rust, dust, decreased charge, increased charge, pierced primers, assembly and disassembly time, safety, and general design and balance.⁸

Those more concerned with fielding and production of the M1911 Colt .45 pistol should read the 1975 Atwood article. An added benefit of this article is that it provides a clear and concise explanation of Hatcher's principle of relative stopping power.*

Most historical information came from military magazines. However, the September 1977 Guns & Ammo article, "Blue Shirts and Bolos" written by Pat Rogers, provides a good update of the Philippine Insurrection.

History reveals a couple of interesting facts about military hand guns. First, the M1911 caliber .45 automatic pistol was adopted only after several years of comprehensive research and evaluation. Second, it indicates the criteria for measuring the acceptability of a hand gun for military application with reliability as one of the most important considerations.**

*Major General Julian S. Hatcher developed a methodology for determining the relative stopping power which was computed as the product of one-half bullet momentum (velocity) times sectional area (mass) times a factor for bullet shape and material. Relative stopping power of a few popular cartridges is as follows: .32 ACP (7.65mm) = 10, .38 special = 27, 9mm parabellum = 32, .45 ACP = 62, and .44 magnum = 132.9

**Reliability appeared to be one of the strongest virtues of the Colt .45 automatic. After minor modifications were made, per recommendation of the ordnance boards, it "...fired six thousand rounds during the tests without jam, misfire or breaking of a part."¹⁰

TESTING

The majority of all the literature included in the bibliography could be classified under this topic. However, to allow a more useful subdivision of subjects, this topic is oriented toward literature on test procedures. All but one reference in this category came from DDC. Three documents relate solely to test procedures. Their titles indicate their area of concern: "US Army Test and Evaluation Command Expanded Service Test - System Test Operations Procedure Hand Weapons (Personnel Defense)," "Adverse Condition (Dynamic Dust) Effect on Small Arms Functioning," and "Arctic Environmental Test of Individual Weapons - Rifles and Pistols."

The value of DDC technical reports is highlighted when comparing them to periodicals. For example, one of the articles indicates that the average shooter has difficulty firing the M1911A1 accurately because the problems a shooter experiences in pointing it "...due primarily to poor barrel-to-stock angle (107 degrees)."¹¹ However, a DDC report indicates the opposite.*

It is surprising how little information on ballistic accuracy is in print. One of the few reports to actually

*In 1975, a test sponsored by the Human Engineering Laboratories at Aberdeen Proving Ground indicated "...it is evident that ... the short, light-trigger pull with a moderate (standard) grip angle was greatly superior to other configurations...as it happens, this combination represents the standard .45 pistol."¹²

provide dispersion figures was done by the Air Force Armament Laboratory in 1975. It provides statistics for three popular military rounds.* The report is entitled "Function Testing of Smith and Wesson Model 15 Revolvers Modified to Fire the 9mm Luger Cartridge."

Technical reports address basically the same information as periodicals. However, unlike articles, they often provide feasible solutions to problems. For example, it is not uncommon to read an article on the M1911A1 indicating that it has excessive recoil. A report, "Mathematical Model & Parametric Analysis of M1911/M1911A1 Caliber .45 Automatic Pistol," reveals that the M1911A1 does have more recoil than is needed to function, and offers four possible corrective actions.**

COMMERCIAL HAND GUNS

Literature in this area, addresses many weapons that were not thought to be strictly military but could have service potential. The majority of material found had to be discounted since it related solely to hand guns

*Smith and Wesson Model 15 revolvers were modified to accept the 9mm parabellum round (more powerful than the .38 special). Average extreme spread at 50 yards was 4.1 inches for the .38 special and 12.5 inches for the 9mm parabellum. For comparison, the .45 caliber M1911A1 had a spread of 12.4 inches.¹³

**The experiment revealed that recoil (peak impulsive impact load) could be reduced by a variety of methods: increased weight of recoil parts, increased recoil distance up to .5 inches, use of a fluid brake, incorporation of a liquid spring, or use of a two piece breach slide assembly.¹⁴

that were for target shooting, hunting, or those with antique or collector value. The article by Thomas M. Johnson in Army magazine spells out the attributes of a hand gun that make it suitable for the military. A similar article can be found in Armor written by Lester M. Fullen. After research, it became apparent that there were a variety of potential military hand guns that promised better accuracy, similar reliability, and less weight than the M1911A1. However, there was no literature that addressed the cost effectiveness of replacing the M1911A1 with a commercial hand gun.

M1911A1 MODIFICATIONS

The American Rifleman provided the majority of literature in this area. The quality of these articles is good due to their technical and objective approach.

The only technical report located on this subject was done in 1972 by the US Army Weapons Command, entitled "Mathematical Model & Parametric Analysis of M1911/M1911A1 Caliber .45 Automatic Pistol." It basically evaluated recoil and possible corrective measures. It is surprising that more tests have not been conducted in this area. In a time when obsolete M48A1 tanks are converted to good M48A5 tanks, one can only wonder why the M1911A1 has not transformed into the M1911A2 (perhaps featuring double action and greater accuracy) until the "hand gun of the

future" comes along. Numerous articles on this subject were rejected because they pertained solely to target shooting. However, the Askins' article "A New Look for an Old Work-horse," written in December of 1977, refers to a modification kit with potential military application. For a recent modification performed by Lackland Air Force Base, see the January 1978 article "Air Force .45 Autos - Airborne Again."

TRAINING

The literature points out that an individual's accuracy with a hand gun is closely related to his training. The best article found on this subject was written in the 1970 November - December issue of Armor by George Miller. While most articles will agree that formal target shooting procedures are not usually applicable to combat shooting, this article provides an alternative. The quick-fire principle, and the combat pistol qualification course are discussed.*

Although it may seem too obvious to mention, one of the best training documents available is FM 23-35. It includes the .38 caliber revolver as well as the M1911A1 .45 caliber automatic pistol. Also, quick fire training is

*Every soldier has a natural ability to point a finger directly at an object at which he is looking. The precise moment the fluid motion of his arm stops, his finger will be pointing at the center of mass of the object. This principle has been incorporated into firing through making the pistol an extension of the pointed finger."16

addressed. Two additional training references are AR 385-63 and AR 622-5.¹⁵

HAND GUN DESIGN

This topic specifically addresses the exact physical configuration of hand guns; eight documents fell into this category. Two interesting articles written by Charles Askins in Guns & Ammo, "Askins Looks at Handgun Hammers," and "Trigger Talk," deal solely with this subject. More general in nature, but also based on logic and an educated opinion, Askins does discuss hand gun design in his article "Handgunning in the Year 2001," in Guns & Ammo.

The only technical report specifically addressing hand gun design was written in 1975. Entitled "Program of Applied Research in Personal Defense Weapon System," and researched under the auspices of the US Army Human Engineering Laboratory, it is an excellent evaluation of human factors (such as grip and trigger pull) and their relationship to hand gun design and configuration.

AUTOMATIC VERSUS REVOLVER

Since the 1907 Springfield Armory Ordnance Board tests, the advantages of automatics over revolvers and vice versa has been a recurring topic in military hand gun literature. Agreement usually exists with respect to the advantages and disadvantages of each configuration. However, the importance placed on one attribute over another is

constantly debated, because "...hand guns are objects of strong personal preferences and prejudices."¹⁷

One of the few references found that advocated the adoption of a revolver rather than an automatic pistol for general military application was written by Charles B. Haslam in 1958. Some statements about issues appear to be based on nothing but his opinion.

In a more objective article, Morris J. Herbert, partially supported by test data, claimed that: "In the field, under all extremes of service, the revolver cannot compare to the autoloading pistol. Because of its design, the revolver clogs more rapidly and needs cleaning more often."¹⁸

After reading periodicals that pertain to this subject, one feels he is arbitrating a debate. This is not the case when it comes to DDC reports. For example, in "Time to Fire: The Semi-automatic Pistol Versus the Revolver," the speed to fire the first round from a holstered weapon is measured by comprehensive testing to the fraction of an inch.

The most recent article found on this topic was written in December 1977 by Mel Tappan in Guns & Ammo. Although the author is primarily concerned with survival in the wilderness, his conclusion is interesting: "I recommend the .45 Colt autopistol as the single best

handgun choice for defensive use under conditions of long term survival...."¹⁹

STOPPING POWER

The following is a quote from one of the best articles available that addressed the age-old controversy of shock action and destructive effect of bullets. It was written in May 1975 by Thomas W. Atwood in Army:

The shock effect of various bullets on gelatin is measured by the amount of kinetic energy transmitted, and in the laboratory impressive comparisons have been made which have misled even the experts. This method is still used today to measure the effectiveness of handgun cartridges, despite the fact that the validity of using energy as a measure of stopping power was disproved more than 70 years ago.²⁰

In his 1968 article, Morris J. Herbert provided an excellent comprehensive explanation of kinetic energy transfer.* However, he reached a different conclusion than Atwood:

From empirical data obtained through controlled experimentation in the Ballistics Laboratory at West Point, it appears that, within the range of impact velocities encountered with handguns, transfer of kinetic energy to the target material is the best measure of the projectile's destructive effect.²¹

*Kinetic energy transfer was measured at West Point by comparing the kinetic energy ($1/2 M V^2$) of a bullet before and after it had passed through a block of gelatin. Since velocity is squared, a small fast bullet appears to have greater stopping power than indicated by Hatcher's scale.²²

This conflict appeared throughout the related literature, and sometimes took the form of a debate over the slow large bullet versus the small fast bullet.

