

GAO

Report to the Chairman, Committee on
Government Operations, House of
Representatives

September 1988

PROCUREMENT

Quality and Safety Problems With the Beretta M9 Handgun



RESTRICTED—Not to be released outside the General
Accounting Office except on the basis of the specific approval
by the Office of Congressional Relations.

**National Security and
International Affairs Division**

B-222372

September 15, 1988

The Honorable Jack Brooks
Chairman, Committee on Government Operations
House of Representatives

Dear Mr. Chairman:

As requested in your March 28, 1988, letter, we have reviewed the M9 9-mm handgun program. Specifically, we addressed (1) M9 quality and safety problems, (2) allegations that the Army attempted to cover up the problems, and (3) differences between the M9 tested in 1984 and the weapon currently being produced by Beretta U.S.A. We also obtained information on the status of the Army's efforts to conduct re-competition tests for awarding a follow-on contract for additional 9-mm handguns as directed by the Continuing Appropriations Act of fiscal year 1987. The results of our review are summarized in this letter and more fully discussed in appendixes I through III.

The Army has experienced quality and safety problems related to frame cracks and the slide assembly separating from the weapon. The contractor has implemented an engineering change proposal that appears to have resolved the frame crack problem. The change reduced the amount of force transmitted to the rear of the frame when the weapon is fired. As for the slide failure problem, the Army has determined that a fatigue crack causes the slide to fail. The Army's focus is on preventing the failed slides from separating from the weapon and injuring the shooter. At the same time, the Army is attempting to determine what causes the fatigue crack to develop.

The Army did not attempt to disguise or hide the quality and safety problems. In fact, the Army rejected production lots of M9s due to the frame crack problem and issued a safety message to M9 users shortly after the first Army M9 slide failed instructing them to, among other things, replace the slide about every 3,000 rounds.

The M9 configuration and acceptance criteria for the weapon have changed from the time the weapon was tested in 1984 and contracted for in 1985. However, according to Army test and evaluation officials, these changes have not materially affected the weapon's performance characteristics. To obtain an independent assessment of the changes to the weapon, we had an independent testing laboratory — Underwriters

Laboratories — review those contract changes that could affect M9 performance. Underwriters concluded that it is probable that the changes make it easier for the manufacturer to comply with the contract specification. The Underwriters report was inconclusive as to whether these changes would have an impact on weapon performance.

The Army, after initially exempting the M9 from re-competition testing for the follow-on procurement contract, decided to include the M9 in re-competition testing, which began about mid-August 1988. The Army expects that a contract will be awarded in May 1989.

Our review was performed from March through August 1988 in accordance with generally accepted government auditing standards. Our objectives, scope, and methodology are discussed in appendix IV. As you requested, we did not obtain official comments from the Department of Defense on this report.

As arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from its issue date. At that time, we will send copies to interested committees and other Members of Congress; the Secretaries of Defense and the Army; and the Director, Office of Management and Budget. Copies will also be made available to other parties upon request.

Sincerely,



Frank C. Conahan
Assistant Comptroller General

Contents

Letter		1
Appendix I		6
Status of the M9 9-MM Handgun Program	Introduction	6
	Quality and Safety Problems	7
	No Indications of an Army Attempt to Cover Up M9 Problems	16
	Comparison of Current M9 With the Weapon Tested in 1984	17
	Ongoing Army Efforts to Conduct Competition for Follow-On 9-MM Procurement	18
Appendix II		20
M9 Contract Modifications and Changes	Changes Affecting Parts Design	20
	Changes Affecting Acceptance Testing Methodology	21
	Changes to Correct or Revise Drawings or Specifications	22
	Other Changes	23
Appendix III		24
Quality Conformance and Lot Acceptance Inspections	Lot Size	24
	Weapons Inspection Procedures	24
Appendix IV		28
Objectives, Scope, and Methodology		
Table	Table I.1: Summary of Slide Failures	10
Figures	Figure I.1: Major Components of the M9 Pistol	6
	Figure I.2: M9 Frame and Location of Frame Cracks	8
	Figure I.3: M9 Slide and Location of Fatigue Cracks	9
	Figure I.4: History of the Slide Failures	12

Abbreviations

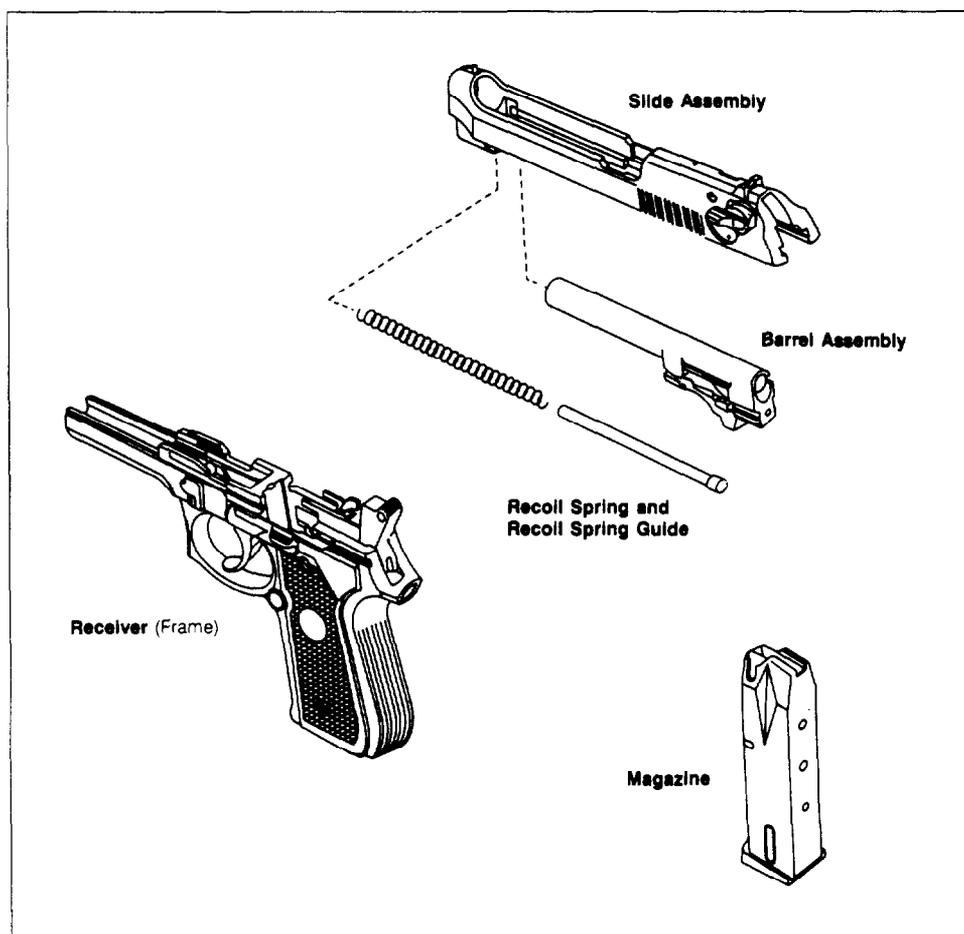
DCAS	Defense Contract Administration Services
ECP	engineering change proposal
GAO	General Accounting Office
MPI	magnetic particle inspection
NATO	North Atlantic Treaty Organization
SEM	scanning electron microscope

