

GAO

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

June 1986

PISTOL PROCUREMENT

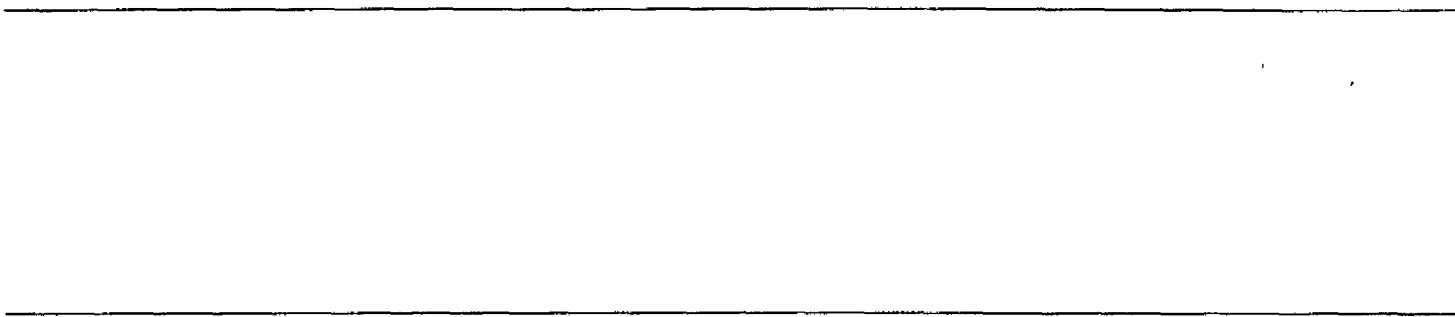
Allegations on Army Selection of Beretta 9-mm. as DOD Standard Sidearm



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

National Security and
International Affairs Division

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June 16, 1986

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

Dear Mr Chairman

This responds to your September 4, 1985, request that we investigate the award of an Army contract for 9-millimeter (mm) pistols to the Beretta U S A Corp , a subsidiary of the Italian firm Beretta. This 5-year contract for 315,930 pistols has an estimated value of about \$75 million. You cited the fact that this award has been clouded by various allegations of favoritism and other improprieties on the part of the U.S. Army. You specifically asked us to investigate allegations that

- the procurement was "wired" for Beretta and that U S firms had no chance for the award from the outset,
- the Army conducted "covert" testing to insure the outcome,
- a competitor's bid was given to Beretta, and
- the award was influenced by an international agreement secretly made between the U S. and Italian governments

You also asked us to examine what potential economic impact this award will have on U S industry

The April 1985 Beretta contract culminated a lengthy, 7-year process requiring three iterations of testing. Problems in selecting a 9-mm handgun can be attributed primarily to the following two factors:

- conflicting goals and priorities of the military services, especially the Air Force and the Army, further complicated by contradictory guidance from authorization and appropriation committees of the Congress;
- evaluating candidates against rigid military specifications. For example, the more than 50 mandatory requirements did not allow the flexibility essential for an "off-the-shelf" procurement

In summary, the 9-mm. program was not a good example of how to conduct an effective procurement and certainly not the way to buy an "off-the-shelf" item.

Our investigation disclosed only one instance, the 1978 Air Force testing, where the perception of bias toward Beretta appears warranted. All candidates failed the 1981-82 Army test, and therefore the competition was canceled. In the 1984 Army testing of candidate weapons, we do not believe that the Army exhibited any deliberate bias toward Beretta. However, we do believe that one competitor, Smith & Wesson (S&W), was unfairly excluded from the competition.

We found no evidence to suggest that secret testing had been conducted, and we were unable to prove or disprove that a competitor's price had been "leaked" to Beretta.

We found nothing to indicate that the selection of Beretta was influenced by any secret international agreement. The interest in and lobbying for the contract by the Italian government on behalf of Beretta was widely known and not unusual. Our analysis indicates that the economic impact of the Beretta sale on U.S. industry will be limited.

These findings and conclusions are discussed below. Appendixes I through V contain further details.

Perception of Bias Toward Beretta

The initial test conducted by the Air Force in 1978 appears to be the origin of the bias charge. According to the Army certain Beretta malfunctions were not counted and the Air Force lacked detailed test data to support its conclusion that Beretta was, by a large margin, the best weapon tested.

In order to obtain data which it considered necessary to support a procurement decision, the Army in 1981 announced another competition. All competitors failed to meet the stringent joint service requirements, and as a result, the competition was unexpectedly canceled in February 1982. The perception of bias was given further credence because S&W, the only American firm in the competition, was evaluated as superior to Beretta and all other candidates. Rather than selectively relaxing requirements to pick a "winner," the Army concluded that the only legally defensible position was to revise the requirements and begin again.

The second Army test in 1984 added to earlier perceptions of bias. S&W and others were found technically unacceptable just 4 working days prior to the deadline for price proposals. Only two firms, Beretta and SACO, were judged technically acceptable. (See table I 1.) They were the

only firms allowed to submit price proposals—the final phase of the competition.

Army officials told us that they treated all candidates fairly throughout the competition. The Army, however, would have been unable to find any candidates technically acceptable or would have eliminated otherwise superior candidates had it not exercised judgment in evaluating test results against criteria. Without exercising professional judgment, the outcome quite likely would have been, as in 1982, cancellation of the procurement.

For example, during testing the Army notified the candidates that a mandatory requirement was being changed to non-mandatory. Had this change not been made, all candidates, except S&W, would have been eliminated from the competition. In another instance, strict interpretation of the mud test results would have eliminated SACO, an otherwise superior candidate, and left only Beretta in contention. Entering the price phase of the procurement with only one contender would have eliminated the force of competition in securing the best price for the government.

We do not question the Army's exercise of professional judgment in its less than strict interpretation of requirements. The purpose of the procurement was to select a commercial pistol in lieu of entering a costly developmental program. In addition, there is an even more important reason for using judgment in evaluating requirements against test results. Test results cannot be considered totally precise and accurate because of the small sample size, the difficulty of controlling some tests, and the known variability in manufactured products. For example, in one subtest, which Army testers said was difficult to control scientifically, only two of each firm's pistols were tested. In another test, the sample size was increased from five to seven, still a small sample, because of the recognized variability in the quality of pistols. No manufacturer can produce pistols whose performance is always identical.

S&W Unfairly Eliminated

While we found no reason to question the Army's elimination of other candidates, our review of the Army's test procedures and results indicates that the Army erred in finding that S&W's weapon was technically unacceptable. The Army evaluators eliminated S&W based on their conclusion that the firm's pistol failed to meet two mandatory test requirements—24 inch ounces of firing pin energy and an expected service life of at least 5,000 rounds. The Federal District Court and the First Circuit

Court of Appeals upheld the Army's elimination of S&W. However, our investigation showed that the Army's evaluation of both of these tests was flawed.

Firing Pin Energy

The firing pin energy requirement was designed to ensure that candidate pistols could fire any 9-mm. cartridge having a primer hardness manufactured to North Atlantic Treaty Organization (NATO) specifications. Our calculations show that the requirement was overstated because of a mistake in converting the NATO metric standard into U.S. units of measurement.

The Army rounded off to the nearest whole number and failed S&W for missing the required measurement by one-ten-thousandth of an inch. With such a minuscule margin of failure, it is clear that the conversion from metric to U.S. measurements was critical and that rounding-off to whole numbers was inappropriate. S&W's test pistols would have passed the more precisely converted firing pin energy requirement. This aspect of the firing pin energy issue was not considered by either the district or appellate court.

Service Life

The Army's rationale for eliminating S&W based on demonstrated service life was also flawed.

The request for test samples called for "an expected service life of at least 5,000 rounds." The word "expected" is defined in dictionary terms as average and is used in the same way as the phrase "life expectancy."

The Army told firms that it needed pistols with an average service life of at least 5,000 rounds. The average service life of the three S&W pistols tested was at least 6,000 rounds. While not discovered until after 5,000 rounds had been fired, one of three S&W pistols cracked at some point between 4,500 and 5,000 rounds. S&W was eliminated because each of its weapons did not exhibit a minimum service life of 5,000 rounds.

The Army rationale for its use of minimum service life was based on the small number of weapons tested (three from each firm) and the desire for a high degree of probability that the selected pistol would actually meet the requirement for an average service life of 5,000 rounds. This application of the test standard was not made known to the competing firms. The decision to test a limited number of weapons was made by

the Under Secretary of the Army and was intended to conserve test resources and expedite the selection process.

The court, in dealing with this issue, held that the Army interpretation was reasonable and did not "materially deviate" from the announced 5,000 round expected service life requirement. We believe that the court's view resulted from misunderstanding the Army's statistical calculations.

S&W's test results, the Army told the court, indicate that it had a 52 percent probability of having an average 5,000 round service life. According to the Army such a low probability compared to Beretta's 88 percent was unacceptable and justified interpreting expected service life as a minimum 5,000 round criterion.

However, no one explained to the court that because the test results were so close, because so few weapons were tested, and finally, because so few rounds were fired, any probability statement was grossly imprecise. Both Army and GAO statisticians agree that such probability statements cannot properly be used to differentiate among candidate pistols. The Army inappropriately used such probability statements to justify S&W's elimination despite the fact that S&W's pistols passed the announced service-life criterion.

Military Specification for a Commercial Pistol

There was no formal requirement document for a new 9-mm pistol until June 1981. At that time, a very detailed set of joint service operational requirements was written and approved. The requirements contained approximately 85 distinct criteria, 72 mandatory and 13 desirable.

Although the requirements were revised after the cancellation of the first Army competition, they were still questioned by an Army outside expert and senior Army and Department of Defense (DOD) officials as being overly specific and in some respects unrealistic and ambiguous.

Before the start of the second Army test, DOD was concerned about the specification. The specification, DOD observed, had a large number of mandatory requirements that test pistols either had to meet or exceed. DOD also noted that the specification attempted to introduce flexibility in the evaluation process by using the phrase "comparable to the performance of the .45." DOD was concerned that the term "comparable" was ambiguous and would be interpreted narrowly as "equal to" rather than more broadly as "similar to." DOD did not believe that establishing a

large number of mandatory requirements was reasonable because (1) chances were that one or more of these mandatory criteria could not be met by any candidate, and (2) the all-around best pistol might not qualify

DOD concluded that in selecting a commercial product, as was the case here one must consider that certain features have already been designed in. Thus, rather than establishing a large number of mandatory requirements, a better way would be to enumerate the desired features in their relative order of importance to the mission. Then it would be possible to trade off more important features against less important ones. The end result would be selection of the best commercially available handgun—one that offers a significant improvement in performance at a relatively small increase in cost. The Army approach, DOD cautioned, had the unnecessary risk of not finding a qualified weapon or of inviting a protest and litigation.

Alleged “Covert” Testing

The allegation of “covert” testing appears to be based on the fact that (1) the firing pin energy test was performed at Fort Dix, New Jersey, although the request for test samples implied that the test would be performed at Aberdeen Proving Ground, Maryland; (2) the final report on testing at Aberdeen does contain firing pin indent measurements, and (3) S&W’s firing pin indents at Aberdeen passed the requirement while those at Fort Dix did not.

We found, however, that the use of the Fort Dix test site was in accordance with the test plan. Also, the Aberdeen test director explained that his measurements were not the firing pin energy test. Rather, they were one of several measurements taken in order to establish a reference point for the record prior to the actual commencement of testing. Further, he noted that S&W’s comparison of his indents with the standard was invalid because he had used a different lot of copper cylinders.

Alleged Price Leak

In the final stages of the competition, Beretta lowered its pistol price 18 percent, reversing its position relative to its rival and assuring its selection. The fact that Beretta’s best and final prices were handwritten into blank spaces on a typewritten letter contributed to the suspicion that SACO’s price was leaked. Beretta’s general manager explained that Beretta was very concerned that its prices might be leaked to SACO. Thus as a precaution, the letter was typed at Beretta’s office in Accokeek, Maryland, with blank spaces left for prices. He told us that he

received the revised unit prices at home during a phone conversation with Mr. Beretta. After this conversation, he inserted Beretta's best and final prices by hand on the pretyped letter, which he personally delivered to the Army's contracting office.