BULLET DESIGN

Stopping power is influenced by bullet design. Two excellent tests on bullet design were conducted by the Ballistic Research Laboratories at Aberdeen Proving Ground. The March 1974 report entitled "Effectiveness of Pistol Bullets in Gelatin," was oriented toward energy deposits and cavitation.* As the name would imply, "Effective Drag Coefficient for Various Small Arms Projectiles in Dense Media," the May 1975 report looks at the correlation between drag and energy deposit.**

A few articles suggest the possibility of developing a military round taking the better features of the US .45' and the NATO 9mm parabellum cartridge. A February 1977 article by Ralph C. Glaze explains the development of a .40 caliber magnum round with potential for military

*Even though the test included the .32, .38, and .45 caliber ammunition, the trend was the same. "The cylinder and the hollow point gave highest fractional energy deposit."²³ The cavitation, which is basically the size of the hole created by the bullet, was measured through the use of high speed movies.²⁴

**The cylinder and hollow point cylinder had over five times as much drag as conventional ball design. With greater drag there is greater velocity loss, which results in less penetration.²⁵

application. Another Guns & Ammo article written by Rick Miller, November 1977, explains the results of a simple test of nine different commercial cartridges for the .45 caliber automatic pistol.

MANUFACTURING*

Three of the six articles referenced dealt with a specific weapon. The remaining three articles were general in nature. The best work was found in Ordnance magazine, "Modern Automatic Pistols," written by Douglas Simmons in 1972. A detailed article on manufacturing hand guns since World War II is provided by Jack O'Connor in the December 1965 issue of Outdoor Life. Although the material is crowded with opinions, the Askins' February 1977 article "Handgunning in the Year 2001" does address changes in manufacturing techniques.

ROCKET GUNS

This topic relates to a family of weapons introduced in the early 1960s by MB Associates located in Bollinger Canyon, California.** Two classic test reports

*The major expense in manufacturing is labor. Steel forgings of the prior WWII days required hours of hand machining. Today, sheet metal stampings are reducing manufacturing hours. Material is also changing, and zinc and aluminum die castings are being employed. When steel is used, numerically controlled machines can help cut costs.²⁶

**The Gyrojet smooth bore hand gun weighs only 16 ounces. It holds six 230 grain rocket propelled bullets, and has a maximum velocity after .1 second of 1250 feet per second.²⁷

are available. In 1963, the Ballistic Research Laboratories conducted the first test, entitled "Antipersonnel Effectiveness of Small Rockets for Infantry Fire Roles."* Three years later they conducted a second test, entitled "Evaluation of a Small Rocket in a Pistol Role."** This report was a comparison test between the rocket pistol and three popular conventional rounds. For a summary of potential system advantages, to include costs, the Johnson article "Gyrojets Galore" has merit. The other two articles (referenced in the annotated bibliography) merely provide reinforcing information of system characteristics. Until new and improved rocket hand guns are developed, this topic has received adequate coverage.

COSTS

Cost is an illusive area. The four government documents referenced merely provide indicies and cost estimating information on small arms. Obviously, one could research the historical costs of military hand gun procurements and quotes could be obtained for the possible procurement of commercially available hand guns. However,

*This report concluded that the greater range of the rocket projectiles does not increase effective lethality. The high level of dispersion negates the advantage of greater range.²⁸

**Relatively speaking, it concluded that kill probability (as a function of range) and penetration capability was comparable to conventional hand guns except at close ranges where "...penetration capability of the rocket is negligible."²⁹

I believe the main issue appears to be the determination of what decides cost effectiveness of any alternative that would modify or replace the current M1911A1 as the standard military pistol, and there are no articles on that subject.

HOLSTERS

The twenty-three year old Marine Corps Gazette article "Lets adopt a Realistic Holster," by J. S. McAlister, provides insight into complaints relative to the M1916 leather holster that is used for the M1911A1 .45 caliber pistol.* Furthermore, in 1968 an article published by Infantry magazine and written by Rex Brookshire continued the attack on the M1916 holster.** On the technical side, in 1967, Rock Island Arsenal, Illinois, conducted an excellent study on holster material, "Evaluation of Synthetic Leather for Army Applications."***

*Common complaints were that the weapon was drawn with difficulty, the holster miljews in the tropics, cracks when it is cold, hard to dry when wet, does not protect the weapon from the elements, and usually looks bad.³⁰ The notion that the weapon is drawn with difficulty could possibly be dispelled by the test "Time to fire." The M1916 holster accounted for about .8 seconds, which was the same average time for the revolver holster.³¹

**The author claimed that (in Vietnam) it trapped dust and moisture, had no provision for left hand shooters, slapped against the hip when running, and was bulky and heavy. He suggested an open ended, slick leather holster with a "fly-away" retaining strap.³²

***The analysis included synthetic leathers (corfam) that were fabric reinforced and others impregnated with urethane. Two different methods for seaming the holsters were used: sewn and cemented.³³

Although this literature search was directed toward military hand guns, I found no literature on military holsters written since 1968.

TUNNEL WEAPON

The tunnel weapon* has been renamed the Special Purpose Revolver.³⁴ Three excellent test reports on this weapon are available through the DDC.

After the weapon was developed by the Land Warfare Laboratories, it underwent testing in February 1969 by the US Army Limited War Laboratory: "Feasibility of a Tunnel Weapon." The engineering design test consisted of firing 245 rounds under a variety of conditions; the April 1969 report is entitled "Final Letter Report of Engineer Design Test of Caliber .44 Tunnel Weapon." After a field test of ten revolvers, in November 1969 the Army Concept Team in Vietnam released their report: "Tunnel Weapon." For a layman's summary of the tunnel weapon, reference is made to the 1972 article by John Strange in Armor.

MULTI-PROJECTILES

Multi-projectiles most commonly refers to shot cartridges, and shot rounds have been developed for the

*Developed primarily for use in tunnels during search operations in Vietnam. It is a modified .44 magnum smooth bore revolver that shoots six special multi-projectile rounds with almost no sound, flash, or smoke.³⁵

M1911A1 pistol and the .38 special revolver. Two reports that provide detail data on the .45 caliber and .38 special shot cartridges are: "Caliber .45 Ammunition," and "Caliber .38 Special Shot Cartridges." For an opinion in favor of multi-projectiles, read the 1976 article "Firing the Multi-Purpose Hand Gun," by J. P. Driver.* Since the tunnel weapon fired multi-projectile rounds, the literature relating to it is also applicable to this topic.

MACHINE PISTOLS

Only one good general purpose article on machine pistols** was located. Written in 1969 by Harold Johnson in Ordnance it discusses evolution of machine pistols from those of the 1960s. In another article, Thomas Nelson deals solely with the Ingram family of weapons.*** Even narrower in scope, a final reference only addresses one weapon: "A Novel Machine Pistol" by Russell S. Robinson.****

*The author advocates that a multi-projectile hand gun would increase hit probability.³⁶ However, the two referenced technical reports indicate that maximum effective range of shot cartridges is only 50 feet versus 50 yards for standard ball ammunition.³⁷

**A fully automatic pistol that is capable of firing a burst of several rounds.³⁸

***Produced by the Ingram Corporation in Georgia, three configurations are offered: .45 caliber, 9mm parabellum, and 9mm short. Only the 9mm short version is light enough to be called a pistol; the other two are more like submachine guns.³

****The S. R. Model 11 was developed in 1944 by the author of this article. It had sixteen round magazine and the 9mm parabellum ammunition could be fired in either a full or semi-automatic mode.⁴⁰

MICROBALLISTICS

Perhaps one of the most exciting subjects, which may lead to the "hand gun of the future", is microballistics.* In a 1966 report, "Microballistic Weapon Systems Studies," by Frankford Arsenal, Pennsylvania, the feasibility (at velocities up to 3,500 feet per second) of a microballistic hand gun was confirmed. In 1973, the Ballistics Research Laboratories went one step further and introduced liquid propellant into the microballistic arena.** The report is entitled "Small Caliber, Multi-Purpose, Automatic Liquid Propellant Gun."

It was surprising to find that the literature search revealed no magazine articles on microballistics.

SILENCERS

One technical report on silencers*** was located. The work was performed by Frankford Arsenal and the report

*The concept of a small fast bullet has appeal. Theoretically, based on kinetic energy transfer, a 10 grain projectile hitting a gelatin block at 3,000 feet per second would transfer 180 foot pounds of kinetic energy which is greater than either the .45 or 9mm parabellum round.⁴¹

**Specifically, high energy density (NOS) monopropellants developed by the Navy. The potential advantages are noteworthy: "...increased muzzle velocity, reduced ammunition weight and volume, reduced ammunition cost, increased barrel life, and reduced flash and smoke."⁴² A 35 grain projectile was shot at velocities up to 5,000 feet per second.⁴³

***Silencers confront two noises: the sound of the projectile passing through the atmosphere, and the noise of escaping gases. If the bullet is traveling faster than the speed of sound, its noise cannot be effectively silenced. The low velocity of the .45 caliber round makes it an ideal candidate to silence.⁴⁴

provided a great amount of detail on a wide variety of weapons. Appropriately named "Silencers," it is so encompassing that requirements for future technical literature on existing silencers is minimized.

The only magazine article found on this subject was done by David Mulle in the March-April 1969 publication of Ordnance. It is oriented toward the layman, and does an excellent job explaining the functioning and history of a few popular silencers.

CHAPTER IV

FINDINGSINTRODUCTION

After a literature search of material relating to US military hand guns, two basic questions can be asked. Does existing literature provide sufficient guidance in determining the best hand gun for the US Army? And if not, where do gaps exist in the literature? Also, for this document to be a useful reference, it must assist the researcher by pointing him in the right direction. Keeping this latter concept in mind, it is time to state my findings.