Status of the M9 9-MM Handgun Program

Introduction

The Department of Defense, in 1980, decided to replace the various types of handguns in its inventory with a 9-mm pistol. After testing several 9-mm versions, the Army decided on the Beretta U.S.A. version, which was designated the M9. Figure I.1 shows the M9 and its major components.

Figure I.1: Major Components of the M9 Pistol



The Army was given the responsibility for procuring the M9 for all the services and in April 1985 awarded a contract with an estimated value of about \$75 million to Beretta for 315,930 M9s. As of fiscal year 1988, the contract had increased to 321,260 handguns and a value of about \$77.3 million.

According to the Defense Contract Administration Services (DCAS) representative at the Beretta plant, as of August 17, 1988, the Army had accepted delivery of 133,830, or about 42 percent of the total number of M9s in the contract award. The number accepted by the Army represents M9s produced through March 1988. Thus, the contractor is about 4 months behind in meeting its planned delivery schedule.

Quality and Safety Problems

The quality and safety problems experienced with the M9s have consisted of frame cracks and slide failures. Of these two problems, the Army considers the slide failures to be the more serious, because when the slide fails and separates from the weapon, personal injury may occur. Furthermore, the Army has not been able to identify the root cause of the slide failures. However, it is seeking solutions to prevent broken slides from flying back at the shooter.

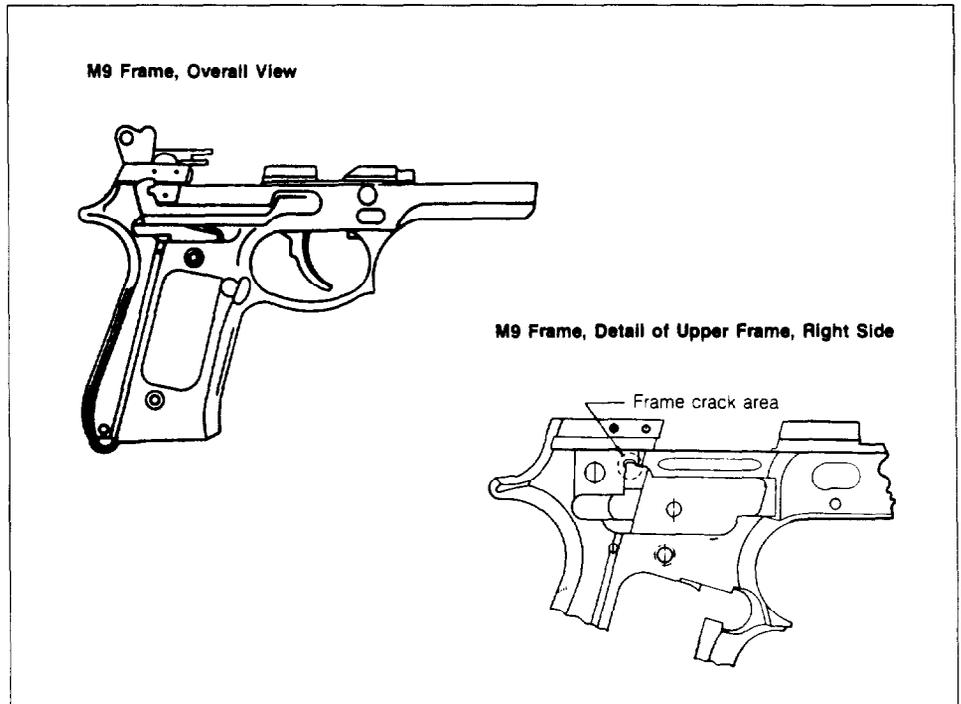
The Army considers the frame crack problem to be cosmetic in nature with no adverse effect on the weapon's performance or reliability. Nevertheless, the frame cracks violate acceptance testing procedures specified in the contract and were the reason the Army rejected the December 1987 and January 1988 production lots, totaling about 12,000 M9s. An engineering change proposal (ECP) has been implemented to correct the problem, and the previously rejected M9s have been reworked, tested, and accepted by the Army.

The Frame Crack Problem

Indications of frame cracks were first noticed during lot production testing of the M9s produced in September and October 1987. At that time, the DCAS representative at the Beretta plant recommended that the Army not accept the lots, which totaled about 12,000 weapons. However, the M9 program office overruled the recommendation on the basis that it was not clear that the frames were cracked. In the program office's opinion, what looked like cracks in the frame could have been surface marks or scratches.

Production lot testing of the November 1987 lot did not indicate any frame cracks. However, frame crack indications reappeared during the December 1987 and January 1988 lot testings. In response to these test results, the Army rejected the two lots. Figure I.2 shows the location of the frame crack. (See app. III for a detailed description of quality conformance lot and acceptance inspections.)