According to the general manager, Beretta cut its price to the "bare bones" for the best and final offer because it really wanted to win the contract. Beretta reasoned that a rock-bottom price was necessary to win since its competitor would also drop its price to the minimum level. He explained that Beretta's pistol price of \$178.50 was the price at which Beretta U.S.A. bought the gun from Beretta, Italy, and that he hoped to be able to produce the pistol in America at the same price as in Italy.

We uncovered no direct evidence to sustain the allegation that SACO's price proposals had been leaked to Beretta. Beretta gave us a plausible explanation for its actions, and the Army has said it took reasonable precautions to protect the pricing data.

Alleged U.S. And Italian Secret Agreement

We found no evidence of a secret international agreement that may have influenced the selection of Beretta in this procurement. In 1978, the United States and Italy signed a Memorandum of Understanding in which they promised to fully consider all qualified industrial and/or government sources of conventional defense equipment in each other's countries, subject to national procurement policy and criteria. In doing so, they promised to eliminate procurement barriers and use competitive bidding. The agreement is a public document and is similar to agreements that the United States had negotiated with other NATO allies.

According to the State Department Italian desk officer, the Italian government takes the agreement very seriously. He said that there was no doubt that the Italian government was interested in the 9-mm. sale and had made its interest known to the U.S. government. In addition, he pointed out that the Italian ambassador in Washington, D.C., was very active on behalf of Italian commercial interests. Such activities on the part of foreign embassies are routine in contrast to those of U.S. embassies, which are prohibited from promoting American military products overseas.

Limited Economic Impact on U.S. Industry

Our analysis indicates that the economic impact of the Beretta sale on U.S. industry will be limited. During the 5-year period covered by the April 1985 contract, the Army's average annual expenditure for the 9-mm. handguns will be only about 4.2 percent of the value of U.S. handgun output in 1984. In addition, during the final 2 years of the contract, all production of the handguns will be at the Beretta U.S.A. facility in Accokeek, Maryland.

Conclusions

While we found no evidence that the 9-mm handgun procurement was "wired" for Beretta, we believe that one competitor, S&W was unfairly excluded from the competition. The goal of the 9-mm testing program was not to eliminate all but superior candidates, but rather to identify those whose products met the government's needs and open competition requires that all qualified competitors be allowed to submit price proposals.

Army test data supports a conclusion that S&W was a technically acceptable candidate and, therefore, should have been allowed to enter the final phase of the competition—the analysis of price proposals. Since its pistols met the Army's announced needs, we have to conclude that S&W was improperly eliminated from the competition. Because S&W's price proposal was never evaluated, the Army cannot establish that Beretta obtained the lowest overall price in meeting its needs.

The 5-year contract with Beretta is for 315,930 pistols at a total cost of about \$75 million over 5 program years. The Army is currently in the second year of the contract and has already ordered 114,030 pistols. In April 1986, the contract quantity was increased by 4,100 for a total of 320,030 pistols. The Army also plans to purchase another 124,000 pistols beyond this amount. We understand that as of May 30, 1986, about 7,600 pistols have actually been delivered. The contract contains a cancellation clause with a \$5 million ceiling in the event that the Congress does not appropriate the necessary funds. Actual cancellation costs depend on the year of cancellation but during the first 3 years would be at the ceiling. Additionally, there could be termination costs if the government terminates Beretta's contract for convenience.

Analysis of all these factors would be required to determine the feasibility, from the standpoint of cost and mission, of reopening the competition and soliciting price proposals from the three technically acceptable candidates—Beretta, SACO, and S&W. At a June 5, 1986, hearing before your Legislation and National Security Subcommittee, we

testified that it was unclear what action, if any, would be in the government's best interest and that the Congress may wish to direct the Army to conduct such a feasibility study

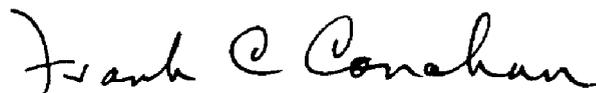
Objectives, Scope, and Methodology

In conducting this investigation, we met with and examined documentation provided by industry representatives; the Departments of Defense and the Army; and other military services. U.S. government personnel contacted included Army officials from the 9-mm. program office in Rock Island, Illinois, who managed the procurement; test officials at Aberdeen, Maryland, and Fort Dix, New Jersey; and senior level officials having decisionmaking responsibility. Finally, we reviewed the public record of on-going litigation and matters brought before our bid protest unit.

Our work was performed during the period October 1985 to February 1986. We discussed key facts with responsible officials and have included their comments where appropriate. However, in accordance with your wishes, we did not obtain the views of responsible officials on our findings and conclusions, nor did we request official comments on a draft of this report. With this exception, our work was performed in accordance with generally accepted government auditing standards.

Unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of the report. At that time we will send copies to the Chairmen, House and Senate Committees on Appropriations and Armed Services, and Senate Committee on Governmental Affairs; the Secretaries of Defense, State, and the Army; and other interested parties. We will also make copies available to others upon request.

Sincerely yours,



Frank C. Conahan
Director

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Abbreviations

DOD	Department of Defense
FPE	firing pin energy
JSOR	joint service operational requirements
NATO	North Atlantic Treaty Organization
RFP	request for proposals
RFTS	request for test samples

Background

History

In 1978, the House Committee on Appropriations reported on the proliferation of handguns and ammunition in the military and recommended standardization. The Department of Defense (DOD), in 1980, determined that a pistol which used the North Atlantic Treaty Organization's (NATO) standard 9-millimeter (mm.) ammunition could replace all .45 and .38-caliber handguns in its inventory. The .45 caliber equates to 11.43 mm and the .38 caliber to 9.6 mm. (See figs. I-1 and I-2.) Informal Air Force testing indicated that the Beretta 9-mm. pistol was the top performer, and a recommendation to purchase it noncompetitively was nearly approved. According to the Army, the informal Air Force tests had not been scientifically controlled and therefore could not be used to legally defend a sole-source procurement.

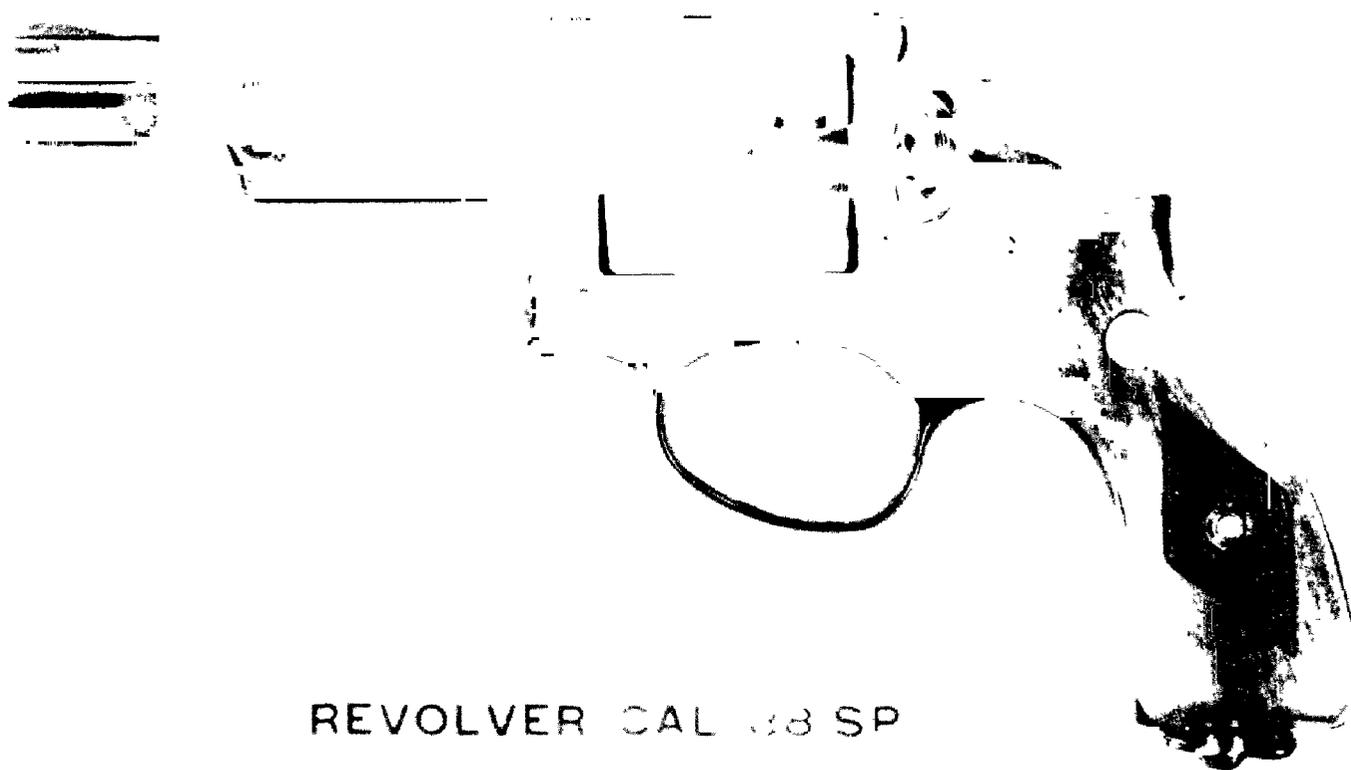
Since there was no formal requirement for a new 9-mm. pistol until June 1981, a very detailed set of joint service operational requirements (JSOR) was written and approved. The competition, which began in late 1981, was open to both foreign and U.S. firms. Four commercial gun makers, including one U.S. firm, Smith & Wesson (S&W), entered the competition. Although the goal was to select a commercially available handgun, the JSOR proved to be too stringent. In February 1982, the procurement was canceled because no candidates' pistols met all the mandatory requirements. S&W, however, did come out ahead of Beretta and the other two competitors.

Figure I.1: Standard .45-Caliber Pistol



(Official U.S. Army Photograph)

Figure I.2: Standard .38-Caliber Revolver



(Official U.S. Army Photograph)

The Army, because of the low priority assigned to replacing its large inventory of .45-caliber pistols (M1911A1),¹ preferred to let the matter drop. But guidance from the House Appropriations Committee resulted in a DOD directive for the Army to hold another competition. The JSOR, which was revised after the February 1982 cancellation, was still very specific, many absolute requirements were retained, but performance

¹ This model number represents the year—1911—when the .45 was first made a military-standard item.

was generally stated in terms of comparability or superiority to the standard 45-caliber pistol

The second Army competition had two unusual characteristics

First, rather than a more traditional procurement process encompassing all evaluation factors, a modified preconditional two-step process was adopted. Because only test funding was then available, testing was separated from the rest of the procurement

In November 1983, the Army asked prospective commercial gun makers, in a formal Request for Test Samples (RFTS), to submit 30 of their 9-mm. pistols (including technical manuals and spare parts) for testing so it could find out if suitable 9-mm pistols were available commercially. The RFTS stipulated that failure to meet requirements in some categories would result in that weapon being dropped from further testing and excluded from participation in the next phase of the procurement, should there be one. Firms would receive no cash remuneration for the test pistols and other items they furnished. All items would become the property of the government and not be returned. As consideration for participating in this test, the gun makers would be furnished the test results for their weapons after test and evaluation was complete and final reports prepared. Samples were submitted in January 1984 and testing began in February 1984

In May 1984, the Army issued a formal Request for Proposals (RFP) for a two-step negotiated procurement restricted to only those bidders that had responded to the RFTS. Step one was the submission of technical proposals by June 1984. Step two was the submission of cost proposals by September 1984 but was restricted to those bidders whose samples had successfully passed the Army tests resulting from the RFTS

The second unusual characteristic of the competition was that the Army would use fixed catalog prices for repair parts as a cost evaluation factor and that repair parts could be ordered concurrently with the pistols

Eight companies, including two U.S. firms, submitted weapons (See table I.1.) The testing began in February and was, for the most part, completed by August 1984. Four firms were found technically unacceptable, two withdrew, and two were found acceptable. Both technically acceptable firms were foreign producers

By mid-November 1984, the overall evaluation of the two technically acceptable firms, SACO and Beretta, was complete and SACO was in the lead. SACO's score in the six areas evaluated was 853.6 compared with Beretta's score of 835.34. But on November 20, 1984, the Army issued a request for best and final offers (See app. IV.) Beretta lowered its unit price \$39.34 (18 percent), while SACO maintained its earlier price (See table I.2.) The price change gave Beretta the lead in cost, on the six evaluation factors. Beretta's overall score was 858 compared with SACO's score of 847. On the basis of its higher score, Beretta was selected as the winner, and the decision was announced on January 14, 1985. Beretta's pistol is shown in figure I 3.