SOURCES

First, what can be concluded about sources? Not surprisingly, DDC literature presents the best source of credible material. In the bulk of these reports, conclusions are substantiated by comprehensive testing.

The Air University Index would have to be rated as the second best source. Although most of these authors were not involved in actual testing, they could often support their opinions with appropriate references. By definition, since these articles were written in military periodicals, the thrust of the hand gun related information was ideally compatible with this research.

Gun enthusiast magazines closely follow government periodicals in relative worth. The two magazines specifically addressed were The American Rifleman and Guns & Ammo. It was surprising to find out how comprehensive these two magazines were. Although not as elaborate as the DDC technical reports, many statements were supported with test data. Even when opinions were stated, the authors usually spoke with a good deal of experience, shedding more credibility on the subject matter.

Finishing last is Readers' Guide. The articles found through this source were so general in nature that only a small percentage proved useful in this research.

TOPICS

Of the eighteen subject areas discussed, the topic of military hand gun history received the greatest coverage. The articles found through the Air University Index do a good job in addressing the past. Writers of history look favorably on the current M1911A1 pistol. They tell us that this weapon was selected only after a detailed evaluation process, and has functioned adequately since adoption.

The literature on testing leads to one inevitable conclusion: If the appropriate government agencies were given the mission and resources to perform an evaluation or comparison of military hand guns, it could be accomplished.

Information on commercial hand guns was available, but none was found to indicate that any of these weapons were significantly better than the M1911A1. The Smith & Wesson Model 59 was commended for having a double-action trigger and a 14 round magazine.⁴⁵ However, no study was found that revealed a soldier needs a double-action weapon or a 14 round magazine. Would these features save lives? Would they be cost effective when considering the inventory of M1911A1 pistols in the system? Future work in this area needs to address these points.

If replacement of the M1911A1 is not proven desirable or cost effective, the concept of improving it may have merit. The interesting fact about M1911A1 modifications is that this idea is not new. The articles point out that since 1955, the Army has been involved in modifying these pistols for national match competition. However, while the government literature suggests that greater accuracy can only be obtained by sacrificing some reliability, the gun enthusiast magazines hinted that modification kits that did not compromise the M1911A1's reliability were available. Further research in this area appears warranted.

With the advent of "quick fire", literature on training is basically oriented in this direction. Formal target shooting positions have been abandoned. However, with the high correlation between military hand gun

proficiency and accuracy, this area deserves constant reinforcing.

The references on hand gun design do not advocate a configuration different from the current M1911A1. The issue appears to be hand gun performance, with design as a by-product.

The automatic versus revolver controversy is starting to wane. The majority of the literature concurs that an automatic pistol is the better configuration for general military application primarily due to the fast reloading capability and ammunition capacity offered by a magazine.

Another area for debate is stopping power. The majority of literature found supports the Hatcher's Formula of relative stopping power, and places less emphasis on kinetic energy. Corresponding to this position, the M1911A1 .45 caliber pistol is credited with having greater stopping power than the 9mm parabellum pistol. However, where greater penetration is desired, kinetic energy favors the 9mm parabellum.

Although bullet design of military weapons is restricted, the literature search reveals impressive statistics from many sources on the influence of bullet design and bullet effectiveness. It is anticipated that this area will continue to receive heavy coverage in gun enthusiast magazines.

Closely related to cost is the manufacturability of an alternate military hand gun. There is adequate literature in this area; however, it is suggested that the decisions on manufacturing are up to the contractor as long as performance, quality, and cost criteria are met. On the other hand, the cost to manufacture a specific weapon will play a great part in determining the ultimate cost effectiveness of replacing the M1911A1 pistol.

Nothing was found on rocket pistols in the last ten years. One can only conclude that the problems associated with the Gyrojet hand gun were not effectively resolved, or that it did not offer significant advantages over the M1911A1.

No literature in any of the references cited addressed the cost effectiveness of modifying or replacing the M1911A1, the standard US Army side arm. This appears to be a key issue and one that deserves evaluation.

The literature indicated that although there are various opinions on the standard M1916 holster, none warrant a redesign. However, the potential for synthetic holster material seems promising and should not be overlooked.

Literature on the tunnel weapon ceases in 1972. The story has been told.

Multi-projectiles is one area that deserves further attention from the technical writers. The reports referenced indicate that multi-projectile bullets offer a significant improvement in hit probability over the M1911A1 firing

standard ball ammunition. The problems of poor range and stopping power offer significant challenges.

Information on machine pistols is plentiful and adequate. It points out that this concept is not new, and hints that machine pistols are nothing more than scaled down submachine guns.

Microballistics ammunition is one area that offers potential for improvements over the M1911A1. As pointed out in the literature, a small bullet with a high velocity has some salient advantages such as flatter trajectory (greater accuracy) and less weight (increased magazine capacity). This area deserves further emphasis.

The last work on silencers was written in 1969. No information was found that would suggest a silencing or partial silencing requirement for any future general purpose military hand gun.

BEST HAND GUN

Does the literature agree on the main purpose of a military hand gun, and the best weapon for that purpose? The problem becomes obvious, because the literature would cause some to conclude that the best weapon in a tunnel is the tunnel weapon, the best for firing under water is the rocket pistol, the best under cover weapon the .38 special with 2 inch barrel, the best for hand-to-hand combat the .45 caliber M1911A1, and the best for shooting at targets

behind barriers the 9mm parabellum pistol. The point is that there could be several "best" guns for a variety of military applications. The fact that the Army has in the inventory other hand guns, in addition to the M1911A1, bears out this point.*

This paper concentrates on the general purpose hand gun for the US Army. What do the references say about purpose? "...close-in personal defense..."⁴⁶ "All the hand guns we presently utilize are sufficiently accurate to fulfill their missions as close-in type weapons."⁴⁷ "To begin with, the purpose of a military handgun is individual defense."⁴⁸ "A secondary weapon is not normally used until the situation has developed to a great extent and the adversary is fairly close and needs to be stopped."⁴⁹ "... deliver quick and effective fire on a man size target at close ranges."⁵⁰ After looking at this general consensus, it is easy to see why the M1911A1 pistol has been in the inventory for so long. Most of the literature agrees that the M1911A1 has some disadvantages, but also that it performs adequately as a close-range defensive weapon.

GENERAL

These findings are based on a sampling of reference

*Besides the M1911A1, FM 23-35 provides information on four .38 special revolvers. Colt and Smith & Wesson both provide a 2-inch and a 4-inch barrel revolver. Also, a CO₂ BB pistol is included for "quick fire" training.

material. Although the enclosed bibliography numbers over 100, it is not inclusive. However, it is the author's contention that references included herein are representative of the unclassified information available on US military hand guns. I hope others will use this document for initial orientation and as a point of departure in research planning.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

DDC literature is the best source for material relating to US military hand guns.

For a less technical approach, a surprising amount of information is available through the Air University Index and gun enthusiast magazines.

The Readers' Guide is not a good source for material relating to US military hand guns.

My literature search has indicated that there is an appropriate amount of material available on the following topics, and no special emphasis is required in the future:

- History of US military hand guns
- Testing / Test procedures
- Automatics versus revolvers
- Stopping power
- Rocket guns
- Holsters
- Tunnel weapon
- Silencers

Although past work has been adequate on the following subjects, due to their relative importance continued emphasis is required:

- Commercial hand guns
- M1911A1 modifications
- Training
- Hand gun design
- Bullet design
- Manufacturing
- Multi-projectiles
- Machine pistols.

An insufficient amount of information is available on the following topics and future emphasis is desirable:

- Costs
- Microballistics.

It is recommended that future efforts related to US Army military hand guns address the following questions:

- Do any commercial hand guns with military potential offer increased effectiveness over the M1911A1?
- Would features such as a double action trigger and a larger magazine capacity save lives?
- Could the M1911A1 be modified to increase its overall combat effectiveness?
- Is current training, including refresher training, adequate to instill confidence in the M1911A1?
- Can the advantages of design features for the "hand gun of the future" be quantified to allow for objective evaluation?

- Can any advantages of bullet design technology be incorporated when considering a replacement for the M1911A1 and the standard .45 caliber ball ammunition?

- What impact do new manufacturing techniques have on the cost effectiveness of replacing the M1911A1?

- Can the stopping power and effective range of multi-projectile rounds be significantly improved?

- Does the machine pistol concept become more desirable when applied to a microballistic hand gun?

- What level of cost effectiveness is required to justify replacing or modifying the M1911A1 as the standard US Army hand gun?

- Can a microballistic hand gun offer a significant improvement over the combat effectiveness of the M1911A1?

- What other technology should be used to assure that the US Army optimizes the state of the art in hand gun development?

Because the primary purpose of a military pistol is for close-range combat and self defense, there are a variety of hand guns available that could perform this mission adequately, including the M1911A1 Colt .45 pistol.

The literature presented in the enclosed annotated bibliography is representative of the unclassified material available relating to US Army military hand guns.

ENDNOTES

¹"US Army Test and Evaluation Command Expanded Service Test - System Test Operations Procedure Hand Weapons." US Army Test and Evaluation Command, September 1972, p. 2.

²Field Manual 23-35, Pistols and Revolvers, September 1971, p. 1.

³Ibid.

⁴T. M. Johnson, "How Many More Rounds for our Aging Heavy Weight?" Army, March 1969, p. 46.

⁵M. D. Waite, "New Loads for the 9mm. Luger," The American Rifleman, November 1974, p. 37.