Figure I.2: M9 Frame and Location of Frame Cracks



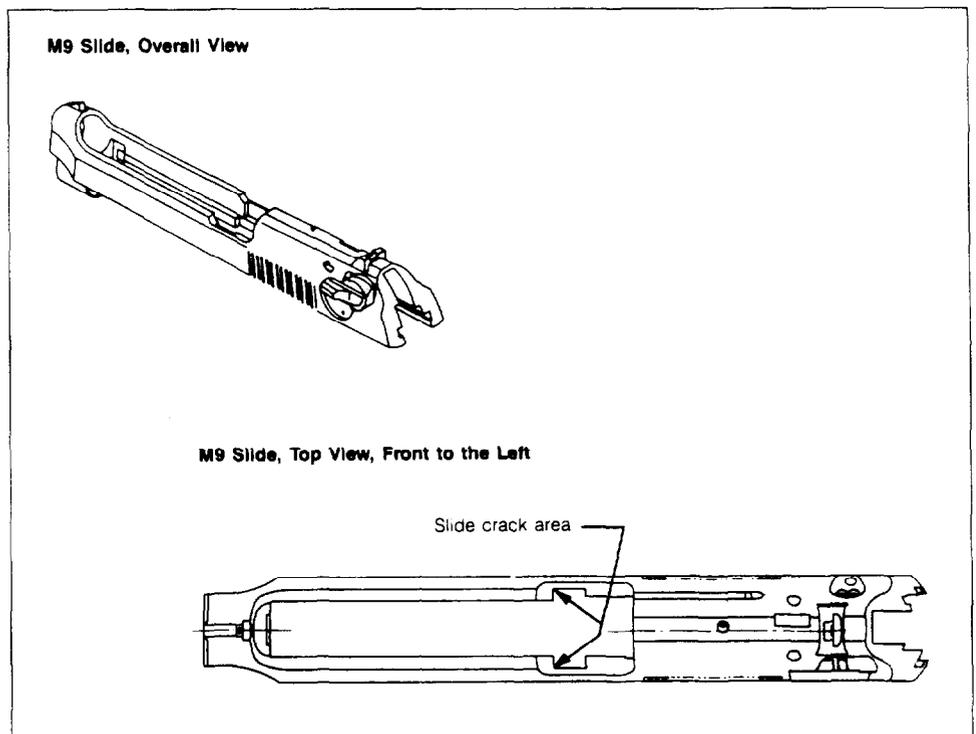
In February and March 1988, the contractor continued to produce M9s at the rate of 6,000 a month. However, these lots were not submitted for acceptance testing. Thus, at the end of March 1988, the Army had rejected 12,000 M9s and the contractor had not submitted an additional 12,000 M9s. During April 1988, an ECP was implemented to correct the frame crack problem. The ECP involved a design modification and associated machining to reduce the force transmitted to the rear portion of the frame when the weapon is fired.

According to the DCAS representative, as of August 30, 1988, the 24,000 M9s handguns in the December 1987 and January, February, and March, 1988, production lots had been reworked, tested, and accepted by the Army. The April 1988 production lot, consisting of 591 weapons produced before the ECP was incorporated and 5,409 M9s produced after the ECP was incorporated, had just been submitted to the government for testing and acceptance. We were told by the DCAS representative and M9 program office that no decision has been reached between the government and Beretta as to who will be responsible for bearing the cost of reworking the M9s produced before the ECP was implemented.

The Slide Failure Problem

Several Beretta 9-mm handguns experienced broken slides that separated from the weapon. The Army has determined that a fatigue crack located near the slide's locking lug slot causes the slide to break when it reaches its full rear firing position. (See fig. I.3.)

Figure I.3: M9 Slide and Location of Fatigue Cracks



As of July 29, 1988, the services had experienced 14 slide failures: 3 involving Navy-owned handguns and 11 involving Army-owned handguns. The three Navy failures occurred under operational conditions, and the 11 other failures occurred under laboratory test conditions.

The Army considers the slide failure problem to be the more serious of the two recent weapon problems. The slide is expected to continue to function without cracks or breaks for at least 7,000 rounds, and as shown in table I.1, most of the weapons met this requirement. However, what is of particular concern to the Army is the unsafe manner in which the slide fails. When failure occurs, the slide breaks into two parts, and the rear part flies back at the shooter, possibly causing injury. As a result of the three operational failures and the first test failure, the shooters received injuries. Three shooters received face lacerations. One

**Appendix I
Status of the M9 9-MM Handgun Program**

of them had a tooth broken and two required stitches. The fourth shooter received chest bruises. Since the first three slide failures, all laboratory tests have been conducted with the shooter behind a protective shield.

Table I.1: Summary of Slide Failures

No.	Service	Model	Date	Slide failure test	Cracks Detected (Number of Rounds)		Failure at round number	Unsafe	Injury	Ammunition
					SEM or MPI	Visually				
1	Navy	92SB	9/23/87	No	a	a	30,000 ^b	Yes	Yes	Various
2	Navy	M9	1/06/88	No	a	a	4,500 ^b	Yes	Yes	NATO
3	Army	M9	2/08/88	No	c	c	6,007 ^d	Yes	Yes	NATO
4	Army	M9	3/10/88	Yes	4,000	4,905	4,908	Yes	No ^e	NATO
5	Army	92SBF	3/14/88	Yes	9,000	16,400	17,408	Yes	No ^e	NATO
6	Army	92SBF	3/16/88	Yes	5,000	13,000	21,264	Yes	No ^e	NATO
7	Army	92SBF	3/17/88	Yes	11,000	17,108	24,656	Yes	No ^e	NATO
8	Army	M9	3/17/88	Yes	c	c	7,806	Yes	No ^e	NATO
9	Army	M9	5/23/88	Yes	8,500	16,000	21,942	Yes	No ^e	NATO
10	Army	M9	5/26/88	Yes	9,500	16,000	21,486	Yes	No ^e	NATO
11	Army	M9	6/22/88	Yes	11,000	f	23,310	No	No ^e	NATO
12	Navy	M9	7/14/88	No	c	c	10,000 ^b	Yes	No ^e	Various
13	Army	M9	7/14/88	Yes	10,000	f	30,083	No	No ^e	NATO
14	Army	M9	7/18/88	Yes	13,000	f	30,545	Yes	No ^e	NATO

Legend
SEM = Scanning electron microscope
MPI = Magnetic particle inspection
M9 = Military Beretta 9-mm sidearm
92SB and 92SBF = Commercial Beretta 9-mm pistol

^aSEM or MPI not used; no cracks seen visually.

^bEstimated number.

^cSEM, MPI, and visual inspection showed no cracks.

^dMagnetic particle inspection at 6,000 rounds showed no cracks.

^eSpecial failure test conducted with protective shield for shooter.