The Beretta contract was not signed until April 10, 1985. The Army delayed signing the contract due to bid protests filed with GAO and litigation. Three disappointed contractors filed bid protests. SACO's was dismissed as untimely. The S&W protest was also dismissed because the firm chose to pursue its remedy in court. Only Heckler and Koch's (H&K) protest was dismissed on its merits.

Both S&W and SACO were unsuccessful in court. S&W lost in both the Federal District Court and the First Circuit Court of Appeals (See app. III.) As of April 1986, SACO was appealing a decision by the Federal District Court in favor of the Army (See app. IV.)

The multiyear contract with Beretta is for 315,930 pistols at a total cost of about \$75 million over 5 contract years. As is typical with multiyear contracts, it contains a cancellation clause. The cancellation clause has a \$5 million ceiling to cover the eventuality of the Congress not appropriating the necessary funds. Actual cancellation costs depend on the year of cancellation but during the first 3 contract years would be at the ceiling. Additionally, there could be termination costs if the government terminates the contract for the convenience of the government.

**Appendix I
Background**

Table I.1: Manufacturers Submitting Pistols for 1984 Competition

Manufacturer	Model	Comments
Steyr-Daimler-Puch, AG Austria	GB	Terminated by Army on May 4, 1984, for poor reliability
Fabrique Nationale Herstal, SA, Belgium	BDA	Voluntarily withdrew on May 31 1984
Colt Industries, Firearms Division, U S A	SSP	Voluntarily withdrew on July 18, 1984
Carl Walther Waaffenfabrik, West Germany	P88	Terminated by Army on September 18, 1984, for failing drop test, dispersion, corrosion resistance, and adverse conditions requirements
Heckler & Koch, West Germany	P7M13	Terminated by Army on September 18, 1984, for failing reliability and corrosion resistance requirements
Smith & Wesson ^a U S A	459M	Terminated by Army on September 18, 1984, for failing service life and firing pin energy requirements
Schweizerische Industrie Gesellschaft ^b Switzerland	P226	Technically acceptable finalist
Armi Beretta, SpA Italy	92SB-F	Technically acceptable finalist and winner

^aSmith and Wesson was a litigant contesting the Army's determination that its pistols were technically unacceptable

^bThis company is represented in the United States by SACO Defense Systems Division of the Maremont Corporation, Maine SACO is a litigant contesting the Army's selection of Beretta

Appendix I
Background

Table I.2: Comparison of Finalists' Prices Before and After Best and Final Offers

Totals in Millions of Dollars					
Items	Units	Unit Price	Total	Unit Price	Total
Initial Price Proposals October 9, 1984					
Pistols	305,580	\$217.84	\$66.567	\$176.33	\$53.883
Magazines	1,222,320 ^a	9.30	11.368	11.95	14.607
Spare parts ^b	30,558 ^c	209.59	6.405	221.79	6.777
Total			\$84.340		\$75.267
Apparent winner					\$75.267
After Best and Final Offers December 11, 1984					
Pistols	315,930	\$178.50	\$56.393	\$176.33	\$55.708
Magazines	1,263,720 ^a	9.30	11.753	11.95	15.101
Spare parts ^b	31,593 ^c	209.42	6.616	221.79	7.00
Total			\$74.762		\$77.8
Winner			\$74.762		

^aPistols multiplied by 400 percent

^bExcept for the receiver, or frame, a complete set of piece parts to assemble a complete pistol

^cPistols multiplied by 10 percent

Figure I.3: Beretta 9-mm. Pistol 92SB-F



(Official U S Army Photograph)

In 1986, 4,100 pistols were added to the original contract quantity of 315,930, increasing the total contract to 320,030 pistols. The Army also plans to purchase another 124,000 pistols beyond the current contract

As of April 1986, the second year of the contract, the Army has ordered 114,030 pistols valued at about \$20.202 million. In addition, it has ordered \$10.966 million in associated repair parts and magazines. As of May 30, 1986, 7,650 pistols have actually been delivered. Other 9-mm. related contracts involve 257,000 holsters valued at \$3 883 million,

314,000 ammunition pouches valued at \$0.892 million, and about 77 million rounds of ammunition valued at \$8.368 million. As of May 30, 1986, the total amount of 9-mm. program funds obligated on contracts was about \$44.311 million.

Key Players in Decisionmaking Process

The key players in the decisionmaking process leading up to the contract award are discussed below.

- The Congress. Since 1978 the House Appropriations Committee had been urging DOD to standardize handguns and handgun ammunition. To clearly demonstrate its support for standardization, the Committee set aside \$1.9 million in fiscal year 1982 for continuation of the testing and evaluation then under way. In light of the subsequent cancellation of the procurement and what the Committee characterized as "foot-dragging" in announcing a second set of tests, the fiscal year 1983 appropriations bill sought to use the "power of the purse to force compliance with the will of Congress." The Committee denied funding for .45-caliber pistol ammunition and spare parts. Meanwhile, DOD was receiving conflicting guidance from other congressional committees. In fiscal year 1983, for example, both the House and Senate Armed Services Committees recommended not authorizing funds for 9-mm. handgun procurement. Similarly in fiscal year 1984, no procurement funds were authorized.
- The Secretary and the Deputy Secretary of Defense. In April 1983, the Secretary of Defense ordered the Army to proceed with the testing, evaluation, and selection of a standard handgun without further delay. Procurement, however, was to await resolution of funding issues.
- The Deputy Secretary of Defense provided further program direction in July 1983. The Army position was still to procure no handguns because of the existence of sufficient serviceable or repairable stocks of .45's. The Air Force supported the new 9-mm. program but also sought the acquisition of a smaller, concealable sidearm for aircrew use. The Deputy Secretary confirmed the Secretary's earlier guidance to test but not procure; noted that the need for a second, more compact handgun had not been demonstrated, and indicated that if possible, the selection process should select more than one winner to keep the spirit of competition alive for any future procurement.
- Under Secretary of the Army. On a number of occasions, he noted that the replacement of the .45 was a very low Army priority. He also expressed concern that the revised operational requirements were too complicated, being directed at the procurement of a military rather than a commercial weapon. He indicated that as in 1982, the requirements

might not be met by any of the competitors and he wanted to guarantee that a winner or set of winners could be selected

- Under Secretary of Defense for Research and Engineering. Concerned that the overly detailed requirements would again lead to cancellation of the procurement, his office was instrumental in persuading the Army to define the term "comparable," as used in the requirements, in a way that permitted flexibility and the use of common sense in interpreting test results
- 9-mm. Program Manager's Office: This key office had day-to-day responsibility for ensuring that the program milestones were met. Major activities of the program manager and his small staff included: (1) implementing guidance from higher authorities such as the Under Secretary of the Army, (2) coordinating issuance of the solicitation that announced the competition, described the requirements, and requested test weapons from interested firms, (3) ensuring issuance of the notice requesting technical and price proposals, (4) developing the formula used for evaluating spare parts prices, and (5) coordinating procurement of ancillary equipment, such as holsters and ammunition
- Test officials: Principal testing was conducted at three locations, as follows: (1) reliability and durability testing at Fort Dix, New Jersey, which involved firing about 275,000 rounds of ammunition on 8 different candidate pistols plus the .45, (2) adverse conditions (sand, dust, mud, and salt water), environmental conditions (heat and cold), and ammunition compatibility testing at Aberdeen Proving Ground, Maryland, and (3) human factors testing at Fort Benning, Georgia, which involved firing by soldiers of different size, sex, and experience
- Evaluation officials: A typical three level structure was created for the 9-mm. procurement. It consisted of a 22-member board, which evaluated the candidates in six areas, including cost, logistics, technical suitability, quality assurance, production, and management, a five member multiservice council, which reviewed the board's evaluations, and a selecting official, who made the final decision on terminating candidates and selecting a winner
- Army systems analysts. These independent analysts observed the testing, analyzed the results, and submitted their own report with separate findings and conclusions to evaluation officials.

Military Requirements for 9-mm. Pistols

A major difference between the 1978 Air Force test and the two Army handgun competitions was the lack of written operational requirements for the 1978 testing of 9-mm. pistols. The first written requirements, formally known as the JSOR, were drafted by a multiservice committee and were formally approved just a few months before the first Army test began in 1981. After none of the four competitors met these requirements, they were revised by the committee. The goal of the revision was to develop requirements which a commercially available handgun could meet.

The Under Secretary of the Army, however, indicated that the revised requirements were still too complicated and had been designed more for procuring a militarily developed weapon. The revised requirements, he believed, should be further relaxed to allow procurement of a weapon that had been commercially developed and was currently available without modification.

A handgun consultant to the Army, who independently evaluated the revised requirements, also found them too specific in describing the technical attributes of a 9-mm. pistol. The emphasis in the JSOR, he noted, appeared to be on telling the contractor how to build a gun rather than defining the desired performance characteristics. For example, he noted that the JSOR specified a 4.1-inch barrel length without explaining that this was necessary to procure the desired projectile performance—lethality—with standard NATO standard ball 9-mm. ammunition.

Others, including an official in the office of the Under Secretary of Defense for Research and Engineering, questioned the need for the amount of specificity in the JSOR, such as the dimensions of the rear and front sights. Finally, the Army independent systems analysts noted that no scenario describing the operational employment of the sidearm was ever developed. The 9-mm. was simply characterized by the JSOR as a “personal defense weapon,” even though there are probably other important uses for a sidearm. We noted that the general lack of a mission rationale became an issue in evaluating the results of at least two tests—mud and salt water corrosion—as discussed in appendix III.

Revision of the 1981 Requirements

Although rewritten, the 1982 version of the requirements is, with only a few exceptions, almost identical to the 1981 version. Both documents begin by describing the operational deficiencies of current .38 and .45-caliber handguns, followed by the mandatory physical and operational requirements, as well as those that were deemed only desirable.

Operational Deficiencies
Of .38 and .45 Caliber
Handguns

The JSOR notes that .38 caliber revolvers have inadequate overall effectiveness; poor maintainability and life expectancy in combat conditions, low-lethality; poor reliability; lack of rapid reloading capability; and small ammunition capacity

The only deficiency noted for the .45 caliber pistol was safety. It may, the JSOR states, accidentally discharge when the operator is attempting to uncock the weapon or when the weapon is dropped. Army systems analysts, however, noted that they had not discovered any historical data to support these safety deficiencies. In fact, their data base, assembled from 8 years of liaison visits to troop units worldwide, contains no record of any problems of inadvertent discharge

Mandatory Physical
Requirements

Except for the deletion of the requirement for a silencer, only minor changes were made to the detailed physical specifications. For example, "ambidextrous" was dropped from the description of the magazine catch, but language was retained requiring that it be operable by the shooting hand of either a right or left-handed person. Each JSOR included the following physical specifications, among others: (1) the ability to fire standard NATO 9-mm. cartridges, (2) a maximum fully loaded weight, (3) a minimum barrel length, (4) a minimum magazine capacity of 10 rounds, (5) a trigger size which permits firing with gloves, (6) a loop in the butt of the gun compatible with published military specifications for braided rope lines used to secure the gun to a firer's belt.