⁶T. M. Johnson, p. 49.

⁷Singleton Keesler, "The Equalizer," Infantry School Quarterly, January 1955, p. 83.

⁸Roger March, "The Search for a Service Autopistol," Marine Corps Gazette, October 1955, p. 26.

⁹Thomas W. W. Atwood, "Let's Keep the .45," Army, May 1975, p. 33.

¹⁰J. S. McAlister, "43 Years in a GI Holster," Marine Corps Gazette, November 1954, p. 60.

¹¹Morris J. Herbert, "The Military Handgun," Military Review, December 1968, p. 28.

¹²"Program of Applied Research in Personal Defense Weapon System," Technical Memorandum 3-75, Dunlap and Associates Inc., January 1975, p. 117.

¹³"Function Testing of Smith and Wesson Model 15 Revolvers Modified to Fire the 9mm Luger Cartridge," AFATL-TR-75-30, Air Force Armament Laboratory, December 1974, p. 28.

¹⁴"Mathematical Model and Parametric Analysis of M1911/M1911A1 Claiber Automatic Pistol," Technical Report 77-52, Weapons Laboratory, USAWECOM, August 1975, p. 3.

- ¹⁵Field Manual 23-35, p. 85.
- ¹⁶George P. Miller, "Pistol Proficiency," Armor, November - December 1970, p. 16.
- ¹⁷Thomas W. W. Atwood, p. 33.
- ¹⁸Morris J. Herbert, p. 25.
- ¹⁹Mel Tappan, "Semi-Auto Survival," Guns & Ammo, December 1977, p. 78.
- ²⁰Thomas W. W. Atwood, p. 35.
- ²¹Morris J. Herbert, p. 25.
- ²²Ibid., p. 26.
- ²³"Effectiveness of Pistol Bullets in Gelatin," Report 145, Ballistic Research Laboratories, March 1974, p. 12.
- ²⁴Ibid.
- ²⁵"Effective Drag Coefficient for Various Small Arms Projectiles in Dense Media," Memorandum Report 2481, Ballistic Research Laboratories, May 1975, p. 91.
- ²⁶D. M. Simmons, "Modern Automatic Pistols," Ordnance, May - June 1972, p. 493.
- ²⁷T. W. Johnson, "Gyrojets Galore," Armor, January - February 1971, p. 51.
- ²⁸"Antipersonnel Effectiveness of Small Rockets for Infantry Fire Roles," BRL-TN-1467-Rev, Ballistic Research Laboratories, August 1963, p. 33
- ²⁹"Evaluation of a Small Rocket in a Pistol Role," Memorandum Report 1760, Ballistic Research Laboratories, July 1966, p. 24.
- ³⁰J. S. McAlister, "Lets Adopt a Realistic Holster," Marine Corps Gazette, May 1955, p. 44.
- ³¹"Time to Fire: The Semiautomatic Pistol Versus the Revolver," TM-33-76, US Army Human Engineering Laboratory, November 1976, p. 15.

³²R. R. Brookshire, "GI Leather," Infantry, September - October 1968, p. 26.

³³"Evaluation of Synthetic Leather for Army Applications," Technical Report 67-2926, US Army Weapons Command, December 1967, p. 2.

³⁴J. J. Strange, "The Quiet Gun," Armor, May - June 1972, p. 46.

³⁵Ibid.

³⁶J. P. Driver, "Firing the Multi-purpose Hand Gun," Marine Corps Gazette, September 1976, p. 47.

³⁷"Caliber .45 Ammunition," Technical Information Report 27.1.6.1, Governmental Affairs Institute, July 1968, p. 2.

³⁸Harold E. Johnson, "Modern Machine Pistols," Ordnance, November - December 1969, p. 314.

³⁹T. B. Nelson, "The Ingram LIW," Armor, January - February 1971, p. 51.

⁴⁰Russell S. Robinson, "A Novel Machine Pistol," Ordnance, May - June 1971, p. 557.

⁴¹Morris J. Herbert, p. 28.

⁴²"Small Caliber, Multi-Purpose, Automatic Liquid Propellant Gun," Report 319, Ballistic Research Laboratories, October 1976, p. 1.

⁴³Ibid.

⁴⁴David Mülle, "Silencers for Small Arms," Ordnance, March - April 1969, p. 513.

⁴⁵M. D. Waite, "Smith & Wesson Model 59 Pistol," The American Rifleman, June 1973, p. 40.

⁴⁶Thomas W. W. Atwood, p. 37.

⁴⁷Charles B. Haslam, "Should our Sidearm be a Revolver?" Marine Corps Gazette, August 1958, p. 30.

⁴⁸Morris J. Herbert, p. 24.

⁴⁹Lester M. Fullen, "Time to Retire the .45?"
Armor, July - August 1970, p. 64.

⁵⁰Geroge P. Miller, P. 15.

USE OF BIBLIOGRAPHY

USE OF BIBLIOGRAPHY

The bibliography presented is annotated and is designed to provide maximum information. Statements regarding the conclusions or recommendations of a reference are provided for greater insight.

All documents obtained from the DDC have an "AD" number included in parenthesis after the bibliographical data for easy retrieval.

To assist in determining the usefulness of a report or article, a "usefulness rating" precedes the bibliography. This could be interpreted as the value a specific effort had to the topic indicated. They are listed in relative order of value from left (highest) to right (least). For example, the topic "Bullet Design" lists reference "B30" first. This comprehensive report conducted by the Ballistic Research Laboratories was the best work found. On the other hand, "B14" is last in this category. This article entitled "Velocity ... the Controversy Continues," merely reiterates the well known parameters that relate to the killing power of a bullet; therefore it is the least useful. The definition of each topic in the "usefulness rating" is self explanatory. "Testing" relates to test procedures, or test reports that are not readily identifiable within another topic.

Although a piece of literature generally can be listed under one topic, some have application to two or

more subjects. The usefulness rating chart relates literature to more than one topic if it provides useful information in those areas.

The bibliography number is preceded by a "B" to prevent confusion with endnotes. It is provided for quick reference and has been assigned to each work in an alphabetical order.

REPORT OR ARTICLEUSEFULNESS RATING

<u>TOPIC</u>	<u>ORDER OF VALUE</u>						
Automatics vs Revolvers:	B89	B35	B09	B20	B47	B45	B87
Bullet Design:	B30	B29	B17	B41	B61	B98	B14
Commercial Hand Guns:	B51 B73	B39 B23	B47 B69	B53 B103	B10	B99	B84
Costs:	B48	B42	B90	B74			
Hand Gun Design:	B72 B77	B06	B85	B27	B05	B08	B79
History:	B54 B51	B55 B91	B09 B92	B57 B71	B33 B104	B76	B39
Holsters:	B32	B58	B15	B89			
M1911A1 Modifications:	B07 B24	B02 B52	B56	B26	B44	B96	B97
Machine Pistols:	B49	B65	B75				
Manufacturing:	B80	B101	B68	B67	B06	B46	
Microballistics:	B82	B59					
Multi-projectiles:	B19	B18	B28	B37			
Rocket Guns:	B31	B03	B50	B100	B63		
Silencers:	B78	B64					
Stopping Power	B47	B09	B62	B70	B14	B66	B43
Testing:	B95 B102	B01 B88	B04 B11	B72 B81	B71	B56	B40
Training:	B60 B93	B38 B12	B36	B25	B13	B22	B16
Tunnel Weapon:	B94	B37	B34	B86			

ANNOTATED BIBLIOGRAPHY

- B01. "Adverse Condition (Dynamic Dust) Effect on Small Arms Functioning," APG-MT-4571, Materiel Testing Directorate, US Army Test and Evaluation Command, May 1975 (ADB010749L). A final test report covering the period from 31 August 1971 to 9 October 1974. US Army Aberdeen Proving Ground conducted this investigation to develop a sand and dust test environment that could be used for future small arms evaluation. The controlled environment that was formulated could prove useful in determining the impact that a modification to the current M1911A1 would have on reliability.
- B02. "Air Force .45 Autos - Airborne Again," Guns & Ammo, January 1978, pp. 50-51. Describes a modification to the M1911A1 that was developed by the gunsmiths at Lackland Air Force Base, Texas. This six to eight hour conversion results in a weapon with a one inch shorter barrel and adjustable rear sights.
- B03. "Antipersonnel Effectiveness of Small Rockets for Infantry Fire Roles," BRL-TN-1467-Rev, Ballistic Research Laboratories, Aberdeen Proving Ground, Md., August 1963 (AD371957). Quantitatively evaluates small rockets used in pistols, rifles, and shotguns. Relative to pistols, this report concludes that a rocket hand gun should not be adopted. This study reveals that the greater range of a rocket projectile does not increase effective lethality, because high level of dispersion negates the advantage of greater range.
- B04. "Arctic Environmental Test of Individual Weapons Rifles and Pistols," MTP 3-4-004, Arctic Test Center, US Army Test and Evaluation Command, 29 May 1969 (AD717385). Outlines cold weather test procedures to be used in evaluating rifles and pistols. Calls for weapon functioning and human factors to be tested in temperatures ranging from 0 to below -45 degrees Fahrenheit.
- B05. Askins, Charles. "Askins looks at Handgun Hammers," Guns & Ammo, January 1978, pp. 46-47. Good article on hammer design. Although not substantiated by testing, the author logically argues for hammers that are large enough to provide good thumb contact. The M1911A1 is criticized for having a hammer that is too small,

and lacking in sufficient checkering* to provide an adequate grip.