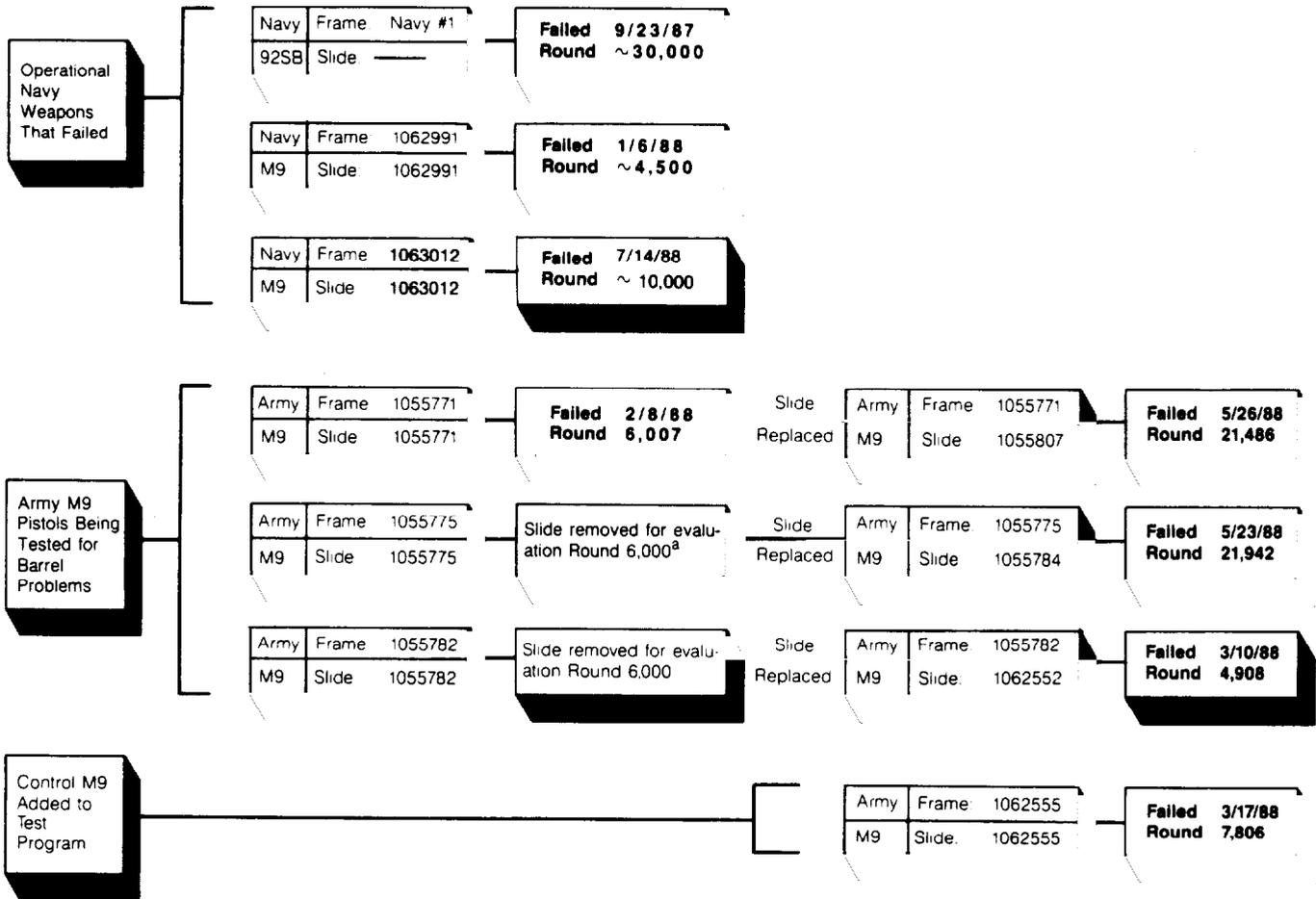
^fRound count not recorded when visual cracks were first seen.

Figure I.4 provides the dates and other details of each of the 14 slide failures.

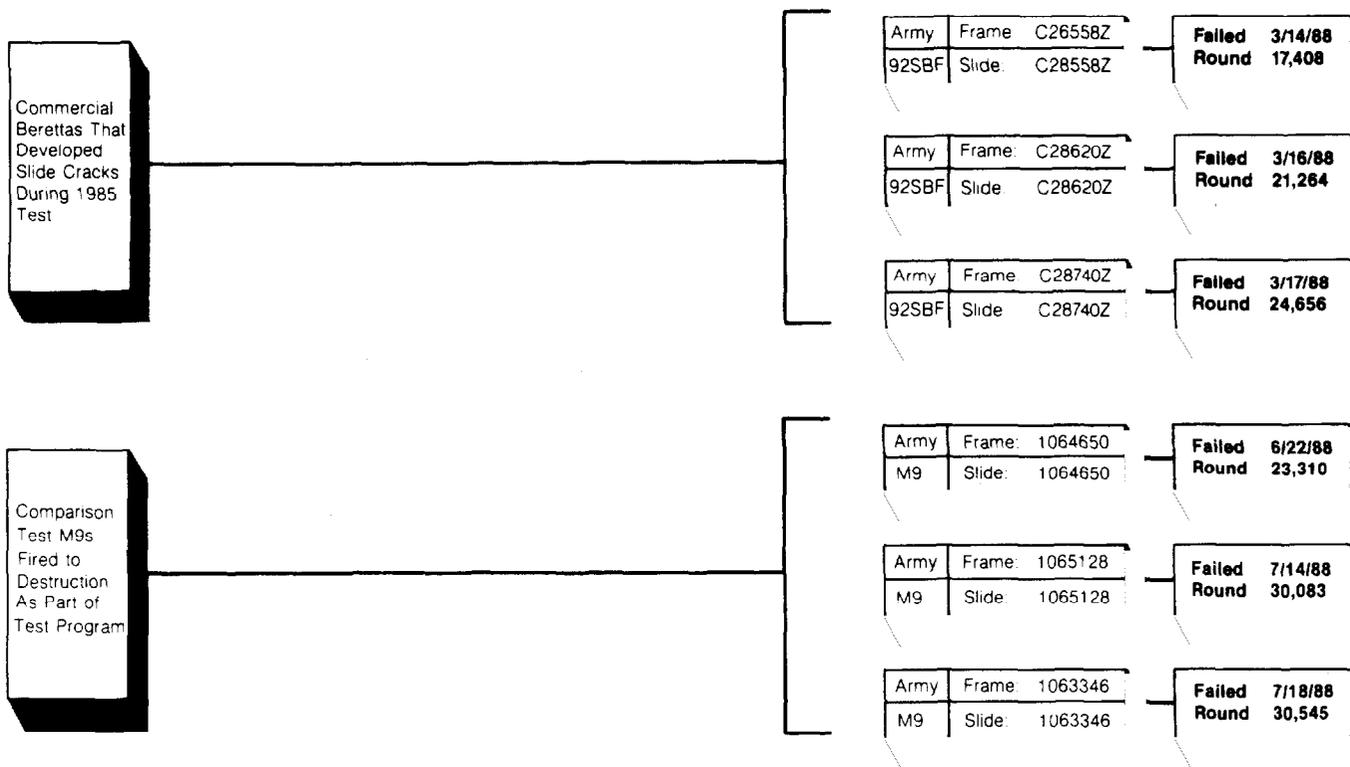
Appendix I
Status of the M9 9-MM Handgun Program

**Appendix I
Status of the M9 9-MM Handgun Program**

Figure I.4: History of the Slide Failures



**Appendix I
Status of the M9 9-MM Handgun Program**



^aCrack found after slide sectioned and inspected under microscope.