Mandatory Operational
Requirements

In revising the original 1981 JSOR, several important changes were made in the sections stipulating mandatory operational requirements. First, all references to reliability in the 1981 JSOR—including reliability under adverse conditions, under different climatic conditions, and over the required service life of the pistol—were changed to stipulate performance comparable to or superior to that of the .45-caliber pistol. The original language had either stipulated performance equal to that of the .45 or simply called for reliable performance or in the case of service life, set a minimum acceptable value for reliability at 800 (calculated by dividing the number of test shots fired by the number of malfunctions)

Stipulating reliability superior to the .45 in the revised JSOR was intended to enable the Army to pick a winner in another competition since three out of four pistols tested in 1981 were found more reliable. Second, the section calling for corrosion resistance under field conditions

was expanded to include a previous desirable characteristic—compatibility to the .45 under complete sea water immersion. Third, double action¹ was defined to prevent the elimination of candidates using innovative approaches. Other operational requirements that remained unchanged in the revised JSOR included (1) an expected service life of at least 5,000 rounds, (2) capability to withstand extended use in the field with maintenance limited to the user level, and (3) compliance with military health, safety, and human engineering standards.

Desirable Characteristics

Unlike mandatory requirements, failure to exhibit “desirable characteristics” would not result in a finding that a weapon was technically unacceptable. Rather, demonstrating desirable characteristics would entitle a weapon to bonus points during the competition. While several “desirable characteristics” were eliminated, the most important change was adding a desirable service life reliability of 495. As was noted earlier, the mandatory reliability of 800 in the 1981 JSOR was changed to reliability superior to that of the .45. Desirable characteristics that were retained in the revised JSOR included (1) a removable front sight, (2) a 15-round magazine capacity, and (3) an expected service life of at least 10,000 rounds.

¹ Single action means that only one function is performed by the pull of the trigger, while double action means that two functions are performed. When a gun is fired single action, the hammer is first cocked and then fired. In the double action mode, pulling the trigger also cocks the weapon.

Analysis of 1981 and 1984 Test Results

Since 1980, the Army has conducted two extensive rounds of testing on 9-mm. pistols. In tests conducted in 1981 and 1984, the performance of candidate pistols was evaluated on the basis of specifications jointly agreed to by the military services. The specifications contained numerous mandatory minimum performance thresholds.

In the 1981 tests, none of the four candidates met all of the mandatory requirements and the proposed procurement was canceled. In 1982, a revised JSOR was approved. The 1984 test results were evaluated on the basis of these revised military specifications. The evaluation standards, derived from the revised specifications, were included in the request for test samples issued to industry in late 1983. The request stipulated that failure to meet mandatory test standards would result in a finding of technical unacceptability and that a firm's price proposal would not be evaluated if its weapons were found technically unacceptable. Testing of eight competitors' handguns commenced in February 1984. During the testing, two firms withdrew and one was eliminated on technical grounds. By August 1984, Army evaluators focused on judging the test results of the weapons of the remaining five firms. Three of these five companies were found technically unacceptable by the Army just before price proposals were due to be submitted.

While we found no reason to question the Army's elimination of other candidates, our review of the Army's test procedures and results indicated that the Army erred in finding that S&W's weapon was technically unacceptable.

Key 1981 and 1984 Test Results

Four manufacturers—Beretta, H&K, SACO, and S&W—entered both the 1981 and 1984 competitions. Our analysis of Army test procedures and results will therefore focus on these four firms. Table III.1 compares selected 1981 and 1984 test results for these firms. Two of these tests, service life and firing pin energy, were the subject of litigation by S&W. H&K was eliminated from the 1984 competition for failing two different tests.

- The first half of table III.1 summarizes official results for five controversial tests out of the approximately 70 tests performed.
- The second half of table III.1 contains the "raw" performance data which the Army evaluated to develop the official test results.

Appendix III
 Analysis of 1981 and 1984 Test Results

Table III.1: Evaluated Pass/Fail Results for Selected 1981-84 Tests and "Raw" Test Data

	Evaluated Pass/Fail Results For Selected 1981-84 Tests				Selected 1981-84 "Raw" Test Data				
					FIRM				
	Beretta	H&K	SACO	S&W	Beretta	H&K	SACO	S&W	.45
Service life ^a									
1981	Pass	Pass	Pass	Pass	8,865	10,000	10,000 ^b	9,500	8,400
1984	Pass	Pass	Pass	Fail	7,000	7,000	6,840	6,000	6,125
Reliability ^b									
1981	Fail	Fail	Fail	Fail	158	169	209	293	165
1984	Pass	Fail	Pass	Pass	1,750	158	2,877	434	162
Mud ^c									
Wet									
1981	Pass	Pass	Fail	Pass	77%	88%	67%	79%	75%
1984	Pass	Pass	Pass	Pass	97%	99%	98%	98%	100%
Dry									
1981	Fail	Pass	Fail	Fail	68%	98%	72%	82%	93%
1984	Pass	Pass	Fail	Pass	98%	100%	79%	96%	100%
Overall									
1981	Fail	Pass	Fail	Fail	73%	93%	70%	81%	84%
1984	Pass	Pass	Pass	Pass	98%	100%	89%	97%	100%
Salt water corrosion ^c									
1981	Fail	Pass	Pass	Pass	76%	81%	71%	88%	85%
1984	Pass	Fail	Pass	Pass	100%	86%	100%	97%	99%
Firing pin energy ^d									
1981	Pass	Pass	Pass	Fail	100%	100%	100%	60%	N/A
1984	Pass	Pass	Pass	Fail	100%	100%	100%	71%	N/A

^aShown in rounds, based on average of weapons tested. See footnote 1, p. 30 for explanation of differences in 1981-84 service life testing. The 1984 7,000 round averages for Beretta and H&K do not represent maximum service life since testing was stopped at 7,000 rounds.

^bReliability is calculated by dividing the number of malfunctions into total rounds fired.

^cThe percentage of successful firings after exposure to this adverse condition.

^dThe percentage of weapons passing the test.

Analysis of the official results and the raw data reveals that some firms which passed tests in 1981 failed the same tests in 1984. In 1984, S&W failed the service life test and H&K failed the salt water corrosion test, both of which they had previously passed. The analysis of the raw data shows that all firms improved their performance in at least one of these selected tests and some in several. However, the raw scores for service life and reliability were dramatically different. SACO, S&W, and the .45-caliber control weapons all showed a decreased service life. For example, S&W's expected service life fell from 9,500 in 1981 to 6,000 in 1984. Both Beretta and SACO showed notable reliability increases—11 and 14 times better, respectively, than their 1981 reliability scores.

Caveats About Pistol Testing

According to a recognized expert on small arms, the tests performed on 9-mm pistols during the two Army competitions were descriptive rather than predictive. The results describe what happened with a certain production lot of weapons from each manufacturer but are not necessarily indicative of another lot's performance. This assertion appears to be borne out by first article testing performed on the Beretta after it was awarded the 9-mm. contract but before full production began. Beretta's reliability during first article testing was even better than the high level it had demonstrated in the 1984 test.

Army systems analysts told us that while testing assumes each pistol's performance is identical (that all the pistols in a production run are homogeneous), the 1981 and 1984 Army competitions provided considerable evidence to question this assumption. In both competitions, the performance of each manufacturer's pistols varied widely. This variability was most apparent in reliability testing, since it involved seven weapons, the largest sample size

Table III.2: 1984 Reliability of Best and Worst Weapons

Firm	Worst weapon	Best weapon
45 control	93	467
Beretta	875	more than 3,500
H&K	97	304
SACO	1305	more than 3,500
S&W	241	more than 3,500

Aside from the obvious variability, it is also important to note the range over which it occurred. The variability of the Beretta or SACO weapons would have had little, if any, impact on the test outcome because the reliability of its "worst" weapon was so much better than that of the 45-caliber control. The reliability requirement was that the candidate weapons be superior to the 45 caliber control weapons.

Many of the other subtests involved a limited number of pistols—for example, two each for the mud and corrosion tests—in contrast to the five (1981) to seven (1984) used in the service life/reliability test. Thus, variability, combined with small sample size, increased the possibility that subtest results could be skewed by one or two poorly performing pistols. In fact, the endurance test director noted that two of five Beretta pistols used in the 1981 reliability test accounted for two-thirds of the malfunctions.

He also told us that to prevent such skewing of the reliability test results, the sample size had been increased to seven for the 1984 competition. At the same time, to reduce the cost of the competition, as well as testing time, the number of rounds to be fired on these seven pistols was reduced from 50,000 to 35,000.¹ The sample size for most other 1981 and 1984 tests was two to three pistols.

A caveat expressed by Army testers concerns the control of variables. According to test officials, they try to conduct a test in such a manner that the results are reproducible. However, because of variables in tests, such as adverse conditions, are difficult to control, the results may not be reproducible. For example, the adverse conditions test director characterized some of these tests as "shaky." Thus an air bubble in the mud (the mud is produced according to military specifications) might make it easier for one sample gun to pass the mud test. Because the environment cannot be totally controlled, repeating the test might produce different results. For example, during the 1984 sand and dust test on the Beretta, when the test was repeated due to a failure in the equipment recording the elapsed time, the pistol in question exhibited no malfunctions, in contrast to one malfunction on the first attempt at the test.

Ammunition and Weapon Changes

Army test and evaluation officials told us that two major differences between the 1981 and 1984 competitions could account for some of the changes in performance. First, 9-mm ammunition manufactured by a different company was used in 1984 because the Army believed that the ammunition used in the earlier test may have contributed to the poor reliability demonstrated by all candidates. Second, some manufacturers apparently did their homework, using the detailed technical debriefing given to each of the 1981 contestants as the starting point for design improvements. Some of the changes made for the 1984 competition were so obvious that test officials were readily able to point them out. For example, SACO sharpened the tip of its firing pin for the 1984 test. Since test officials saw no significant changes in the S&W pistol design, we discussed the matter with company personnel. S&W confirmed that it too had made some changes prior to the start of the second competition.

While directly attributing a test result to different ammunition or a weapon's modification is difficult, test officials suggested that some of

¹In 1981 endurance testing, 5 of each contestant's pistols were fired a total of 50,000 rounds (10,000 rounds each), in the 1984 tests, 7 pistols were fired a total of 35,000 rounds. Four of the 7 were fired 3,500 rounds each, and the remaining 3 were fired 7,000 rounds each.

the 1984 results were probably attributable to these factors. For example, they attributed SACO's poor reliability test results in 1981 to a problem in the design of its firing pin. Although SACO passed the firing pin energy test, the tip of its pin was apparently too blunt, resulting in many failures-to-fire. After sharpening the pin tip for the 1984 test, SACO experienced no misfires whatsoever.

Service Life Test

Although S&W passed the service life requirement in 1981, Army evaluators eliminated S&W from the 1984 competition for failing this requirement, as well as the firing pin energy test. (See p. 40.) A visible frame crack was detected on one of the S&W test pistols during a scheduled inspection made after 5,000 rounds of test firing. The relevant operational service life requirement is stipulated in the JSOR as follows: "an expected service life of at least 5,000 rounds." A crack in the frame of a pistol which is visible to the naked eye signifies the end of a weapon's service life. S&W contested its elimination from the competition before the Federal District Court of Massachusetts and the First Circuit Court of Appeals. Both courts upheld the Army's elimination of S&W.

In concluding that there was nothing irrational or unfair about either the service life test or requirement, the Appeals Court relied on statements by test officials and an Army systems analyst. They had testified that there was no visible crack at 4,500 rounds and that the frame could not have cracked exactly on the 5,000th round since cracks propagate during repeated firing; therefore, they reasoned that even though it was not detected until disassembly after firing 5,000 rounds, the S&W pistol had started to crack sometime between 4,500 and 5,000 rounds.

We asked Army test officials and the systems analyst why they had both concluded, in their official reports tendered to evaluation officials, that S&W had passed the service life requirement. The endurance test director explained that technically the S&W pistol had met the operational requirement because it had fired 5,000 rounds—the minimum acceptable service life. Unlike other service life failures that occurred during the testing, however, he was unable to pinpoint exactly when the crack had occurred. For example, through analysis of malfunctions, test officials determined that a SACO pistol which fired 7,000 rounds had actually cracked at round 6,523. The S&W pistol, he explained, showed no sharp increase in malfunctions that might be attributable to the crack.