- B06. Askins, Charles. "Handgunning in the Year 2001," Guns & Ammo, February 1977, pp. 44-47f. Discusses evolution of hand gun design since 1869. Changes in manufacturing techniques are addresses. The author predicts that weapons like the M1911A1 and the Browning Hi-Power will eventually be modified to a double action configuration.
- B07. Askins, Charles. "A New Look for an Old Workhorse," Guns & Ammo, December 1977, pp. 60-63f. Explains three conversions available for the M1911A1 that were developed by Frank Packmayr and Associates. This knowledgeable author was impressed by these kits that provided either improved sights or an adjustable rear sight, plus double action mechanism. One hundred shots that were fired fell within an impressive 2.92 inch shot group at 50 yards. Although not tested, the kits are supposed to increase the reliability and durability of the pistol.
- B08. Askins, Charles. "Trigger Talk," Guns & Ammo, September 1977, pp. 55-56f. The correlation between trigger design and accuracy is described. The M1911A1 is complimented for having a simple and rather straight trigger making it well suited for target shooting. An interesting article based on experience rather than controlled experimentation.
- B09. Atwood, Thomas W. "Let's Keep the .45," Army, Vol. 25, May 1975, pp. 32-36. Excellent paper on the history of the Colt .45 automatic pistol. Provides WWI and WWII production statistics, as well as the advantages of an automatic pistol versus a revolver. Explains how the US War Department tests proved that the M1911 was the best pistol available for adoption. Describes Hatcher's principle of relative stopping power, and reveals that the 9mm Parabellum round is only about one half as effective as the .45 caliber cartridge.
- B10. Ayoub, Massad F. "A Gun in Your Store?" The American Rifleman, May 1977, pp. 30-32. Although directed toward the small businessman, the author attempts to select the best defensive hand gun. After discussing various attributes of weapons, he recommends either the .38

*Checkering refers to the grooves on the hammer that facilitate positive thumb contact and minimum slippage.

Special revolver or the .380 automatic. They were selected based on their adequate power and their ease of controllability. The .45 automatic was discounted due to excessive training requirements.

- B11. "Ballistics Report, Volume I," Small Arms Ammunition Division, Frankford Arsenal, Pa., 30 September 1947 (AD846186). Although dated, this compilation of ballistic reports could be of interest to small arms test personnel. Topics pertaining to the .45 caliber pistol or cartridge included in this volume are: velocity change due to powder moisture content, modified rest for .45 caliber velocity testing, a new .45 pressure gage, and .45 caliber misfires.
- B12. Bois, Donald. "What Do You Know About Guns?" Outdoor Life, February 1968, pp. 70f. A 142 paragraph programmed text. Nothing new, but may be of interest to training personnel.
- B13. Brister, Bob. "Fast Guns," Field and Stream, September 1976, pp. 88-92. An interesting article on the speed various guns can be put into action. Although primary emphasis is on hunting rifles, conclusions are applicable to most guns. The author's research indicates that familiarization and training are more important to first round hit than weapon design and weight.
- B14. Brister, Bob. "Velocity ... the Controversy Continues," Field and Stream, January 1974, pp. 90-93. Addresses the advantages of a small fast bullet versus a large slow bullet. Talks about killing power as it relates to hunting animals. Indicates that factors for consideration include bullet design, energy, penetration, energy transfer rate, as well as the physical and mental condition of the animal that is shot.
- B15. Brookshire, Rex R. "GI Leather," Infantry, Vol. 58, September - October 1968, pp. 22-26. Criticizes the M1916 hip holster as obsolete. Based on the author's experience, he feels it has the following disadvantages: inhibits quick employment of the pistol, traps dirt and moisture, has no provision for left hand soldiers, slaps against the hip when running, causes discomfort when sitting, and is generally too heavy and bulky.
- B16. Burmeister, Robert A. "Mastering the Handgun," The American Rifleman, June 1971, pp. 44-47. A good technical article on sighting-in hand guns with adjustable sights. Adjustments for providing optimum accuracy at 25, 50 and 100 yards are explained. For the .45

automatic, the author suggests a firm grip with the thumb high on the frame to prevent sideways twist when pulling the trigger.

- B17. Byers, Charles M. "Determining Wound Ballistics," The American Rifleman, May 1971, pp. 30-32. A relatively inexpensive test procedure for measuring bullet performance is outlined. Bullets are fired into modeling clay and then a casting compound is poured into the cavity formed. When the compound hardens, the clay is removed and a casting of the cavitation is available for evaluation. Chemical composition of materials used is provided.
- B18. "Caliber .38 Special Shot Cartridges," TIR 27. 1.6.2, prepared by the Governmental Affairs Institute for the Army Materiel Command, July 1968 (AD392413). Explains the ballistic characteristics of two shot-cartridges that can be used in a .38-special revolver. Designated the XM260 and XM667, they contain fourteen hi-density shot and fourteen #2 lead shot respectively.
- B19. "Caliber .45 Ammunition," TIR 27.1.6.1, prepared by the Governmental Affairs Institute for the Army Materiel Command, July 1968 (AD293658). Explains the characteristics of the XM261 and XM668 shot-cartridges that can be used in the M1911A1 pistol. The rounds contain sixteen hi-density shot and sixteen #2 lead shot respectively. The report reveals one of the disadvantages of shot ammunition. Effective range is only fifty feet.
- B20. Carmichel, Jim. "Target Pistols: How to Pick A Winner," Outdoor Life, May 1977, p. 54f. This article covers criteria for selecting an accurate hand gun. Popularity of automatic pistols over revolvers in competitive target shooting is mentioned. Those who criticize the accuracy of the M1911A1 will be interested in the performance of modified versions. The author points out that changes in the slide, barrel bushing, trigger pull, and sights can reduce dispersion at fifty yards to 3.39 inches.
- B21. "Colt Pistols," Life, 2 March 1967, pp. 48-54f. A beautiful photographic display of Colt pistols dating as far back as 1836. At best, it has minor historical value. An example on how titles can be misinterpreted.
- B22. "The Combat Subjects and Corresponding Proficiency Levels Essential to the 1967 Training Program for the Light Weapons Infantryman," US Army Infantry Human

Research Unit, Fort Benning, Ga., December 1958 (AD478394). This study developed information for use in constructing training programs for infantrymen. It is interesting to note that the research group suggests that training be conducted under more realistic conditions.

- B23. Cooper, Jeff. "From Behind the Iron Curtain, a Sneak Preview of the Check 75," Guns & Ammo, February 1977, p.48. Although the author did not test this pistol, he provides a photograph and description. Resembling the 1935 Browning Hi-Power, this new double action hand gun manufactured in Brno, Czechoslovakia holds fifteen 9mm parabellum rounds. According to the author, it may be the best service automatic pistol in the world.
- B24. Cooper, Jeff. "Hardballer: The Space Age .45," Guns & Ammo, September 1977, pp. 44-46. Describes the new production of a M1911A1 type pistol by AMT Industries. Features include stainless steel construction, adjustable trigger, and movable rear sights. The unique stainless steel process results in a dull medium gray color.
- B25. Curtis, Tom. "Your SideArm, Sir!" Marine Corps Gazette, Vol. 39, August 1955, p. 12. A one page opinion that may have merit. The author feels that low confidence in the M1911A1 is due to limited familiarization. The suggested solution is to give a pistol to each officer upon commissioning, or to allow them to purchase the M1911A1 at cost.
- B26. Davis, Carl J. "Development of the National Match Pistol," The American Rifleman, July 1966, pp. 30-33. Explains the origination of M1911A1 National Match Pistols. In 1955, Springfield Armory produced 800 of these modified pistols. Primary improvement was accomplished by using a National Match barrel and bushing. In addition to part numbers of key components, the author provides a table indicating the modifications made to each series of Match pistols produced between 1955 and 1965.
- B27. Dinan, Alton S. "Sights That Can Aid Your Pistol Scores," The American Rifleman, July 1969, pp. 17-19. The evolution of pistol sights over the last 100 years is discussed. It is suggested that the Patridge-style sights are optimum for greatest accuracy. This style has a rectangular front sight and a rectangular notched rear sight. Sight adjustments and the distance between the sights are also addressed.

- B28. Driver, J. P. "Firing the Multi-Purpose Hand Gun," Marine Corps Gazette, Vol. 61, September 1976, pp. 46-47. An opinion, recommending the development of a double action revolver that shoots multi-projectile rounds. Although this is a relatively recent article, it advocates a concept as old as the flintlock. The hand gun proposed is surprisingly similar to the tunnel weapon that saw limited action in Vietnam.
- B29. "Effective Drag Coefficient for Various Small Arms Projectiles in Dense Media," BRL-MR-2481, Ballistic Research Laboratories, Aberdeen Proving Ground, Md., May 1975 (ADB004154). Three popular calibers (.32, .357, and .45) are fired at gelatin blocks (simulated biological tissue) using seven different bullet designs. This excellent test emphasizes the importance of bullet shape and the correlation it has with drag and energy deposit.. Blunt cylinder type (wadcutter) ammunition exhibits five times the drag as compared to the ball design. Mathematical modeling and related equations are addressed.
- B30. "Effectiveness of Pistol Bullets in Gelatin," BRL-CR-145, Ballistic Research Laboratories, Aberdeen Proving Ground, Md., March 1974 (AD918563). Energy deposits and cavitation of calibers .32, .38, and .45 are determined for various velocities from 700 to 1,300 feet per second. Seven bullet configurations are tested. Results indicate that energy deposit of the cylinder, or hollow point cylinder is well over twice as great as the standard ball design. Two hundred and fifty-two high speed motion pictures were used and mathematical modeling was employed.
- B31. "Evaluation of a Small Rocket in a Pistol Role," BRL-MR-1760, Ballistic Research Laboratories, Aberdeen Proving Ground, Md., July 1966 (AD375697L). Comparison test between the Tyrojet rocket projectiles and the caliber .357, .38 special, and .45 rounds. Emphasizes the negligible penetration capability of the Gyrojet Rocket at close ranges. Reveals that the Gyrojet offers no significant advantage over conventional military hand guns. An outstanding reference document on the Gyrojet gun.
- B32. "Evaluation of Synthetic Leather for Army Applications," TR-67-2926, Research and Engineering Division, US Army Weapons Command, December 1967 (AD826741). Synthetic leather for Army use is evaluated. Test report includes a nine month field test of a holster worn by selected security police. Information useful for holster re-design.