The first slide failure occurred on September 23, 1987, and the second on January 6, 1988. Both failures occurred in Navy operational units, and the actual number of rounds fired through the weapons is uncertain, because there was no requirement to keep a record of the rounds fired or of the ammunition that was being used. It is estimated that the first failure occurred after about 30,000 rounds and the second one after about 4,500 rounds. Until recently it was believed that other than North Atlantic Treaty Organization (NATO) standard ammunition had been used in these guns. However, based on additional information obtained by the Navy's Small Arms Program Manager, he believes that only the first weapon was firing non-NATO standard ammunition. The contract required that the 9-mm handgun be designed with the capability to fire NATO standard ammunition. However, the use of non-NATO standard ammunition in the M9 is not considered a breach of the contract or its warranty.

The third operational Navy slide failure occurred on July 14, 1988. It involved a field unit using an M9 firing NATO standard ammunition at the time of the failure. Although an M9 safety message recommended the slides be replaced after 3,000 rounds, the Navy estimated that this weapon had fired up to 10,000 rounds when it failed. The reason the safety replacement criteria was exceeded was that the unit had just returned from an operational deployment. The slide was scheduled to be replaced on July 25, 1988. Preliminary analysis of the failed slide showed that it had a low metal toughness similar to the slide failure that occurred February 8, 1988, after 6,007 rounds.

The first laboratory slide failure, which occurred on February 8, 1988, involved an Army M9 firing NATO standard U.S.-produced M882 ammunition. This weapon was one of three M9 handguns being tested for problems related to the barrel. As part of the test, all three weapons had been inspected after 6,000 rounds using a scanning electron microscope (SEM) or magnetic particle inspection (MPI) process, and there were no indications of slide cracks. When the M9 slide failure occurred at 6,007 rounds, the broken slide and the slides on the other two test weapons were removed for metallurgical evaluation. The evaluation showed that one of the other slides also had fatigue cracks. This evaluation marked the beginning of an Army slide failure test program to determine why the failures had occurred.

The Army replaced the slides on the three weapons and continued to fire the M9s, using NATO standard ammunition, until each broke. One

slide failed at 4,908 rounds, another failed at 21,942 rounds, and the third failed at 21,486 rounds.

The next grouping of weapons in figure I.4 shows the test results for four other weapons: one M9 and three Army-owned commercial (92SBF) handguns. The slide on the M9 failed after 7,806 rounds, and the slides on the three 92SBFs failed at 17,408, 21,264, and 24,656 rounds. All the weapons were using NATO standard ammunition.

In 1985, the Army acquired the three commercial 92SBFs for testing to determine which part would fail first. The first part to fail was a barrel. After the barrel failed, the Army suspended testing and inspected the weapons using an MPI process. The inspection showed slide cracks on all three weapons. Because slides are considered spare parts and there had not been any slide failures at that point in time, the cracked slides did not raise any specific concerns. However, after the first three slide failures in late 1987 and early 1988, the Army decided to resume testing of the three commercial weapons.

The final grouping of weapons involved three M9s that were being tested as part of an annual comparison test.¹ After the weapons were fired 10,000 rounds, the slides were inspected using the MPI process and one slide was cracked. The Army decided to fire all three weapons until the slides failed. Slide failure occurred at the 23,310 round mark on one weapon, 30,083 on another weapon, and 30,545 on the third weapon. Unlike previous slide failures, two of these failures occurred in a safe fashion. In other words, the slides did not separate from the weapons.

The contractor believes that the failures resulted from firing non-NATO standard ammunition or NATO standard ammunition that had not been properly certified to ensure that it complied with NATO specifications. The contractor believes that such ammunition could exert enough pressure variation to damage the weapon. Army testing officials told us that, while ammunition is always a factor that has to be considered, ammunition is not the primary cause for the slide failures.

Army officials also told us that the contractor has recently completed tests in which 20,000 rounds were fired through each of 12 M9s. The tests, observed by Department of Defense representatives, consisted of firing six weapons using NATO standard ammunition produced by one

¹A test conducted to compare production weapons to the M9 military specifications.

manufacturer and six weapons using NATO standard ammunition produced by another manufacturer. In the first set of six weapons, cracks developed on four slides, and in the second set a crack developed on one slide. However, none of the slides failed.

The Army's current focus is to identify a means to ensure that, if a slide fails, the broken slide will not injure the shooter. According to the Deputy Program Officer, the Army has decided not to accept delivery of any more M9s, after the April production lot is accepted in late August or early September 1988, until a fail-safe mechanism is incorporated in the weapon. He said that the Army would probably resume accepting deliveries in January 1989.

The Army is also pursuing the root cause of the metal fatigue that causes the slide to fail. As part of its efforts to identify the cause of the fatigue cracks, the Army is reviewing the process for heat-treatment of the slides. Prior to April 1988, all the slides were manufactured in Italy. Since that time, the slides have been manufactured in the United States. The slides that failed were manufactured in Italy; however, the Army has not made a determination whether to review the heat-treatment process for these slides because the contractor is no longer using Italian manufactured slides. Instead, the process used by the U.S. contractor is being reviewed to determine if the process needs to be revised in order to preclude future failure.

No Indications of an Army Attempt to Cover Up M9 Problems

On March 1, 1988, about 3 weeks after the first Army M9 slide failure occurred, the Army issued a safety message to M9 users advising them of the slide failures and instructing them on the safety procedures to be followed. The M9 program manager told us that he had not responded to the two earlier slide failures on Navy weapons because of the lack of available information about them and uncertainties about the type of ammunition used in the weapons.

Before issuing the safety message on March 1, 1988, the M9 program office advised the Army Materiel Command, on February 18, 1988, of the slide failures, stating that an investigation of these incidents was under way. The March 1, 1988, safety message instructed M9 users to (1) maintain a count of the numbers of rounds fired, if possible; (2) replace the slides about every 3,000 rounds; and (3) send removed slides to the Anniston Army Depot for replacement.