Appendix III
 Analysis of 1981 and 1984 Test Results

The systems analyst's conclusion was based on a literal interpretation of the JSOR. He told us that "expected," the word used in the actual requirement, is defined by the dictionary as mean average. Thus, the question "What is the life expectancy of females?" could be restated as "On the average, how long do women live?" Consequently, in calculating service life, the systems analyst took the average of the 3 pistols that had been test fired up to 7,000 rounds

Even assuming that the cracks had occurred 500 rounds before they were detected, his calculations show that S&W's expected service life of 6,000 rounds met the 5,000 round requirement

Table III.3: S&W Service Life

Number of Rounds		
Pistol	Failed at	No failure up to
C-1		7,000
C-2	4,500	
C-3	6,500	
Total		18,000
Average		6,000

The evaluation officials referred to on page 23, were not required to accept the conclusions of either the test staff or the systems analysts who were independently observing and commenting on the testing. In fact, the evaluation staff used a different criterion in deciding that the crack detected at 5,000 rounds was grounds for eliminating S&W. The criterion approved by the evaluation board in April 1984, about 1 month before the pistol in question cracked, stated "no failure for endurance weapons up to 5,000 rounds." In other words "if one fails—all fail." We asked the official responsible for establishing this criterion why it was more stringent than either the JSOR requirement or the 1981 service life evaluation criterion. He explained that the 1984 service life determination was to be based on the performance of a more limited sample—3 weapons fired to 7,000 rounds rather than 5 fired 10,000 times each. In order for the Army to have a high degree of confidence that the mean service life of pistols made by each competitor was at least 5,000 rounds, no failures could be allowed.

The use of a more rigorous standard—a minimum rather than an average 5,000 round service life—was not made known to the competing firms. The decision to test a limited number of weapons was made

by the Under Secretary of the Army and was intended to conserve test resources and expedite the selection process

The court, in dealing with this issue, held that the Army interpretation was reasonable and did not “materially deviate” from the announced 5,000 round expected service life requirement. We believe that the court’s view resulted from a misunderstanding of the Army’s statistical calculations. S&W’s test results, the Army told the court, indicate that it had a 52 percent probability of having an average 5,000 round service life. According to the Army, such a low probability, compared to Beretta’s 88 percent, was unacceptable and justified interpreting expected service life as a minimum 5,000 round criterion.

However, no one explained to the court that because the test results were so close, because so few weapons were tested, and finally, because so few rounds were fired, any probability statements are imprecise. Both Army and GAO statisticians agree that such probability statements cannot properly be used to differentiate among candidate weapons. The Army inappropriately used such probability statements to justify S&W’s elimination, despite the fact that S&W’s pistols passed the announced service life criterion.

Moreover, the Army’s explanation of why it deviated from its announced criterion is illogical. For example, in applying its unannounced minimum service life criterion, the Army would have had to retain in the competition a pistol with a much lower service life probability than S&W’s—as long as no test pistols failed before 5,000 rounds. Thus a candidate whose pistols each fired to 5,001 rounds and cracked would have met the Army’s minimum service life criterion. Yet its probability of having an average 5,000 round service life would have been almost zero.

The systems analyst said that he could only speculate as to the reasons for the apparent decrease in S&W’s service life since the 1981 Army test. In 1981, S&W had an expected service life of 9,500 rounds; it had 4 frame failures, 1 at 9,000 rounds and 3 at 9,500 rounds. Two other weapons—the .45-caliber control and SACO—also had a shorter service life in the 1984 test. The control weapon had a failure at 3,500 rounds in 1984, while none failed prior to 7,000 rounds in 1981. In both Army tests, the control weapons were rebuilt models. There is no way of determining whether, prior to being rebuilt, these weapons had seen little or

heavy use² and, consequently, no way of determining whether the decreased service life of the .45 and the S&W in 1984 might constitute a pattern attributable to some unknown variable. In contrast, the SACO 1984 frame failures appear to have an explanation. For the 1984 test, the manufacturer tried to improve the weapon's performance in adverse conditions testing by hollowing out areas in the frame. Both 1984 frame failures occurred in these hollowed-out areas. The 1984 SACO frame failures, after 6,523 and 7,000 rounds, respectively, had been fired, gave SACO an expected service life of 6,841 rounds. In 1981, SACO had no frame failures.

Reliability Test

All four contestants failed the reliability test in 1981 because the highest score was less than half the mandatory requirement of 800. However, the reliability of three out of four pistols exceeded that of the .45 control weapons. Thus for the 1984 test, the reliability goal was revised to require superiority to the control weapons, which were to be put through the same series of tests. Only H&K, whose reliability was 4 points less than the control weapon, did not meet this revised requirement. Unlike the differing conclusions with respect to service life, there was unanimity among test officials, systems analysts, and evaluators that H&K had failed the reliability requirement.

Calculating Reliability

The manner in which the Army calculated reliability indicates that the performance of weapons changed significantly between the 1981 and 1984 tests. Reliability is expressed by the Army as the mean round between operational mission failure. During test firing seven different categories of malfunctions are tabulated. Each malfunction is, in turn, categorized by a "class" indicating the degree of seriousness. Class I malfunctions, the least serious, are clearable by the operator in less than 10 seconds. Class II are also clearable by the operator but take 10 seconds or more to resolve. Finally, class III, the most serious, are not operator clearable but require sending the pistol to maintenance for repair. The total number of malfunctions is divided into the total number of rounds fired in order to calculate the mean round between operational mission failure. Table III.4 demonstrates the marked improvement in the reliability of Beretta and SACO 9-mm. pistols between 1981 and 1984.

²Apparently, a large percentage of the current inventory of .45-caliber pistols had been fired infrequently. Only weapons distributed to units, such as those involved in training, are likely to be fired often. The Army estimates that on the average a pistol is fired only 200 times a year.

Table III.4: Reliability—Mean Round Between Operational Mission Failure

System	1981	1984
45 control	165	162
Beretta	158	1,750
H&K	169	158
SACO	209	2,877
S&W	293	434

Alternate Method to Express Reliability

Another way of expressing reliability is to show performance—either malfunctions or satisfactory firings—as a percentage of the total rounds fired. This methodology is simple to understand because perfect performance equates to 100 percent. Table III 5 uses this methodology. This table shows a less significant performance difference between the two competitions and the individual competitors. While the mean round between operational mission failure emphasizes the differences between competitors, it tends to obscure the fact that all the weapons tested were highly reliable.

Table III.5: Reliability—Percentage of Successful Firings

System	1981	1984
45 control	99.39	99.38
Beretta	99.37	99.94
H&K	99.41	99.37
SACO	99.52	99.97
S&W	99.66	99.77

The high reliability of all the pistols tested is further indicated when one compares the seriousness of the malfunctions that occurred during testing. Table III 6 summarizes malfunctions according to their seriousness, class I being the least serious and class III the most.

Table III.6: 1984 Malfunctions Classified by Seriousness

System	Class I	Class II	Class III	Total
45 control	180	11	25	216
Beretta	10	1	9	20
H&K	208	0	14	222
SACO	11	0	1	12
S&W	60	0	16	76

As shown by the table, the majority of malfunctions were class I, minor Class II malfunctions were generally not a problem. Army systems analysts noted that none of the class III malfunction rates was high considering that about 35,000 rounds had been fired on each system

Army systems analysts noted that because even minor malfunctions are counted in calculating reliability scores, two systems could have the same reliability score and yet be very different due to the severity of the malfunctions. A detailed examination of the test data suggests that a weapon can have a poor reliability score and yet be comparable to a weapon demonstrating higher reliability because the poor score is based on minor malfunctions.

Analysis of Test Results

Army testers and systems analysts told us that they were surprised by the reliability improvements made by some weapons between 1981 and 1984. In the case of SACO, they attributed the improvement to the redesign of the firing pin, discussed on page 31. In 1981, 72 percent of SACO's malfunctions was concentrated in two out of seven possible failure modes—about 41 percent of its malfunctions was failure to fire and 31 percent was failure to feed. Army systems analysts told us that these two malfunctions were interrelated and that their almost total absence in SACO'S 1984 scores was probably attributable to the firing pin redesign.

On the other hand, the systems analysts pointed out that the cause of Beretta's 1981 failures was more difficult to diagnose. They do not appear attributable to any single design problem, such as SACO's firing pin. Test officials did point out several Beretta design changes made prior to the 1984 test. One change in particular, the removal of an experimental teflon coating used on internal components of the gun, was mentioned by several test officials as a possible explanation for Beretta's improved reliability

H&K, like SACO, had a large number of failures concentrated in a few failure categories. About 68 percent of H&K's 1981 failures was failure to feed, indicative of a magazine design problem. While the number of failures in this category was reduced to about 25 percent of 1984 malfunctions, this improvement was offset by the appearance of a new malfunction. In 1984, about 68 percent of its stoppages was failure of the bolt to remain to the rear, compared to 1 percent in 1981. Army systems analysts believed that this new failure mode could still be indicative of a magazine problem. The failure occurred after the last round was fired

from the magazine when the slide should remain at the rear of the pistol. According to the Army, Air Force testing in 1978 did not consider this and other minor failure modes in calculating reliability, a partial explanation for the higher reliability scores reportedly obtained by the Air Force. The failure of the H&K bolt to remain to the rear, test officials said, could have been ammunition related. The 1981 test ammunition had a higher propellant charge than that used in 1984, resulting in the force of a fired shot pushing the bolt back with greater force. Systems analysts, however, discounted this thesis.

Significance of High Reliability

While the high reliability scores achieved by SACO and Beretta were impressive, the systems analysts suggested that these scores might not be all that significant. They pointed out that the JSOR goal of a desired reliability of 495 was intended to provide a 98-percent probability of successfully completing a 10-round mission (1 fully loaded magazine). This goal is based on the operational assessment that the personal defense weapon is a weapon of last resort and will not be used very often, when it is used, very few rounds will be expended. Finally, by the nature of its most likely use, the penalty paid for a failure to function will be very high.

The test results for all weapons demonstrates a high degree of confidence that they can engage for short mission lengths without interruption.

Table III.7: Probability of Completing a Mission Without Interruption

Percentage				
System/magazine capacity	7-round mission	10-Round mission	15-Round mission	30-Round mission
SACO/15 rds	99	99	99	98
Beretta/15 rds	99	99	99	98
S&W/14 rds	98	97	96	92
45 control/7rds	95	94	90	82
H&K/13 rds	95	93	90	81

The benefits of Beretta's or SACO's high reliability are seen only in missions requiring more than 10 rounds.

Mud Test

The requirement to function reliably after exposure to adverse conditions, including mud, salt water, sand, and dust, is based on the fact that American soldiers could be tasked to operate in many different climates.

and environments. The .45-caliber pistol has the edge in adverse conditions tests. Because of its loose-fitting parts, mud and other foreign matter trapped between the .45's mating parts has less effect on its functioning than on 9-mm. pistols with their tighter fitting parts. There is a trade-off, however, since their tight fit tends to make 9-mm weapons more accurate. Even though the 9-mm.'s performance under adverse conditions did not match that of the .45 in 1981, these requirements were still mandatory for the 1984 competition. However, in 1984, the requirement was for "comparable" performance.

The mud test was conducted in two phases. First, the loaded weapon and two spare magazines were immersed for 60 seconds in a mud bath of a specified viscosity. The wooden plug used to prevent mud from clogging the barrel was removed and the gun and magazines hand wiped before test firing. For the second phase, mud-immersed guns were hand wiped and left to dry for 4 hours before test firing. As noted on page 29, test officials did not have a high degree of confidence in the test results because of the small sample size and the difficulty of completely controlling the test environment.

We found no evidence that the performance criterion for the adverse conditions tests—comparability to the .45—was further defined in either the operational requirements or the specifications communicated to manufacturers. Just prior to the start of the testing, evaluators were instructed to use professional judgment and reason in arriving at conclusions. (See pp. 5 and 23.) Such judgment was exercised in concluding that SACO had passed the mud test. As shown in Table III 8, the .45 control weapons had no malfunctions in either the wet or dry phase of the mud test, a performance not equaled by any other weapon. SACO's performance in dry mud, however, was 17 percent less than that of its nearest competitor. In other words, SACO was not only not equal to the .45 but also not equal to the performance of other weapons tested.