- B33. Faulkner, D.S. "Colt .45 vs the Luger," Marine Corps Gazette, Vol. 43, December 1959, pp. 48-49. A good historical summary addressing the initial tests that led to the adoption of the M1911 Colt pistol. Covers the December 1906 Springfield Armory comparison of the Colt, Luger, Bergmann, Savage, Knoble, and the White-Merrill pistols. This article surfaces the important fact that a comprehensive evaluation was conducted prior to the selection of the Colt.45.
- B34. "Feasibility of a Tunnel Weapon," TR-LWL-CR-02F68, US Army Limited War Laboratory, Aberdeen Proving Ground, Md., February 1969 (AD500937L). An excellent reference on the concept and initial testing of modified Smith and Wesson .44 magnum revolvers firing cartridges containing fifteen high density spheres. Includes photographs, drawings, and statistical analysis.
- B35. Featherstone, C. L., and R. J. Scaglione. "A Feasibility Study for Determining a Small Arms Measure of Effectiveness for Handling Characteristics," Navel Postgraduate School, Monterey, September 1975 (ADB008586L). Dispells the notion that a revolver is superior to an automatic in handling, speed, and pointing. Comparing a M1911A1 Colt .45 caliber pistol to a Smith and Wesson Model 10 .38 caliber revolver over 256 data points through four task sequences proved that there was relatively no difference in handling characteristics between the two weapons.
- B36. Ferrier, W. I. "Pistol Training for Combat," Marine Corps Gazette, Vol. 55, August 1971, pp. 50-51. Points out the need for realistic hand gun training. Discusses military and law enforcement experiences and reveals the differences between target shooting and combat shooting. Emphasizes that in close-quarter shooting, sights are not usually used and it is instinctive to assume a forward crouch.
- B37. "Final Letter Report of Engineer Design Test of Caliber .44 Tunnel Weapon," APG-MT-3213, Materiel Test Directorate, Aberdeen Proving Ground, Md., April 1969 (AD193064L). Four test revolvers fired 245 rounds. Five chargeable malfunctions surfaced problems with hammer spur, trigger stud, and cartridge length.
- B38. FM 23-35, Pistols and Revolvers, Department of the Army, September 1971. Operation, cleaning, maintenance, and training material is discussed.

- B39. Fullen, Lester M. "Time to Retire the .45?" Armor, Vol. 79, July-August 1970, pp. 64-66. A good summary of the advantages and disadvantages of the M1911A1 pistol. The author feels that a more modern hand gun is needed to include such features as adjustable sights, double action, and a minimum capacity of ten rounds. Less recoil and less noise are also advocated.
- B40. "Function Testing of Smith and Wesson Model 15 Revolvers Modified to Fire the 9mm Luger Cartridge, AFATL-TR-75-30, Air Force Armament Laboratory, Eglin Air Force Base, Fl., February 1975 (ADB003897). Explains the successful modification of the .38 Special revolver to fire both .38 Special and 9mm parabellum ammunition from the same cylinder. Indicates that over two million rounds of 9mm ammunition is in the Air Force's inventory, and it has 121 percent greater muzzle energy than the M41 .38 Special bullet.
- B41. Glaze, Ralph C. "G & A's Belted Blaster," Guns & Ammo, February 1977, pp. 36-40f. Developed by the magazine's staff, this .40 caliber magnum round is claimed to have the best features of both the .45 caliber and 9mm parabellum rounds. For the test, a Browning P35 Hi-Power pistol was modified to accommodate the 180 grain bullet and its velocity of 1,260 feet per second. With 635 foot pounds of muzzle energy, the Hatcher scale rating would be 70 for this new round. Slightly more powerful than the .45, and having more than twice the relative stopping power of the 9mm parabellum, this round has potential for military application. The modified pistol holds an impressive ten rounds.
- B42. "Gun Barrels, Cost Estimating Relationship," Procurement & Production Directorate, US Army Weapons Command, October 1970 (AD876653L). Through regression analysis a cost estimating relationship is determined.
- B43. Harris, Charles E. "Hunting with a .45 Handgun," The American Rifleman, February 1972, pp. 38-39. An article of marginal value. It is the author's opinion that one of the key disadvantages of the .45 automatic pistol is the military sights. The jacketed service bullet is also criticized. Indicates that greatest shock action can be obtained by using wadcutter type ammunition. No testing is conducted or referenced.
- B44. Harrison, E. H. "The .45 National Match Pistol," The American Rifleman, June 1966, pp. 40-42. Cross section

drawings of the National Match configuration are provided. Disadvantages of accurized pistols are mentioned. Close fitting of parts hinders disassembly and prohibits interchangeability of components between pistols. Production quantities are given. The development, specifications, and production sources for National Match ammunition is discussed. An objective and information article.

- B45. Haslam, Charles B. "Should Our Sidearm be a Revolver?" Marine Corps Gazette, Vol. 42, August 1958, pp. 28-31. One of the few authors that feels a revolver is superior to an automatic pistol for general military application. Recommends a 9mm parabellum revolver be developed. References the 1952 Tripartite Conference where representatives from the United States, Canada, and the United Kingdom recommended standardization to the 9mm parabellum round. Argues that an automatic clogs faster than a revolver.
- B46. "Heckler & Loch MP9 S Pistol," The American Rifleman, January 1973, pp. 56-60. Although this article addresses a relatively new West German pistol, it has primary value in the area of hand gun manufacturing. Discussion is centered around the use of steel pressings rather than steel forgings. This method minimizes machining time. Quality of the resulting pistol was judged excellent. Of 500 9mm Parabellum rounds fired, one failure occurred. The problem was attributed to the ammunition. Spread at 25 yards was 3.02 inches.
- B47. Herbert, Morris J. "The Military Handgun," Military Review, Vol. 48, December 1968, pp. 23-33. A superb article highlighting the main parameters to be considered in developing a new military hand gun. References tests conducted at the West Point Ballistics Laboratory in New York. Indicates that the 9mm parabellum round transfers more kinetic energy than the .45 caliber bullet. Experimentation results on permanent cavitation is discussed. The author states that a revolver clogs faster than an automatic.
- B48. "Historical Inflation Indices Cost Research Report," AMSWE-CPE-73-9, Cost Analysis Division, US Army Weapons Command, May 1973 (AD910428L). Provides historical indices for hardware and personnel. A good reference on costs relating to small arms.

- B49. Johnson, Harold E. "Modern Machine Pistols," Ordnance, Vol. 54, November - December 1969, pp. 314-317. Good historical article on machine pistols. Photographs include the Czech 1961 Skorpion, the Polish Wz63, and the US made Ingram Model 10.
- B50. Johnson, Thomas W. "Gyrojets Galore," Armor, Vol. 75, November-December 1966, pp. 23-25. Provides a description of the 13 mm Gyrojet rocket pistol, military carbine, and the survival hand gun with kit. Costs and system advantages are discussed. Includes photographs of the three basic configurations.
- B51. Johnson, Thomas M. "How Many More Rounds for Our Aging Heavyweight?" Army, Vol. 19, March 1969, pp. 45-49. Gives specifications of popular military hand guns. Recommends a comparison test between the Colt M1911A1, Browning Hi-Power, Colt Commander, Smith and Wesson M39, and the MB Associates Gyrojet pistol. Explains growth of the 9mm par-bellum round among the NATO nations. Provides some historical information, and includes a few photographs.
- B52. Jorgensen, Henry A., and Bern Diamond. "Increasing Colt .45 Performance," The American Rifleman, November 1969, p. 31. The modifications discussed are basically for target pistols. Extending the front sight two inches beyond the front of the barrel and adding weights to the recoiling slide, present some obvious disadvantages to the average service pistol.
- B53. Kates, Don. "The Best Police Handgun," The American Rifleman, July 1975, pp. 26-28. The author subjectively evaluates the following weapons for police application: .45 automatic, 41 Magnum revolver, .44 Magnum revolver, .357 Magnum revolver, and the .38 Special revolver. He rejects the Magnums and the 9mm rounds due to over-penetration and excessive range. Indicates that the .38 Special lacks stopping power. The .45 automatic is determined to be the best commercially available pistol to function at normal hand gun ranges.
- B54. Keesler, Singleton. "The Equalizer," Infantry School Quarterly, Vol. 45, January 1955, pp. 82-92. One of the best historical articles available on military hand guns. Discusses the evolution of firearms starting in 1322. A vivid account of the 1904 Thompson-LaGarde tests at Philadelphia Polyclinic where ten corpses were shot with a variety of bullets. Their findings were confirmed on the floors of the Chicago Stock Yards where steers were shot. The .45 caliber bullet exhibited the best stopping power and shock effect.