The Navy reacted to the Army's safety message by issuing its own slide failure engineering bulletins. The bulletins advised users that M9s should only be used for operational and emergency requirements—not for training or familiarization purposes. On March 22, 1988, the Navy lifted its restriction on M9 use for familiarization and training. On April 19, 1988, the Navy notified the Army that it would not accept delivery of any more M9s until the slide failure problem has been resolved.

Comparison of Current M9 With the Weapon Tested in 1984

As of May 13, 1988, the Army had approved 24 contract modifications and changes for the M9. We reviewed these actions to determine whether the gun's performance or configuration or acceptance criteria had been affected by the contract modifications and changes. The changes can be categorized as design changes, testing methodology changes, drawing changes, specification changes, and "other" changes.

The Army Materiel Systems Analysis Activity issued a report in February 1988 assessing the effects contract actions have had on M9 performance. The report stated that (1) the M9 continues to meet the Army requirements set forth in the 1984 Request for Test Samples, and (2) contract changes have not materially altered the M9's characteristics or configuration or degraded the M9 pistol's reliability, durability, accuracy, or dispersion (shot pattern).

There were three changes related to the firing pin indent specification and the acceptance criteria for targeting and accuracy that, we felt, could affect the M9's performance. (See actions W5S0115, W6S3002, and G7S3072 in app. II.) We requested Underwriters Laboratories to analyze these changes in terms of their effect on weapon performance.

Underwriters reported that the first change increased the firing pin indentation maximum limitation from 0.038 to 0.043 centimeters. Underwriters concluded that as long as the firing pin has sufficient energy to fire the bullet's primer but not penetrate it, it is acceptable. They also stated that the increase in the maximum tolerance could be viewed as making it easier to comply; however, it would not seem to affect the weapon's performance.

In reviewing the two changes affecting targeting and accuracy, Underwriters observed that both requirements changed. Initially, the contract specification for targeting required the center of impact of a 10-round shot group be not more than 10.2 centimeters away from the point of

aim, with no specific restriction on the outer boundary for the shots. The change required that all 10 rounds of a shot group be within an 46- by 56-centimeter, oval-shaped target (roughly the size of a human torso) with the aiming point at its center. Underwriters stated that whether this change would make it easier to comply with the requirements is uncertain. They concluded that it is likely that the change would allow the 10-shot pattern to be over a larger area, but it would not allow even a single shot to be more than 28 centimeters away from the point of aim. Further, under the older requirements, one or perhaps two shots could be further away than that distance.

Underwriters reported that the change in the accuracy requirements gave two choices of the method used for determining acceptance. One choice is that the mean radius of the 10-round shot group must not be 4.6 centimeters greater than the mean radius of that same ammunition as shot through a test barrel. They observed that this is an increase over the 3.6-centimeter original requirement. The other choice, added by this change, is that the mean radius of the 10-round shot group must not exceed 8 centimeters (thus not comparing the ammunition fired from the production barrel with the same ammunition as fired from a test or proof barrel). Underwriters concluded that the revised accuracy requirement is less stringent than the original, but the change is offset somewhat by the restrictions imposed under the new targeting requirement.

Underwriters Laboratories concluded that it is probable that the changes would make it easier for a manufacturer to comply with the contract specification. The Underwriters report was inconclusive as to whether changes would have an impact on weapon performance.

Ongoing Army Efforts to Conduct Competition for Follow-On 9-MM Procurement

The Continuing Appropriations Act for fiscal year 1987 directed the Department of Defense to hold a re-competition during fiscal year 1987 for the follow-on procurement of the 9-mm handgun beginning in fiscal year 1988. The associated conference report directed the Army to use the same performance specifications used in the 1985 contract.

On September 30, 1987, the Army issued a Request for Test Samples. The request stated that the M9 would be exempted from testing, because, in the Army's opinion, the M9 continued to meet production and lot acceptance requirements. This decision caused concern on the part of officials in the Office of the Secretary of Defense who believed that the M9, along with other competitors' weapons, should be subject to

identical tests using new U.S.-manufactured M882 9-mm NATO standard ammunition.

Between September 1987 and April 1988, Office of the Secretary of Defense officials continued to express concerns with Army's plan to exempt the M9 from recompetition. In fact, Defense put a hold on \$5.3 million of the Army's fiscal year 1988 procurement funds until the Army complied with Defense policy and congressional direction to subject all candidates to identical testing.

In addition, on February 25, 1988, we issued a decision in response to a bid protest filed by Smith and Wesson on October 28, 1987. The protest took issue with the Army's decision to exempt the M9 from recompetition and not to exempt Smith and Wesson, which contends it passed all of the 1984 test requirements. Our decision stated that (1) Smith and Wesson's gun should not be retested on those elements that it had passed during the earlier 1984 competition/testing, or (2) if Smith and Wesson's gun was to be completely retested, then the Beretta M9 should also be retested. Two weeks later, on March 11, 1988, the Army asked us to reconsider our decision. On April 14, 1988, we affirmed our original decision.

After considerable discussions between your Committee and the Army and between the Office of the Secretary of Defense and the Army, the Army publicly announced that its ongoing competition for follow-on procurement of 9-mm handguns was being canceled and that a new competition, including testing of the M9 handgun, would be held. The Army's decision, which appeared in the Commerce Business Daily on April 28, 1988, advised that a Request for Test Samples would be issued on May 10, 1988, and that a draft Request for Proposal would be issued 10 days later. Competition testing began during August 1988, and the Army expects that a contract will be awarded in May 1989.

M9 Contract Modifications and Changes

As of May 13, 1988, the Army had approved 24 contract modifications and changes grouped as follows: 8 design improvements or upgrades, 7 acceptance testing methodology changes, 5 corrections or changes to drawings or specifications, and 4 "other" changes. These 24 contract actions are summarized below.

Changes Affecting Parts Design

W6S3017 - May 20, 1987	This change altered the shape of the lanyard loop located on the butt of the pistol to make it symmetrical and thus avoid installation errors.
W6S3018 - May 20, 1987	This change made the legs of the trigger spring symmetrical in order to preclude incorrect installation.
W6S0037 - May 20, 1987	This alteration added a 60-degree-inclined countersink to the disassembly hole located at the base of the magazine to allow disassembly using a 9-mm cartridge.
W6S0038 - May 20, 1987	This change replaced the lanyard loop pin with a newer version.
W6S0075 - May 20, 1987	This change decreased the depth of the countersink hole used for magazine disassembly (see W6S0037).
G7S6059 - December 16, 1987	This modification described the process and tools to be used to smooth the hammer full cock notch. This change was made to (1) correct the failure of two pistols to pass a single-action trigger-pull test, (2) allow acceptance of that lot, and (3) implement appropriate drawing changes to eliminate the problem in future lots.
G7S3152 - December 11, 1987	This alteration changed the required surface roughness on the hammer full cock notch, which was not specified in change G7S6059.