**Table III.8: 1984 Mud Test Results—
 Percentage Successful Firings**

	Wet	Dry	Average
.45 control	100	100	100
SACO	98	79	88
S&W	98	96	97
Beretta	97	98	97
H&K	99	100	99

The evaluators concluded that SACO had met the requirement because it had passed the wet mud portion of the test and because the dry mud requirement was probably unrealistic when compared with potential field experience. In addition, the evaluators pointed out that SACO's exclusion would have resulted in the elimination of an otherwise outstanding candidate and would have left only one candidate in the competition.

Salt Water Corrosion Test

While latitude was shown in assessing SACO's dry mud performance, Army evaluators exercised no such latitude in assessing H&K's performance after exposure to salt water. Salt water immersion, a desirable characteristic in 1981, was elevated to a mandatory requirement for the 1984 competition.

In a procedure similar to that used for the mud test, two weapons and a number of magazines were immersed in a saltwater solution of a specified salinity. Between test firings, which took place over a period of 10 days, the weapons were placed in a humidity-controlled chamber. Over the 10-day period, H&K experienced 55 malfunctions in 390 rounds fired compared with 2 malfunctions in 210 rounds for the .45-caliber control weapon. As table III.9 demonstrates, many of H&K's malfunctions occurred after the 5th day of exposure—36 out of 55. The Army systems analysts concluded that for the first 3 days of the test, H&K's performance was comparable to that of the control weapons. Overall, they found H&K's performance acceptable because, in their opinion, the 10-day testing cycle was not realistic. Their report noted that although no mission scenario is given for the salt water immersion requirement, "one might imagine that landing in the tropics might be simulated by the 3 day firing cycle."

Table III.9: 1984 Salt Water Immersion Test Results—Percentage Successful Firings

System	After 3 days	After 5 days	Overall
.45 control	100	98	99
SACO	100	100	100
Beretta	100	100	100
S&W	100	99	97
H&K	97	82	86

Like SACO's performance in the mud test, H&K's performance under salt water immersion was not as good as that of its competitors. Consequently, Army evaluators concluded that H&K had failed to meet this

requirement. Unlike SACO, H&K had not exhibited overall superior performance throughout the test program.

Firing Pin Energy Test

S&W was the only 1984 contestant to fail the firing pin energy test, a test it had also failed in 1981. Although S&W challenged its elimination from the 1984 competition, based in part on this test, both the District Court of Massachusetts and the First Circuit Court of Appeals upheld the Army decision.

Requirement Source

We asked Army officials why a 24-inch-ounce firing pin energy (FPE) was required. They explained that any 9-mm. pistol selected must be able to fire 9-mm. cartridges made to NATO specifications. The NATO requirement for primer hardness stipulates that when a steel ball weighing 55 grams (1.93985 ounces) is dropped from a height of 305 mm (12.00785 in.), all primers shall fire. The Army multiplied 2 ounces times 12 inches to arrive at the requirement of 24 inch ounces. However, if one were to multiply 1.93985 ounces times 12.00785 inches, the requirement would be 23.29343 inch ounces. Table III.10 contains various inch ounce measurements made at Fort Dix, New Jersey, in order to develop the 24-inch-ounce standard for the S&W pistol. Our interpolation of the indent (depth) required for 23.29343 is also included.

Table III.10: Firing Pin Energy Measurements

FPE inch ounces	Indent inches
22	.011
23.29343	.113
24	.0115
26	.012

Army rounding off of the metric-to-U.S. conversion increased the requirement slightly. If a more precise conversion had been used, S&W would have met the requirement.

Test Methodology

The test, which was performed in the same manner for each manufacturer, consisted of two parts

In one phase, the testers determined the depth of the indent corresponding to 24 inch ounces of energy for each type of 9-mm. pistol. Each manufacturer's firing pin adapter was used in establishing this

standard.³ Testers measured the indents made by the adapter in copper cylinders. The indents were made using a precisely measured weight dropped a precisely measured distance equating to exactly 24 inch ounces

In another phase, testers measured indents made by test pistols to determine conformance to this standard. The same type of copper cylinders was inserted in a special adapter simulating a bullet. This device was placed in a gun and the trigger pulled, leaving an indent in the piece of copper. A total of 70 cylinders was indented in this manner—seven pistols were “fired” five times each, in both single and double action ($7 \times 5 \times 2 = 70$). A special gauge was used to determine the depth of these 70 indents. The device was a standard machine shop depth gauge calibrated to one-thousandth of an inch. Hence, the dial indicator had to be “eyeballed” to obtain readings to ten-thousandths of an inch.

Analysis of Test Results

The evaluation criterion required five of seven pistols to pass the test—five of the seven tested in the single action mode and five of the seven pistols tested in the double action mode (See footnote p. 26.) Six of seven S&W pistols met the single action mode, but only four of seven passed in double action. Had a more precise metric to U.S. conversion been used, six out of seven S&W pistols would have passed in both single and double action.

A closer examination of the test results indicates that in 70 measurements, S&W exhibited less than the required amount of firing pin energy only 10 times. Two of the three pistols that failed in double action fell short of the requirement by one ten-thousandth of an inch. In fact, the average for the pistols tested was .01172 inches, just slightly more than the .0115 inches required. In contrast, during 1981 testing, S&W pistols failed the firing pin energy test by up to three-thousandths of an inch. Finally, as a normal part of the endurance test, additional indent measurements were made, including the S&W pistol C-7 that had failed the single action firing pin energy test. These measurements were consistently better than those taken on the same pistol during the actual firing pin energy test.

³Test officials explained that in 1981 the Army had fabricated the firing pin adapters. They said this might explain why in 1981, 24 inch ounces for S&W equated to an indent depth of .011 inches.

Appendix III
 Analysis of 1981 and 1984 Test Results

Table III.11: Additional FPE Measurements on S&W Pistol C-7

Single action indents in inches				
FPE test indents	Rounds fired	FPE Endurance Test Indents		
011	60	012,	012,	012
0115	1,000	012,	012,	012
011	2,000	013,	011,	012
011	3,000	012,		012
011	3,500	011,		011

Only twice in 15 measurements taken after the indicated number of rounds did the same test pistol demonstrate a firing pin energy as low as the initial measurements. In addition, this pistol had no malfunctions during the endurance test.

Both a test official and the systems analysts told us that they were surprised that evaluators had failed S&W due to insufficient firing pin energy. The endurance test director who took the firing pin energy measurements called S&W's failure borderline and said he was not comfortable with failing S&W based on the test. According to the systems analyst, firing pin energy was about as important as the requirement for a lanyard loop. He noted that SACO had passed the firing pin energy test in 1981, even though it had a firing pin energy problem—a problem clearly visible in the large number of failures-to-fire during endurance testing. Failure-to-fire is one of seven types of malfunctions tabulated during testing. Despite failing the firing pin energy test in 1984, S&W had no failures-to-fire in 33,000 rounds of endurance testing. He indicated that performance was a much better predictor of a firing pin energy problem. The 1984 competition included a separate test for ammunition compatibility in which all competing pistols were fired with 16 different types of 9-mm. ammunition, presumably exposing the pistols to cartridges of differing primer hardness. S&W's performance was on a par with that of SACO, which passed the firing pin energy test.

Covert Test Allegation

As noted above, the firing pin energy test was performed at the endurance test site, Fort Dix, New Jersey. The test plan stated that the test would be performed at Fort Dix, even though the request for test samples stated that the test would be performed at Aberdeen Proving Ground, Maryland. However, the final report on testing performed at Aberdeen does contain firing pin indent measurements. S&W has claimed that it passed the firing pin energy test using the standard developed at Fort Dix compared with the indents taken at Aberdeen.

The S&W indents taken at Aberdeen were a minimum of .0120 and a maximum of .0140 inches against a Fort Dix standard for S&W of .0115 inches. In addition, S&W asserted that the Fort Dix test constituted "covert testing" to eliminate S&W from the competition.

The Aberdeen test director explained that his measurements were not the firing pin energy test. Rather, they were one of several measurements taken in order to establish a reference point for the record prior to the actual commencement of testing. Also, while he measured firing pin indents, he did not establish the 24-inch-ounce standard. He noted that S&W's comparison of his indents with the Fort Dix standard was invalid because he had used a different lot of copper cylinders. The hardness of these cylinders can vary between lots. To make a valid comparison, it is necessary to develop a standard using cylinders from the same lot.

Cancellation of 1981 Procurement

Beretta's poor performance in the first Army competition, compared to S&W's performance, gave rise to the suspicion that the procurement had been canceled because Beretta had not won. Our work did not substantiate this conclusion and instead suggested that overly stringent joint service requirements resulted in cancellation of the 1981 competition. To pick a winner, the Army would have had to selectively relax requirements. But the Army believed that such a technique would subject it to a charge of bias and litigation. Thus, the Army concluded that the most legally defensible position was to cancel the competition and revise the requirements in preparation for a new round of testing.

Delay in Terminating Candidates

On September 18, 1984, 4 working days before price proposals were due, three candidates were notified of their termination due to their failure to meet mandatory requirements. (See table I 1.) On the same day both Beretta and SACO were granted an extension to October 9, 1984, to submit their price proposals. S&W has asked why, given the high cost of preparing price proposals, about 2-1/2 months elapsed between the discovery of cause for termination and the notification.

For example, the 5,000-round crack in an S&W pistol was discovered on May 30, 1984; the endurance test director told us that he had discussed the crack with the chairman of the evaluation board in early July, and the official test report containing data on the failure was transmitted to the evaluation staff on July 18. On August 1, 1984, 2 weeks later, the termination issue was discussed by the evaluation council, a review

level between the evaluation board and the selecting official (See app I, p 23) It recommended that no decision be made to eliminate any candidate until receipt of complete information and testing data and/or recommendations from the evaluation board which "officially informs it of the official testing results." The evaluation board's official report, recommending termination of three candidates, was available by the end of August

This report expressed general concern about terminating candidates before all testing had been completed and the results analyzed. The basis for the concern was that remaining candidates might fail mandatory requirements, resulting in "no candidate in the program (and subsequent program termination) or an embarrassing reinstatement of one or more candidates."

The evaluation council chairman told us that the council was well aware of the results of the canceled competition. He said that the council's two goals in 1984 were to treat all firms equally and to maximize competition. Both goals argued against premature termination of a candidate. The evaluation board chairman cited bureaucratic red tape in accounting for the elapsed time between early July and mid-September. He noted that about 2-1/2 months was perhaps not unreasonable given summer vacations and the difficulty of assembling board and council members from around the country for meetings. The selecting official, who had to approve candidate termination, agreed and noted that his own busy schedule made it difficult to arrange meetings. However, he added that if a delay had occurred, he could not understand the basis for it since a failure was a failure and was not going to go away.

Amendment of Requirements

After testing had commenced in February 1984, two requirements in the RFTS were either formally or informally amended. Had they not been amended, the cumulative effect would have been the cancellation of the competition. The requirements and the justification for relaxing them are summarized in the following paragraphs

Fixed Rear Sight

Both the JSOR and the RFTS list as a mandatory requirement a fixed rear sight, which is adjustable by reflection by drifting in a slot similar to the M1911A1 (.45 caliber pistol). Five of eight candidates met the requirement without question. However, one did not meet the requirement, another met the letter but not the intent of the requirement, and a

third met the letter but not the exact intent. The evaluation board concluded that the sight requirement had been "totally misclassified" by being made mandatory. Since the board believed that the requirement should not have been mandatory, it recommended that the requirement be treated as such during the evaluation. Reasonableness and common sense, the board noted, should be the decision criteria. No firm was notified that it had failed the fixed rear sight requirement. Neither the JSOR nor the RFTS was formally amended.

Center of Impact

On April 19, 1984, the RFTS was formally amended by moving the center of impact requirement from category 2, "Mandatory," to category 3, "Negotiable" at the option of the government. In addition, the amendment specified that the performance of all weapons in this subtest would be averaged to determine compliance with the requirement. Although testing had already begun, the center-of-impact measurements had not yet been taken.