- B55. Marsh, Roger. "The Search for a Service Autopistol," Marine Corps Gazette, Vol. 39, October 1955, pp. 24-29. Excellent account of the tests that were conducted under the direction of the War Department from 1897 to 1911. Many Luger enthusiasts will be surprised to learn of the purchase of 1,000 Luger pistols and the unsuccessful field tests that followed. Discusses WWI production figures of the M1911, and the modifications in 1921 that created the M1911A1 pistol.
- B56. "Mathematical Model & Parametric Analysis of M1911/M1911A1 Caliber .45 Automatic Pistol," SWERR-TR-72-52, Small Arms Weapon Systems Directorate, US Army Weapons Command, August 1972 (AD904542L). Math model and computer simulation of recoil impulse for M1911 ball and XM261 shot cartridges is given. It is significant in that it determines that 26.5 to 58 per cent of the recoil force is not needed to work the recoil mechanism. Four possible methods for reducing the recoil of the M1911A1 are provided.
- B57. McAlister, J. S. "43 Years in a GI Holster," Marine Corps Gazette, Vol. 38, November 1954, pp. 59-61. Good article on the development and testing of the M1911. Emphasizes the fact that this pistol fired 6,000 rounds during testing without one misfire. Early production figures are given. Points out that the M1911 was designed by John Moses Browning, and he developed the Browning Hi-Power 9mm thirteen shot pistol as an improved version of the M1911A1.
- B58. McAlister, J. S. "Let's Adopt a Realistic Holster," Marine Corps Gazette, Vol. 39, May 1955, pp. 44-45. The author feels that the M1916 leather holster should be replaced. There is a sketch of a possible replacement holster that features a large flap which completely covers the pistol butt. A pocket for a magazine and cleaning rod is also advocated.
- B59. "Microballistic Weapon Systems Studies," R1807, Small Caliber Engineering Directorate, Frankford Arsenal, Pa., January 1966 (AD375582). This article validates the feasibility of developing a light hand gun with up to twenty barrels capable of firing 10 to 30 grain bullets with velocities up to 3,500 feet per second. Includes information on the status of advanced pistol concepts.

- B60. Miller, George P. "Pistol Proficiency," Armor, Vol. 79, November - December 1970, pp. 15-18. Discusses development of the Combat Pistol Qualification Course (CPQC) and the quick-fire principle. Points out that success of this new range can be measured in terms of better troop motivation and higher scores.
- B61. Miller, Rick. "The .45 is Best," Guns & Ammo, November 1977, pp. 49-50+. Discusses nine commercially available cartridges for the .45 caliber automatic pistol. Measures muzzle velocity and conducts a test on automobile body penetration. The author concludes that standard hard-ball ammunition is excellent for general application. It demonstrates adequate power and penetration, and provides reliable feeding.
- B62. Miller, Thomas A. "Hatcher's Formula," The American Rifleman, February 1975, p. 39. A well written page explaining the theory of relative stopping power. This article indicates that Hatcher's formula is the best method for determining stopping power. He claims that kinetic energy may merely reveal that a bullet has the ability to penetrate an object. Easy to understand examples are provided.
- B63. "More Punch Than a .45: Rocket-Firing Small Arms," Popular Science, Vol. 187, December 1965, p. 113. Gives a description, photograph, and features of the Gyrojet hand gun. Indicates that the commercial price of \$250 could be brought down to \$50 with full production.
- B64. Mulle, David. "Silencers for Small Arms," Ordnance, Vol. 53, March - April 1969, pp. 512-514. Good summary on the historical use of silencers. Emphasizes that bullets going faster than the speed of sound cannot be silenced, and that revolvers are usually harder to silence than automatics due to the space between the cylinder and barrel. Includes photographs of a silenced .22 caliber pistol similar to the one carried by U-2 pilot Francis Gary Powers, the British DeLisle .45 caliber carbine, and the German Schalldampfer 9mm carbine.
- B65. Nelson, Thomas B. "The Ingram LIW," Armor, Vol. 80, January - February 1971, pp. 50-52. Explains development of a new family of weapons designed by Gordon Ingram of the Military Armament Corporation. The .45 caliber version weighs 6.25 pounds, and the 9mm-Short machine pistol is 3.5 pounds.

- B66. Nihart, Brooke. "Are Army Generals Undergunned?" Armed Forces Journal, Vol. 109, October 1971, pp. 44-45. Explains the tradition of giving Colt .32 caliber automatic pistols to new brigadier generals starting in June 1947. The author criticizes this pistol since it has less than half of the relative stopping power of the M1911A1.
- B67. Nonte, George C. "Something Really New in Revolvers," Popular Mechanics, Vol. 136, August 1971, p. 107. Covers the Smith and Wesson Model W-12 revolver. Indicates that all parts except for the grip are interchangeable, and it makes maximum use of sintered (agglomerate by heating) parts and investment (hollow or skeleton) castings.
- B68. O'Connor, Jack. "The Big Change in Guns," Outdoor Life, Vol. 136, December 1965, pp. 61-76. Discusses changes in manufacturing since WWII. Trend is toward less hand labor.
- B69. O'Connor, Jack. "Remington's Latest: A New Handgun and Two New Cartridges," Outdoor Life, Vol. 131, May 1963, pp. 120-122. Describes the XP-100 pistol and the .221 caliber Remington cartridge. The 50 grain bullet leaves the muzzle at 2,650 feet per second, and develops 780 foot pounds of energy.
- B70. O'Connor, Jack. "The Question of Killing Power," Outdoor Life, Vol. 141, March 1968, pp. 64-65f. Good article addressing the key parameters for measuring killing power of a projectile. Author feels that bullet design and velocity are the two main criteria.
- B71. "Predicted Effects of Bullet and Propellant Weight Variations on Interior Ballistic Behavior in the Caliber .45 Automatic Pistol M1911A1," BRL-MR-2691, Ballistic Research Laboratories, Aberdeen Proving Ground, Md., October 1976(ADB014546). Computer simulation successfully used to predict muzzle velocities and maximum pressures resulting from changes in bullet and propellant weight.
- B72. "Program of Applied Research in Personal Defense Weapon System," TM-3-75, US Army Human Engineering Laboratory, Aberdeen Proving Ground, Md., January 1975 (ADA007657). This comprehensive effort concluded that the trigger pull and grip angle on the M1911A1 standard .45 caliber pistol was excellent from a human engineering perspective. The trigger pull and grip angle of the Luger pistol was found inferior to the M1911A1.

- B73. Rees, Clair. "New Auto Pistol Trio from Beretta," Guns & Ammo, September 1977, pp. 72-74f. Describes three new double action pistols produced by the Beretta Arms Company. The .22 and .38 caliber versions are of minor importance, but the 9mm parabellum pistol could have military application. It is designated the Model 92, and is an improved design of the Model 1951 which is used by the Italian, Egyptian, and Israeli Armies. The Model 92 holds an impressive fifteen rounds and weighs 32 ounces without ammunition.
- B74. "Results of Department of Defense Cost Research Survey," Office of Assistant Secretary of Defense (Systems Analysis) March 1968 (AD829375). A reference document providing status on cost research studies that were initiated or completed between March 1967 and March 1968. Section "Q" addresses small arms and ammunition.
- B75. Robinson, Russell S. "A Novel Machine Pistol," Ordnance, May - June 1971, pp. 556-557. The S.R. Model 11 Machine Pistol developed by the author in 1944 is described. It only weighed two pounds empty and held 16 9mm Parabellum rounds. Although tested by the United Kingdom Ordnance Board, it was rejected primarily due to poor accuracy. Several years after introduction, an improved double-action version was designed. Called the S.R. Model 16, at present there is no requirement for this weapon
- B76. Rogers, Pat. "Blue Shirts and Bolos," Guns & Ammo, September 1977, pp. 48-52+. Excellent article on the 1898 Philippines insurrection with photographs of both US and Philippine weapons. Explains the evolution of the Colt Military Model 1902 automatic pistol, and Model 1905, the New Service Model 1909, and finally the M1911. The author feels that forty years of experience has proven that the Hatcher Scale is without a doubt an outstanding indicator of relative stopping power of pistol cartridges.
- B77. Sears, Robert N. "U.S. Made Browning Challenger II Pistol," The American Rifleman, March 1977, pp.48-49. Although this article pertains to a .22 caliber automatic pistol, the author indicates that it incorporates many design and manufacturing improvements. It is interesting to note that this pistol has a grip angle of 108 degrees which is almost identical to the M1911A1. Average spread for the Challenger II was .94 inches at 25 yards.