G8S3009 - February 12,
1988

This modification outlined the manufacturing process, procedures, and engineering changes needed to eliminate the frame crack problem.

Changes Affecting Acceptance Testing Methodology

W5S0133 - October 23,
1985

This alteration changed the specifications for targeting and accuracy tests and the firing pin indent test by (1) allowing the weapon to be hand-held during testing and (2) establishing retest criteria for pistols that had failed the initial test.

W5S3051 - January 2,
1986

This modification authorized dye penetrant tests to detect cracks in alloy parts.

W6S3002 - January 28,
1986

This change defined the test barrel/equipment and the test methodology to be used in computing the ammunition accuracy baseline. Each new lot of ammunition used in acceptance testing was required first to be test-fired through two proof barrels to determine its dispersion characteristics. The test consists of a minimum of three 10-shot targets from each barrel. The ammunition accuracy baseline was defined as the average mean radius plus one sample standard deviation.

W6S0000 - March 4, 1986

This alteration added the requirement to determine the cause of test failures prior to corrective action and resubmission for acceptance testing.

W6S0015 - April 15, 1986

This change eliminated the requirement to stamp each pistol with a government acceptance stamp.

G7S3072 - May 20, 1987

This modification changed the targeting and accuracy acceptance test methodology to move from a test environment to a production environment. In addition, the computation of the ammunition accuracy baseline was revised.

The targeting requirement was changed: the weapon was no longer required to shoot a 10-round shot group at 50 meters with the center of impact not more than 10.2 centimeters radially from the point of aim. The new requirement was for the gun to shoot a 10-round shot group at 50 meters with all rounds falling within an oval target figure measuring 18.5 inches wide and 22 inches tall.

The accuracy requirement was also changed: the gun was no longer required to shoot a 10-round shot group at 50 meters with a mean radius not more than 3.6 centimeters greater than the mean radius of the same ammunition when shot from a test barrel. The gun was now required to shoot a 10-round shot group at 50 meters with a mean radius the larger of (a) 8.0 centimeters or (b) 4.6 centimeters plus the ammunition accuracy baseline.

Also, the modification changed a computation factor used in determining the ammunition accuracy baseline from one sample deviation, as outlined in W6S3002, to two sample standard deviations.

W6S9010 - December 16,
1987

This change increased the lot size for firing pin indent acceptance testing in order to coincide with other testing methodology.

Changes to Correct or Revise Drawings or Specifications

W6S0074 - May 20, 1987

This change revised drawing notes and dimensions and updated parts lists for the new lanyard loop pin detailed in change W6S0038.

G8S3010 - February 12,
1988

This change corrected language that was improperly translated on a drawing.

Appendix II
M9 Contract Modifications and Changes

G7S3188 - May 4, 1988 This alteration made a correction to one drawing and revised another drawing by changing the tolerance specification on the barrel muzzle.

G8S2012 - May 4, 1988 This alteration made corrections to four drawings.

W5S0115 - September 17, 1985 This change increased the maximum allowable firing pin indent from 0.038 to 0.043 centimeters.

Other Changes

W6S6035 - June 18, 1986 This change accepted 17 pistols that had failed first article testing after appropriate rework, retest, and inspection.

W6S6057 - October 16, 1986 This modification authorized surface grinding (buffing) on 12 slides to remove surface scratches and authorized the nominally undersized dimension that resulted from the grinding.

W6S7043 - October 16, 1986 This change approved an alternative method for joining steel strapping used in packaging.

W6S7046 - November 4, 1986 This change increased the allowable lot size for reliability testing from 6,000 to 7,200 weapons or a month's production, whichever was smaller.

Quality Conformance and Lot Acceptance Inspections

Lot Size

The contract specifies that lot size may be 6,000 pistols or a month's production, whichever is smaller. For inspection purposes, the contract stipulates that a lot is made up of 500 weapons. After five successive lots of 500 weapons have passed all tests and have been accepted, the lot size is increased to 3,000. The lot size can be further increased to 6,000 after five additional successive lots of 3,000 have been accepted. At the time the first lot was rejected for frame cracks in December 1987, the lot size being submitted to the government for acceptance was 6,000. According to the contract, lots that have been rejected must be corrected and resubmitted at the next smaller permissible lot size. The government is currently testing lots of 3,000, and when it has accepted five successful lots, the contractor may increase the lot size to 6,000.

Weapons Inspection Procedures

According to the DCAS representative, during the manufacturing process, contractor personnel inspect the weapons and conduct various tests to ensure that the weapons meet contract requirements. After the tests are conducted and the weapons are packed for shipment, the government representative at the contractor's plant selects a number of weapons for lot acceptance testing.

Inspection and Testing During the Manufacturing Process

Contractor quality control personnel inspect parts and subassemblies at various points in the manufacturing process. The inspectors are required by the contract to inspect a number of parts and subassemblies from each lot, as stipulated in government specifications. The exact number depends on the part, or point in the manufacturing process. The government representative selectively observes manufacturing operations and randomly inspects sublots; however, he does not observe every part of the inspection or every subplot test.

Each weapon is inspected and tested by the contractor after final assembly to ensure that it functions properly. Any weapon that fails one of the tests is rejected. In such cases, the cause of the failure must be determined and corrective action taken before the weapon may be resubmitted for retest. The required weapon tests are described below.

High-Pressure Resistance

Each pistol fires one standard high-pressure test cartridge. After firing, the weapon is visually examined for cracks and other evidence of damage, and the cartridge is visually examined for defects. The barrel, locking block, and slide are then magnetic particle inspected for indications

of faults. If the weapon passes the test, it is etched with the appropriate proof and magnetic particle inspection marks.

Headspace

Each pistol is tested to ensure that it meets the headspace requirement—1.915 to 1.930 centimeters. The test consists of placing the minimum and maximum gauges in the barrel chamber of the pistol while the slide is open. The slide is then manually returned to the battery position. When the minimum gauge is used, the slide should close fully. When the maximum gauge is used, the slide should not close fully.

Trigger Pull

Each pistol is tested to ensure that it meets the trigger pull requirements in both the single and double action mode. The trigger pull requirement is 1.80 to 2.90 kilograms for single action and 3.60 to 7.30 kilograms for double action. The test is conducted by pointing the pistol toward the ceiling with the hammer in a single action mode. The test weights are applied to the trigger bow parallel to the axis of the barrel. When the minimum weight is applied, the hammer should not release, and when the maximum load is applied the hammer should release. The test is then repeated with the weapon in the double action mode with the hammer in the uncocked position.