The amendment was made, in part, because legal counsel to the evaluation staff had advised them that the wording in the RFTS would not permit averaging—that is, every weapon tested had to meet the requirement for that firm to pass. Since the requirement was mandatory, failure to pass meant the candidate would be eliminated from the competition.

Five of each competitor's pistols were tested for center of impact. All five guns of only one manufacturer, S&W, individually passed the test.

Analysis of 1984 Price Competition

The final phase, step two of the selection process, involved the evaluation of price proposals by the two finalists—SACO and Beretta. The Army's evaluation officials had determined, at the end of step one testing, that only these two firms had submitted technically acceptable 9-mm. pistols. By September 18, 1984, all other firms had been eliminated as technically unacceptable.

Price proposals were submitted by SACO and Beretta on October 9, 1984, and evaluation of the proposals ended sometime prior to November 22, 1984. As shown in table I.2, SACO was the apparent winner with a low evaluated price of \$75 million for the 5-year package of pistols, magazines, and spare parts. Beretta's price was \$9 million higher. However, on November 20, 1984, the Army notified SACO and Beretta that it was requesting best and final offers to be submitted by December 11, 1984.

Best and Final Offers

According to the contracting officer's representative, best and final offers were requested in order to give the two finalists an opportunity to review data which might affect their October 9 prices. Thus, on November 20, 1984, each finalist was given the following information:

- A copy of the military specification for its pistol. Based on the actual test results, the specification mirrored the JSOR but modified the specific requirements to reflect the actual performance during testing. For example, Beretta's specification reflected the much higher reliability it had exhibited during testing rather than superiority to the .45 or a goal of 495. In short, the specification told the manufacturer what performance the Army would expect from production pistols—before it committed to a firm 5-year contract price subject only to economic adjustments for inflation.
- A copy of the revised license agreement, which covered the technical data package that was to be conveyed to the government under the contract terms. The package—in effect the blueprints for the weapon's design—would permit the government to ask for competitive bids from any interested gun manufacturer in the event of future purchases.
- A copy of the revised contract warranty provisions.
- A list of serious concerns compiled by the evaluation staff. For example, Beretta was notified of shortcomings in its quality assurance plan and in technical drawings.
- A revision to the total quantity of pistols to be purchased—an increase of 10,350 over the 5 years of the contract.

Army officials emphasized that all the above factors necessitated a request for best and final offers. On December 11, 1984, Beretta and SACO responded. Beretta's unit price for each pistol dropped \$39.34, or about 18 percent, while SACO's unit price remained the same. A recomputation by the Army's cost evaluator showed that Beretta was the winner with a low evaluated price of \$75 million for the 5-year package of pistols, magazines, and spare parts. SACO's price was \$3 million higher than Beretta's.

Price Leak Allegation

Beretta's dramatic price drop of 18 percent seems disproportionate to the quantity increase of 3 percent. Therefore, it is understandable why suspicions have arisen about the protection of price data.

The Army assured us that it had taken precautions to protect the pricing data both before and after it received best and final offers. It kept the price data under lock and key and allowed only authorized personnel access.

The fact that Beretta's best and final prices were handwritten into blank spaces on a typewritten letter contributes to the suspicion that SACO's price was leaked. We asked Beretta's general manager, who had inserted and initialed the prices in ink, why he had done so. He explained that Beretta was very concerned that its prices might be leaked to SACO. Thus, as a precaution, the letter was typed at Beretta's Accokeek office with blank spaces left for prices. He told us that he received the revised unit prices at home during a phone conversation with Mr. Beretta. After this conversation, he inserted Beretta's best and final prices by hand on the pretyped letter, which he personally delivered to the Army's contracting office.

According to the general manager, Beretta cut its price to the "bare bones" for the best and final offer because it really wanted to win the contract. Beretta reasoned that a rock bottom price was necessary to win since its competitor would also drop its price to the minimum level. He explained that Beretta's pistol price of \$178.50 was the price at which Beretta U.S.A. bought the gun from Beretta, Italy, and that he hoped to be able to produce the pistol in America at the same price as in Italy.

We found no direct evidence to sustain the allegation that SACO's prices were leaked to Beretta. Beretta has given a plausible explanation for its

actions, and the Army has said it took reasonable precautions to protect the pricing data.

Price Analysis

A price analyst on the evaluation staff analyzed both Beretta's and SACO's price data. The analysis covered the price of pistols, as well as the price of magazines and spare parts. The evaluation of all three elements, not solely the pistol price, was used to determine the low bidder.

Pistol Prices

The price evaluator analyzed both Beretta's \$178.50 unit price and SACO's \$176.33 unit price and determined that both were reasonable. He reviewed the 1981 quotations from the canceled 9-mm. pistol source selection, as shown in table IV.1.

Table IV.1: 1981 Price Quotations

H&K	\$232.50
SACO	225.69
Beretta	207.00
S&W	175.00

Furthermore, he used an independent government estimate based on retail price data for similar 9-mm. pistols, as shown in table IV.2.

Table IV.2: 9-mm. Retail Prices

9-mm. pistol model	Unit price
Astra Model A-80	\$ 490.00
Beretta Model 92S	515.00
H&K VP70	489.00
Llama Omni	499.95
ODI Viking	579.00
SACO	590.00
S&W	388.00
Star Model 28	520.00
Taurus Model PT92	311.00
Walther P38	680.00
Total	\$5,061.95
Average price	\$ 506.20

Finally, the price analyst obtained the most current Beretta price list showing the Model 92SB at \$600 each and the most current SACO price list showing the Model P-225 at \$620 each.

The analyst concluded that there was no basis to determine that either Beretta or SACO had offered unreasonable prices

Magazine and Spare Parts Prices

The price of each 9-mm pistol was not the only factor considered in determining the low bidder. Others involved the price of spare magazines¹ and repair parts

In past procurements, the Army had selected the low bidder of an item and then found itself in a noncompetitive sole-source position when purchasing spare parts. To avoid being placed in a such a "take it or leave it" price position, the Army asked bidders for separate prices for magazines, as well as each piece part of their pistols. In addition, the Army asked bidders for subassembly prices. Subassembly prices would allow the Army to decide whether it would be more economical to buy piece parts to be assembled by Army personnel or to buy the parts already assembled by the manufacturer

To give the manufacturers some idea of how many magazines and spare parts sets it would buy, the Army said it would base its price analysis on the following quantities

- magazines at 400 percent of the number of pistols and
- spare part sets at 10 percent of the number of pistols.

A spare parts set would include all the piece parts and/or subassemblies constituting a complete pistol, except for the frame (receiver). DOD does not buy replacement frames. If a frame becomes unserviceable, the pistol is removed from the inventory, the serviceable parts removed, and the frame demilitarized. Finally, the Army did not commit itself to purchasing any magazines or spare parts. Rather, in the contract, it reserved the right to buy anywhere from zero to 500 percent magazines and zero to 20 percent spare parts sets

Beretta's and SACO's price quotes for each magazine were \$9.30 and \$11.95, respectively, and for each spare parts set were \$209.42 and \$221.79, respectively. The cost evaluator simply multiplied each contractor's magazine unit price by 400 percent of the number of pistols and each contractor's spare parts set price by 10 percent of the number of pistols. Because of the 400-percent factor used to evaluate magazines,

¹A holder which automatically feeds the 9-mm cartridges into the pistol

Beretta's lower magazine price more than any other factor resulted in its having the lowest overall evaluated price. (See table I 2.)

Allegations of Spare Parts Double-Counting

The method used to evaluate spare parts prices was the subject of SACO's litigation before the U.S. District Court, Maine, Civil Case Number 85-0082P. On February 20, 1986, the court dismissed SACO's allegations. On April 14, 1986, SACO filed notice of its intent to appeal this decision.

SACO alleged that the spare parts provisioning lists developed by the Army for the purpose of price evaluations were unfair because they double-counted certain SACO, but not Beretta, parts. A provisioning list is a determination of the parts needed to support a weapon in the field.

In developing a provisioning list, a logistics evaluator determines which piece parts and subassemblies to purchase. Factors considered in making this determination include:

- Price of subassembly versus separate piece parts
- Cost in time and labor to repair subassembly with individual piece parts versus cost of subassembly
- Likelihood of small subassembly parts being lost or broken during maintenance in the field. For example, if a subassembly consists of several small, easily lost pieces, to buy the subassembly makes sense provided the prices of the individual pieces are not significantly lower than the subassembly price. All pistols in the competition were provisioned by an Army logistics evaluator, a process completed in July or August 1984. After the receipt of price proposals in October, the SACO and Beretta provisioning lists were checked to confirm assumptions that had been made about piece versus subassembly prices, but no adjustments were necessary. The price analyst then used these lists to perform his evaluation.

According to the logistics evaluator, the provisioning lists developed for both SACO and Beretta do indeed contain examples of double-counting—a fact attributable to the unique designs of each gun and his judgment as to the best way to support that gun. In addition, he pointed out that the Beretta and SACO guns had been provisioned independently and that each list was internally consistent but not comparable to that of another type of gun. For example, on SACO's gun the front sight can be separated from the slide, but on the Beretta it is an integral part of the slide. The SACO provisioning list has two front sights, while

Beretta's list contains only one, built into the slide. The logistics evaluator explained that there was a logical reason why the SACO provisioning list had two front sights. Since the SACO design has a separate front sight, it has to be provisioned in case the front sight on a weapon needs replacement. On the other hand, if a SACO slide is damaged, it is cheaper in terms of time and labor for the Army to replace it with a slide subassembly which already has two sights mounted on it. However, SACO claimed that since the Army provisioned two SACO front sights, it should also provision two Beretta front sights. To do so, however, the Army would have had to buy an additional slide costing nearly \$50 (in contrast, the second SACO front sight cost only about \$5). The evaluator told us that to buy an expensive slide in order to replace a broken front sight did not make any economic sense.²

The logistics evaluator told us that double-counting actually hurt Beretta more than SACO. This can be demonstrated by comparing the price of provisioned items to the price of piece (individual) parts. These prices exclude the frame, which the Army did not buy, and the magazine.

Table IV.3: Demonstrating Effects of Double-Counting

	SACO	Beretta
Provisioned parts	\$221.79	\$209.42
Less piece parts	(212.47)	(195.52)
Difference—due to higher subassembly cost & double-counting	9.32	13.90

Provisioned items, which include some subassemblies, are more expensive because quoted prices were higher for subassemblies than for piece parts. For example, Beretta's barrel subassembly, consisting of four piece parts, was priced at \$40.45, while the individual parts totaled \$39.40. The other reason provisioned items are more expensive is double-counting. Thus the provisioned items include two each of four Beretta parts. In the case of Beretta, the extra cost of subassemblies (versus individual parts) plus the double-counting was \$1.90 and \$12, respectively, for a total of \$13.90. Since the comparable figure for SACO is a total of \$9.32, the double-counting affected Beretta more than SACO.

²Although the Army originally asked Beretta to modify its design to make the front sight removable, this plan was later abandoned, as is discussed later in this appendix.

Rationality of the 10 Percent Factor

SACO also alleged that the Army's decision to base its spare parts evaluation on 10 percent of the quantity of pistols had no rational basis and that in its cost analysis, the Army had ignored test data which showed that SACO pistols required no spare parts during the first 5,000 rounds of test firing.

The District Court of Maine found the program manager's explanation of the origin of the 10-percent factor convincing and concluded that the selection of 10 percent was the result of a "considered process." Whether one evaluates the price of piece parts or provisioned parts for one or any number of pistols, SACO's spare parts, we found, are more expensive than those of Beretta. However, we noted that the magazine percentage factor (400 percent), not the spare parts factor (10 percent), resulted in SACO's overall price being higher than Beretta's. Excluding magazines, SACO was still the low offeror by \$0.294 million (pistols + parts), since its lower pistol price offset its higher parts prices. When magazines are included, however, SACO's overall price is about \$3 million more than Beretta's (pistols + parts + magazines). Thus even if the Army had excluded spare parts from its price evaluation, SACO would still have lost because of the combination of its higher magazine price and the 400 percent magazine factor. SACO did not argue that the 400 percent magazine factor was irrational.