- B78. "Silencers," R-1896, Frankford Arsenal, Pa., August 1968 (AD847383). A comprehensive evaluation of foreign and domestic silencers. Includes statistics, drawings, and photographs. Tests the caliber .22 Hi-standard pistol, caliber .30 M1903 rifle, caliber .30 M1 carbine, caliber .32 Sleeve gun, caliber .32 Welrod pistol, 9mm Welrod pistol, 9mm Sten submachine gun, 9mm Walther P38 pistol, 9mm Walther MPK submachine gun, and the .45 caliber M3 submachine gun.
- B79. Simmons, D. M. "High-Power Blowback Pistols," The American Rifleman, November 1967, pp. 60-63. The author examines 12 pistols that were developed for potential military application that feature a blowback design. This configuration is usually associated with low-powered pistols such as .22 caliber rimfire weapons. Of interest is the Kimball Model 1955 pistol which was designed to fire the .30 caliber carbine round. Photographs and descriptions of the 12 weapons are provided.
- B80. Simmons, Douglas M. "Modern Automatic Pistols," Ordnance, Vol. 56, May - June 1972, pp. 493-495. Discusses manufacturing costs and production techniques. Indicates that hand guns in the past were made from steel forgings that required a lot of manufacturing time. Current efforts are directed toward reducing machining and hand finishing time. Some new pistols are incorporating up to 80 per cent of zinc die cast parts.
- B81. "Small Arms Use in Vietnam: M14 Rifle and .45 Caliber Pistol," TN-1-67, US Army Human Engineering Laboratory, Aberdeen Proving Ground, Md., January 1967 (AD649517). Provides results to a questionnaire given to 83 combat troops. No attempt is made to analyze the responses.
- B82. "Small Caliber, Multi-Purpose, Automatic Liquid Propellant Gun," BRL-TR-94, Ballistic Research Laboratories, Aberdeen Proving Ground, Md., October 1976 (ADB015472L). Evaluates high density (NOS) monogropellants developed by the Navy. The results of this evaluation are impressive. Small 35 grain projectiles were projected at velocities of up to 5,000 feet per second. They developed kinetic energy greater than that of a M-16 rifle. Potential lies in less ammunition weight and volume, as well as a reduction in flash and smoke.
- B83. "The Soviet 9mm Stechkin Machine Pistol," FSTC-CW-07-104-75, Foreign Science and Technology Center, US Army Materiel Command, March 1975 (ADA007802). Forty-three pages of statistics, drawings, and photographs.

Less powerful than a 9mm parabellum, this pistol fires short ammunition, and has a fully automatic capability.

- B84. Stevens, R. Blake, and Jack V. Krema. "Browning's Last Pistol - The Model 1935 Hi-Power," The American Rifleman, July 1969, pp. 34-35. Tells the story of the design and production of the Browning Model 1935 pistol. Although initial production was in Belgium, during 1944 it was manufactured in Canada for Canadian, British, and Chinese Nationalist forces. Like the M1911A1 it is a single-action weapon, but it holds 13 9mm Parabellum rounds. The M1935 was produced with both adjustable and fixed rear sights.
- B85. Stewart, James B. "Why the Double Action Semi-Automatic Pistol?" The American Rifleman, June 1973, pp. 22-25. The author traces the evolution of double-action design since 1894. Descriptions of pistols such as the German Walther P38 are provided. Unfortunately, the Smith & Wesson Model 59 pistol is not included.
- B86. Strange, John J. "The Quiet Gun," Armor, Vol. 82, May-June 1972, pp. 493-495. Describes the six shot revolver that was developed by the Land Warfare Laboratory, Aberdeen Proving Ground, Md., for use by tunnel search personnel in Vietnam. This modified .44 magnum revolver has a .523 caliber smooth bore barrel with an effective range of fifty feet. Advantages mentioned include increased hit probability, and reduced flash and noise.
- B87. Tappan, Mel. "Semi-Auto Survival," Guns & Ammo, December 1977, p. 78f. Compares the advantages of an automatic pistol to those of a revolver. The author feels that the automatic is superior under conditions of survival. He further states that the Colt .45 caliber automatic pistol is the best defensive hand gun available.
- B88. "Test of Caliber .38, Special, Revolvers," RE-TR-71-84, Small Arms Weapon Systems Directorate, US Army Weapons Command, December 1971 (AD890433L). Firing test of standard M41 ammunition in twenty-four caliber .38 Special revolvers. Recommendations for improving reliability are provided.
- B89. "Time to Fire: The Semiautomatic Pistol Versus the Revolver," TM-33-76, US Army Human Engineering Laboratory, Aberdeen Proving Ground, Md., November 1976 (ADA033431). Reveals that the time to fire the first round from a holstered revolver averaged 1.7 seconds, and for the M1911A1 automatic 2.3 seconds. Advantage of the revolver was attributed to double-action configuration.

- B90. "Transportation Cost Study," AMSWE-CPD-70-17, Cost Analysis Office, US Army Weapons Command, July 1970 (AD87 915L). Provides cost estimates for shipping various weapon systems to include the M1911A1 pistol. Rates for motor, rail, air, and sea shipments are given.
- B91. Triggs, James M. "Colt D.A.38," The American Rifleman, September 1962, pp. 56-57. Historical article that explains how the Colt Model 1982 .38 caliber revolver was selected by the Army. In 1908, production stopped on this .38 caliber revolver as the pendulum swung to the .45 caliber round. The final revolvers produced were referred to as either the New Army, New Navy, Marine Corps Model, or the 1904 Officers Model. An exploded view of the revolver is provided in addition to a step by step disassembly procedure.
- B92. Triggs, James M. "Smith & Wesson Military & Police Revolver," The American Rifleman, January 1961, pp. 38-39. Explains the design and initial 1899 production of the Smith & Wesson .38 caliber revolver. Indicates that an improved version designated Model 1902 M&P fired the more powerful .38 Special Round. An exploded view and disassembly procedure for this weapon is provided. It is interesting to note that both Smith & Wesson and Colt .38 Special revolvers remain in the US military today.
- B93. Trueblood, Ted. "Don't Sell the Short Gun Short," Field and Stream, August 1977, pp. 10-12f. Interesting tales of hunting with handguns with no great substance. Author feels that greatest accuracy with a hand gun can be achieved by using both hands, and by sitting down with the shooter's arms resting on his knees.
- B94. "Tunnel Weapon," ACG-25/69I, Army Concept Team in Vietnam, November 1969 (AD864423). Results of a ninety day field test of ten tunnel revolvers in Vietnam. Two key recommendations indicated the tunnel weapon needed improved ammunition reliability, and greater lethality at twenty-five feet.
- B95. "US Army Test and Evaluation Command Expanded Service Test - System Test Operations Procedure Hand Weapons (Personnel Defense)," AMSTE-RP-702-102, US Army Infantry Board, Fort Benning, Ga., November 1972 (AD755623). Describes service test procedure to be used for evaluation of hand guns.

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- B96. Waite, M. D. "The .45 Can be Accurate," The American Rifleman, November 1966, pp. 30-33. Explains a 16 step accurizing procedure for the M1911A1 including photographs. Average spread at 25 yards is said to have improved from 5.66 inches for the rack pistol to 1.11 inches for the modified version.
- B97. Waite, M. D., "Fit for a General," The American Rifleman, March 1974, pp. 24-26. Discusses weapons that have been issued to U.S. Army generals with primary focus on M15 .45 caliber automatic pistol. This weapon began production in 1972 at Rock Island Arsenal, Illinois, and is actually a modified M1911A1. Details of the configuration are provided. Although this pistol is accurized, no performance information is given.
- B98. Waite, M. D. "New Loads for the 9mm Luger," The American Rifleman, November 1974, pp. 32-35. Starts with the introduction of the 9mm Parabellum round in 1902 and ends by describing 20 jacketed and 13 cast bullet loads available for the 9mm Parabellum weapon. All jacketed ammunition functioned perfectly when tested with the Browning Hi-Power, Colt Combat Commander, and Smith & Wesson Model 59 Pistols. Due to the feeding requirement of an automatic pistol only 6 of the cast bullets functioned properly. Pictures and comprehensive tables are provided. This was the most detailed work on 9mm Parabellum ammunition located.
- B99. Waite, M. D. "Smith & Wesson Model 59 Pistol," The American Rifleman, June 1973, pp. 40-42. Provides a thorough description of the Model 59 Pistol which is an improved version of the Smith & Wesson Model 39. Most notable, this new pistol holds 14 rounds of 9mm Parabellum ammunition in a staggered magazine. Weight is 30 ounces unloaded and 36.25 ounces loaded. The rear sight adjusts for windage. Unfortunately, the test pistol demonstrated no better accuracy than the M1911A1. Spread at 25 yards was 4.76 inches. Over 600 rounds of various 9mm Parabellum ammunition were fired without malfunction. It incorporates a double-action trigger mechanism.
- B100. Warner, Ken. "How That Rocket Gun Works," Popular Mechanics, Vol. 124, November 1965, p. 105. Describes the Gyrojet hand gun. Indicates that it has a circular error dispersion of up to twenty inches at ninety-seven feet. Author claims that it has poorer accuracy than any quality conventional hand gun.

- B101. Weller, Jac. "The Quiet Revolution in U.S. Firearms Making," The American Rifleman, January 1971, pp. 52-59. Discusses the changes in weapon manufacturing techniques over the last 30 years. A full range of manufacturing topics are addresses such as automation, rifling processes, and finishing. Two weapons, the Colt Mark III revolver and the Smith and Wesson Model 39, are followed step by step through production sequence. Excellent.
- B102. "What Happened in the Handgun Tests?" The American Rifleman, December 1971, pp. 19-22. Relates to the testing conducted by H.P. White Laboratory, Inc., Md., of 116 hand guns for the U.S. Treasury Department. The goal was to determine procedures necessary to judge the reliability and safety of commercial hand guns. The test procedure is outlined, but it is interesting to note that only 15 of these weapons survived the 5,000 round reliability phase. A Colt .45 pistol (Government MK IV) was among the finishers.
- B103. "World's Hottest Handgun," Popular Science, Vol. 182, June 1963, pp. 138-139. Describes the XP-100 Remington pistol with the .221 caliber high velocity cartridge. Comparison is made to five popular rounds.
- B104. Worman, Charles. "Colt Single Action Army Revolver," Hobbies, Vol. 82, March 1977, pp. 142-143. Like all the other Worman articles encountered this article is oriented toward gun collectors. However, interesting historical information is provided. Nicknamed the "peacemaker," the Army purchased 8,000 of these .45 caliber revolvers in 1873, and Colt continued to produce the civilian version as late as 1940.