Function Firing

Each pistol is tested for proper functioning by firing a fully loaded magazine—15 rounds. The magazine used in the test is the one to be shipped with the pistol. The first three rounds are fired in the double action mode at approximately 2-second intervals. The second three rounds are fired in the single action mode (weapon is cocked) at approximately 2-second intervals. The remaining 9 rounds are fired in rapid succession in single action mode.

Targeting and Accuracy Firing

Each pistol is tested for targeting and accuracy by firing 10 rounds of ammunition. The weapon can be hand-held or fired from a government-approved fixture, which simulates hand-held conditions. The point of aim is the center of the target figure. The targeting requirement is that all 10 rounds, when fired from 50 meters (57.4 yards), should fall within an 18.5- by 22-inch, oval-shaped target. The accuracy requirement is that the mean radius of the shot grouping should be the greater of (a)

8.0 centimeters or (b) 4.6 centimeters plus the mean radius of the ammunition accuracy baseline¹ when shot through a proof barrel. If a pistol initially fails the targeting and/or accuracy requirement, it may be retested once, and if it then meets the requirements it passes.

Final examination of the pistols takes place once they have successfully passed the above tests. Final examination includes visual and manual inspection of most of the major components of the pistol for compliance with requirements. This inspection is essentially the same as inspection prior to testing except that the inspectors check every pistol to ensure that proof and magnetic particle inspection marks are etched on them. Following final examination, the pistols are cleaned and packaged, and the government representative is notified that the lot is ready for acceptance testing.

Lot Acceptance Testing

The government representative selects a random sample of 30 weapons from the finished lot for lot acceptance testing. These weapons are kept under the physical control of the government representative until testing is completed. Lot acceptance testing consists of three tests, outlined below.

Firing Pin Indent

The contractor performs the tests of the 30 sample weapons with the government representative observing and recording the test results. The weapons are mounted in a holding fixture and tested in both the single and double action modes to determine whether the weapons meet the requirements—the depth of the indent should be between 0.030 and 0.043 centimeters and should not be off center more than half the diameter of the firing pin striker point. If a pistol fails the initial test, the contractor is allowed to repeat the test three times for each mode with the results of each group of three being averaged. If the weapon does not pass the retest, the entire lot is rejected. After failure analysis is performed and corrective actions are taken, the rejected lot may be resubmitted for acceptance as a reconditioned lot. If this occurs, a sample of 60 pistols will be used in the retest.

¹See p. 22 for a description of the ammunition accuracy baseline.

Interchangeability

The government representative selects 10 of the 30 sample weapons for the interchangeability test. The pistols are disassembled and reassembled by the contractor, under the observation of a government representative. According to the contract, the weapons are reassembled so that they will contain parts from each of the other pistols. Once reassembled, the weapons are retested for headspace, trigger pull, firing pin indent, function firing, and targeting and accuracy. Failure of any sample pistol to pass any one test is considered a failure of the interchange test and results in the retest or rejection of the entire lot. The government representative may allow a retest. If so, the test sample is increased to 20 pistols. Failure of a retest will cause rejection of the lot. After analysis and correction, the reconditioned lot may be resubmitted for testing.

Reliability

The government representative selects three weapons from the 20 not used in the interchangeability tests. The weapons are field-stripped and examined by the government representative for compliance with contract specifications and workmanship. Each of the three weapons is fired to 5,000 rounds. Upon completion of the test, the barrel and slide are magnetic particle inspected, and the receiver is dye penetrant inspected to identify cracks. Failure of a weapon to successfully complete the test will result in rejection of the entire lot. A lot may be resubmitted for testing after failure analysis has been performed and corrective actions have been taken on all the weapons in the lot.

Upon successful completion of the inspections and tests, the government representative approves the acceptance of the lot. The lot is then considered ready for final packing, crating, and shipping.

Objectives, Scope, and Methodology

The objectives of our review were to assess the military's M9 9-mm handgun program as it relates to

- M9 quality and safety problems,
- allegations that the Army attempted to cover up the quality and safety problems,
- possible differences between the M9 tested in 1984 and the weapon currently being acquired by the Army, and
- competition for a follow-on procurement of 9-mm handguns.

We reviewed the Army's plan and actions for correcting M9 safety and quality problems related to frame cracks and slide failures. We also reviewed correspondence, safety messages, failure reports, and a contract change concerning the problem areas to determine how the Army managed the problems and if there was an attempt to cover up the problems. To assess the effect of engineering change proposals and other contract actions on the weapon's performance and criteria acceptance, we had Underwriters Laboratories analyze several contract actions. In addition, we reviewed an Army Materiel Systems Analysis Activity report to determine if the ECPS and other contract modifications had affected the weapon's configuration or performance. We also reviewed contract provisions and inspection reports and held discussions with the DCAS representative at the Beretta plant to determine the inspection and testing procedures followed during the manufacturing process. To determine the status of the Army's re-competition efforts, we reviewed correspondence and plans for follow-on M9 production, including requests for test samples and requests for proposals.

We interviewed program, test, and acquisition officials at Rock Island Arsenal, Illinois; Picatinny Arsenal, New Jersey; Aberdeen Proving Ground, Maryland; Beretta U.S.A., Accokeek, Maryland; and the offices of the Secretary of Defense, Deputy Assistant Secretary of the Army (Acquisition), and the Army Materiel Command in Alexandria, Virginia. We also interviewed Beretta U.S.A. plant officials at their Maryland facility. To determine whether other agencies and groups were experiencing problems with the M9 or other 9-mm handguns, we interviewed officials with the Federal Bureau of Investigation, the U.S. Secret Service, and the U.S. Capitol Police.

As requested, we did not obtain official Department of Defense comments on this report. We performed our review from March through August 1988 in accordance with generally accepted government auditing standards.

Requests for copies of GAO reports should be sent to:

U.S. General Accounting Office
Post Office Box 6015
Gaithersburg, Maryland 20877

Telephone 202-275-6241

The first five copies of each report are free. Additional copies are \$2.00 each.

There is a 25% discount on orders for 100 or more copies mailed to a single address.

Orders must be prepaid by cash or by check or money order made out to the Superintendent of Documents.

United States
General Accounting Office
Washington, D.C. 20548

Official Business
Penalty for Private Use \$300

First-Class Mail Postage & Fees Paid GAO Permit No. G100