At the conclusion of testing, SACO's parts replacement record was superior to that of Beretta. Logistics evaluators noted that "based on test data only, it cost \$0.00 to maintain the P226 (SACO) over the required life of 5,000 rounds", \$11.30 less than Beretta's cost. This was one reason why SACO's score in the logistics sub-factor was higher than that of Beretta. Army evaluators explained, however, that the test data was not an adequate basis on which to predict parts demand because testing does not reflect the real world in which parts are lost, broken during maintenance, or pilfered.

There is probably no satisfactory way to predict the spare parts costs of two weapons systems over time to determine which is cheaper. What one can develop, as the Army did, is a list of potential outcomes which could be contradicted by other equally probable results. For example, while Beretta's parts are less costly, SACO used fewer parts during testing; two of SACO's pistols, however, failed after 5,000 rounds, while none of Beretta's cracked through 7,000 rounds of firing. As the Army evaluators found, the outcome was inconclusive.

The Army should not suggest, as it has, that 10 percent of each provisioned item represents a conservative estimate of the required spare parts support for the projected 25-year life of the system. The Army can make no accurate projection. For example, before ordering the first increment of spare parts, Army maintenance specialists assigned replenishment factors³ for each of Beretta's 65 parts, ranging from 10 to 30 percent. These high percentages, as well as the initial order for parts at 20 percent of the quantity of pistols for 2 years, are attributable to provisioning needs, that is, the necessity of filling the numerous stockage points that will support this new weapon. However, once generated, actual demand data will become the basis for ordering parts. An Army logistics evaluator told us that some of the parts stocked during provisioning might, in fact, never have to be ordered again.

**Proposed Design
Modifications Not Pursued**

On December 11, 1984, when best and final offers were submitted, SACO and Beretta representatives were handed letters dated December 6, 1984, which listed hardware weak points and proposed changes found during testing and evaluation of the weapons. While the government did not direct the firms to perform any hardware changes at that time, it stated:

" In the event your company receives an award for the M9, 9mm handgun, these hardware changes and weak points would have to be corrected or implemented as appropriate on your weapons after award, but prior to First Article Testing and initial deliveries "

For example, SACO was notified of frame failures after 5,000 rounds of firing that shortened the pistol's service life. Beretta was asked to redesign the front sight to make it removable and simplify the gun's safety mechanisms. The Army did not pursue these changes.

Because the contemplated changes were significant, SACO has charged that the letters should have resulted in negotiations with the contractors, as well as another request for best and final offers. During the SACO litigation, attorneys for the Army asserted that the Army had never intended to require weapons modifications. According to an Army procurement lawyer, the wording of the letters was ambiguous. In any event, the Army was not precluded from making any changes in the Beretta pistol design. However, he said the selecting official was insistent that there be no design changes.

³The replenishment factors are based on experiences of similar systems.

Appendix IV
Analysis of 1984 Price Competition

The selecting official characterized the letters as imprudent and said that he never had any intention of changing the pistol's design. He called it "opening a pandora's box" to ask for changes on a firm-fixed-price contract because one ran the risk of allowing the contractor to "get well" on pricing the changes. He told us that the letters had been distributed without his knowledge

The 9-mm. Program: Defense Cooperation and Its Economic Impact

International Agreement

In 1978, the United States and Italy signed a Memorandum of Understanding in which they promised to fully consider all qualified industrial and/or government sources of conventional defense equipment in each other's countries, subject to national procurement policy and criteria. In doing so, both countries promised to eliminate procurement barriers and use competitive bidding. The agreement is a public document and is similar to agreements that the United States has negotiated with other NATO allies. This emphasis on reciprocal defense purchases, commonly known as the "two-way street," was prompted by concern on the part of our allies that their purchase of American-made military equipment far exceeded sales of European-made equipment to the United States.

According to the State Department Italian desk officer, the Italian government takes the "two-way street" very seriously. He said that there was no doubt that the Italian government was interested in the 9-mm sale and had made its interest known to the U.S. government. In addition, he pointed out that the Italian ambassador in Washington, D.C., was very active on behalf of Italian commercial interests. Such activities on the part of foreign embassies are routine in contrast to those of U.S. embassies, which are prohibited from promoting American military products overseas.

The same State official noted that the award of the contract to Beretta was a positive event in U.S.-Italian relations. Italy, in recent years, has moved from being a good ally to being a very good ally. For example, he noted that the Italian government took certain risks in 1979 in agreeing to station American cruise missiles in Italy. While the Beretta sale is in no way a quid pro quo, he added that the Italians did expect their closeness as an ally to be worth something. The sale of the Beretta 9-mm pistol was seen by the Italians as a commercial coup, a prestige sale worth a good deal of publicity.

Economic Impact on U.S. Industry

Although Beretta U.S.A. is incorporated in the United States and based in Accokeek, Maryland, it is 80 percent owned by the Italian corporation, Beretta. Our analysis indicates that the economic impact on U.S. industry as a result of the award to Beretta will be limited.

Background

From the outset, the Defense Department has anticipated that the contract for replacing the .45-caliber pistol might be awarded to a foreign manufacturer. In fact, most of the weapons tested by both the Air Force and the Army were made in Europe—six of the eight pistols tested in

1984 Only two American firms—Colt and S&W—participated in the Air Force and Army testing. The lack of greater participation by American firms may be attributable to the fact that S&W is the only American producer of sizable quantities of 9-mm. pistols and that 9 mm. has long been a standard caliber in Europe. Standardization with our NATO allies was in fact part of the rationale for switching to a 9-mm. handgun

Although only two American firms competed, there was keen interest. DOD has not bought any .45-caliber pistols since World War II. Furthermore, the experience with the .45 is any indication, its replacement stands a good chance of being in the DOD inventory for a long time. Although the Army has already contracted for 320,030 pistols, it also plans to buy an additional 124,000 weapons. The contract with Beretta has an option to increase the quantity to be purchased by up to 100 percent at the contract price of \$178.50 per pistol, plus an inflation adjustment.

Data on the contract price for the pistols, spare parts, and magazines for the 5 years of the contract, is contained in appendix IV. However, over the 5-year contract, the Army's average annual expenditure will be only about 4.2 percent of the value of U.S. handgun production in 1984

American Handgun Industry

Handgun production consists of various calibers of both pistols and revolvers. In 1984, the United States produced 753,000 pistols and 927,000 revolvers with an estimated wholesale value of \$351 million. Comparing 1980 with 1984, revolver production declined 46 percent and pistol production declined 4 percent. During the first half of 1985, U.S. handgun production was about 11 percent less than in the first 6 months of 1984. Consequently, there is significant idle capacity in the domestic handgun industry

International trade is not a large factor in the U.S. handgun industry. In 1984, United States exports were only 5.9 percent of the value of domestic production (117,000 handguns worth \$20.8 million; imported parts were worth an additional \$4.1 million). Imports were valued at 7.7 percent of domestic production, or \$27.1 million, imported parts were worth an additional \$4.6 million. Comparing 1984 with 1980, handgun exports rose in value 33 percent and handgun exports decreased in value 23 percent.

**Contract Provisions Lessen
Impact**

The effects on U.S. industry from awarding this contract to a foreign firm are reduced by some contract requirements. The contract limits the amount of imports but allows all production to be overseas in the first year. By the second year, assembly and testing are required to be performed domestically (in the United States or Canada). By the third year, the barrel, slide, and frame must be produced domestically. During the final 2 years, all production must be within the United States or Canada. The contract requires at least half of the barrels, slides, and frames purchased over the 5 years of this contract to be produced domestically.

Another contract requirement lessens Beretta's potential benefits from future contracts. The U.S. government has the right to all technical data from this contract and can disseminate it to potential bidders on future 9-mm. contracts. Dissemination of technical data should increase competition and lower the costs of future purchases more than would be the case if Beretta had retained exclusive ownership rights to this technical data.

**Comparison of Beretta
Versus American Firm
Winning Contract**

The contract requires at least half of the contract quantity to be produced in the United States. Based on contract data, we estimate that about one-third of Beretta's non-investment expenditures, that is, expenditures which include costs for labor, raw materials, and management, will be spent overseas. Our analysis indicates that domestic handgun producers have a much lower propensity to import, therefore, the Army purchase from Beretta U.S.A. will result in increased imports.

Theoretically, increasing handgun imports should lower the value of the dollar on the international exchange market. However, the extremely small size of this handgun purchase compared to aggregate U.S. imports and exports implies that any impacts on the value of the dollar or associated trade patterns will be small.

In recent years, domestic handgun production has declined, creating excess capacity. Awarding Beretta this contract should result in more capital investment than awarding it to a domestic supplier with a large level of idle capacity because (1) the amount of investment necessary to change calibers in a domestic pistol plant with idle capacity is less than the investment needed to build a new facility or greatly expand an existing facility and (2) the existing U.S. facilities of Beretta are small.

Purchasing this handgun from Beretta will also have regional economic effects. Areas in which the domestic handgun industry are concentrated,

such as Hartford, Connecticut, and Springfield, Massachusetts will experience slower growth than would otherwise be the case. The Washington, D.C., region in which the Beretta U.S.A. plant is situated will experience higher growth than it otherwise would. Regions with a concentration of firms supplying Beretta will be helped; regions with a concentration of firms supplying domestic handgun manufacturers could be adversely affected.

Influence on Private Sector and Foreign Demand

While it can be assumed that private sector demand for handguns will be unaffected both by the Army's decision to purchase 9-mm. handguns and by its choice of supplier, this may not be the case. Firms such as Beretta that already produce and commercially sell 9-mm. pistols will have an advantage in capturing this shift in demand. This shift in demand is likely to be modest in size relative to domestic handgun production. In 1984, measured by quantity, .45-caliber domestic pistol production constituted 4.5 percent of domestic handgun (pistols plus revolvers) production, 9-mm. pistols were produced in slightly smaller quantities. Thus, even under the extreme scenario that all 1984 demand for domestically produced .45-caliber pistols shifts to 9-mm. handguns, this shift would be only 4.5 percent of 1984 handgun production.

Beretta estimates that production costs for the 9-mm. pistol will be substantially less in Italy. In addition, U.S. handgun exports are already very modest—only 2 percent of handgun production in the non-communist world. Therefore, the U.S. industry does not appear to be very competitive with foreign producers. Consequently, even if foreign demand for 9-mm. handguns increases greatly, production in the United States is likely not to increase very much.

Italian Trade Policy

As noted previously, the Italian government takes the "two-way-street" very seriously. Depending on the circumstances, had an American firm won the 9-mm. contract, the Italian government possibly could have retaliated. For example, the Italian government could have increased barriers to U.S. goods or not purchased defense or other goods from the United States. The effect of this retaliation could have been much larger than the value of the Beretta contract.

Request Letter

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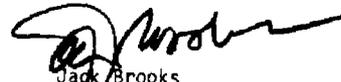
Dear General:

On April 10, 1985, the Army awarded a contract to Beretta U.S.A. Corporation, a subsidiary of Italy's Beretta Corporation, for the manufacture of semi-automatic 9mm pistols to be used as the military services' standard side arm. I understand that the award encompasses almost 316,000 weapons costing approximately \$60 million, and that the process leading to the decision took seven years and included three rounds of extensive testing. I also understand that despite this level of effort, the award has been clouded by various allegations of favoritism and other improprieties on the part of the U.S. Army.

In this regard, it has been alleged that this procurement was "wired" for Beretta and that U.S. firms did not have a chance for the award from the outset. It has also been alleged that, to ensure the outcome, the Army conducted "covert" testing and gave Beretta a competitor's bid prior to the submission of its best and final offer. In view of the seriousness of these allegations and the negative impact this award could have on the U.S. firearms industry, I request that you immediately undertake an investigation into this procurement. In addition to addressing the specific allegations mentioned above, I request that you determine (1) if this contract was influenced by any international agreement that may have been secretly made between the U.S. and Italian governments and (2) what potential economic impact this award will have on U.S. industry. Further, I request that the results of this investigation, including your findings, conclusions and recommendations, be provided to the Committee no later than February 28, 1986. Your assistance in this matter is greatly appreciated.

With best wishes, I am

Sincerely,



Jack Brooks
 Chairman

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