REPORT BY THE

# Comptroller General

OF THE UNITED STATES

# Proposed Program For New 9-mm. Handguns Should Be Reexamined

The Department of Defense's proposed program for new 9-mm. pistols would cost about $133 million (1980 dollars) more than it would cost to continue to use the present mix of sidearms. Since the purpose of adopting a new sidearm was to save money, the program should be reexamined. According to Defense, it canceled the initial large-scale purchase of 9-mm. pistols because all candidate pistols failed specified tests.

This report was requested by the Chairman, Subcommittee on Investigations, House Committee on Armed Services.



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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON D.C. 20548

B-206324

The Honorable Richard C. White
Chairman, Subcommittee on
Investigations
Committee on Armed Services
House of Representatives

Dear Mr. Chairman:

As you requested during the hearing on the Department of Defense's decision to standardize its inventory of sidearms by purchasing all new, semiautomatic 9-mm. pistols, we have examined the alternatives considered in making this decision and the feasibility of converting .45-caliber pistols to use 9-mm. ammunition.

The proposed program to acquire new 9-mm. pistols would cost about $133 million (1980 dollars) more than continuing to use the present mix of sidearms. On the basis of our examination of the justification documents and our interviews with military user representatives, we believe the proposed acquisition of 9-mm. handguns is questionable. Accordingly, we believe Defense should reexamine its plans for a large-scale procurement of 9-mm. pistols and continue using the present inventory of revolvers and pistols. Defense does not concur with this.

In response to congressional interest in standardizing handguns to save money on logistics and maintenance costs, Defense directed the services to study the small arms issue. The Army, as the Executive Agent for small arms, assigned the task to the newly formed Joint Services Small Arms Program. The study group was to determine

--what types of handguns were needed to meet service requirements, and

--whether the United States should adopt the North Atlantic Treaty Organization (NATO) standard 9-mm. cartridge.

The basis for Defense's sidearm replacement was the standardization issue, not necessarily deficiencies in current sidearms. According to the small arms study, replacing Defense's current inventory with 9-mm. pistols, over the next 20 years, would cost about $133 million more than it would cost to continue to use the present mix of sidearms.

The Defense decision to adopt a new family of sidearms using 9-mm. ammunition was based on the small arms study of four alternatives (cost estimates in 1980 dollars):

--Continue using the present inventory of revolvers and pistols, replacing weapons only as needed; 20-year cost - $274.6 million. (See p. 4.)

--Standardize revolvers which use .38-caliber ammunition; 20-year cost - $265.1 million. (See p. 5.)

--Standardize the .45-caliber standard pistol; 20-year cost - $333.7 million. (See p. 5.)

--Buy a new, single family of sidearms which uses NATO standard 9-mm. ammunition; 20-year cost - $407.6 million. (See p. 5.)

The study group rejected alternatives 1, 2, and 3 because the .38-caliber revolvers and .45-caliber pistols in use did not offer all the features of the new 9-mm. pistols. However, most of the revolvers and pistols were serviceable and had met user needs for many years. Moreover, Army and Navy user representatives told us that the additional features offered by the new 9-mm. pistols were not essential to most of their units. The Air Force user representative told us the 9-mm. procurement specification did not provide for major improvements over current sidearms. In fact, these users told us that replacing present pistols and revolvers had a low priority. Only Marine Corps and Coast Guard users expressed a desire to obtain the new 9-mm. pistols.

Defense adopted alternative 4, not because of cost savings, but because of the additional features the 9-mm. pistol offered. The small arms study group stated that the 9-mm. pistol was more accurate than the .45-caliber pistol and more lethal than the .38-caliber revolver. Other advantages cited were improved effectiveness, reliability, safety, and operational suitability. The major disadvantage is that 417,000 .45-caliber pistols and 170,000 .38-caliber revolvers, most of which are in serviceable condition, would have to be retired.

The new 9-mm. pistol to be procured would use the NATO standard 9-mm. ammunition. Although this ammunition is more expensive than the ammunition now used, the study group expects that large-scale domestic production of NATO 9-mm. ammunition, which would be necessary if the services were to adopt it, will lower its cost.

Our inquiry into the feasibility of converting .45-caliber pistols to use 9-mm. ammunition showed this alternative to be

potentially a less costly means of switching to 9-mm. ammunition. At our request, an Air Force gunsmith substituted commercial 9-mm. parts for .45-caliber parts on a serviceable pistol. The conversion took less than 10 minutes, and we estimated the parts to cost $100. The modified pistol was test fired and was found to function safely and reliably. The malfunction rate was good, with only 7 malfunctions occurring in 2,000 rounds fired.

Since that test, the Army has received an unsolicited proposal from Colt Industries to make these conversions at $107 per pistol. Colt did not include refinishing or repairing the pistols at the time of the conversion.

Another contractor, Kart Sporting Arms Corp., had previously offered to convert .45-caliber pistols, but the Army rejected the offer. The contractor's offer included modifying .45-caliber parts to accept 9-mm. cartridges and replacing the barrels and magazines for about $70 per pistol. To demonstrate the feasibility of its approach, the contractor modified one pistol and test fired it satisfactorily. Kart's January 1982 estimate for conversion is $70 to $85 per pistol and does not include refinishing or repairing pistols.

## CONCLUSION

Considering the high cost of replacing the Defense inventory of sidearms, the low priority for new sidearms, the uncertainty regarding the cost of NATO certified 9-mm. ammunition, and the uncertain advantages the 9-mm. offers over the current large inventory of serviceable weapons, we believe a large-scale program to replace military sidearms is questionable.

Accordingly, our draft report proposed that the Secretary of Defense stop efforts for a large-scale procurement of 9-mm. pistols and continue using the present inventory of revolvers and pistols. That large-scale procurement started in June 1981 when the Army asked prospective contractors to submit proposals and candidate weapons for competitive evaluation.

Defense anticipated contract award in January 1982, for an initial quantity of about 217,000 pistols to be delivered over a 60-month period starting 90-days after contract award. However, on February 19, 1982, Defense advised us that it was canceling the proposed procurement and reexamining its requirements. Therefore, we are making no recommendations concerning that contract.

## RECOMMENDATION

With the cancellation of the proposed procurement, the urgency to award a contract by January 1982 is gone. Since

there are reasonable doubts about the costs and effectiveness of the new 9-mm. handgun program, we recommend that the Secretary of Defense reexamine the program. Such a reexamination should consider all cost-effective options that can meet valid military requirements. For example, if standardization on NATO 9-mm. ammunition remains the dominant requirement, it may be possible--over time--to convert existing .45 pistols, as they go through needed depot overhaul, to a 9-mm. configuration. Ultimately, those pistols that cannot be economically converted could be replaced with new 9-mm. pistols.

## AGENCY COMMENTS

Defense provided oral comments through designees it authorized to speak officially on this subject.

Defense did not agree with our originally proposed recommendation to stop plans for a large-scale procurement of 9-mm. pistols and continue using the present inventory of revolvers and pistols. Defense believed our proposal gave undue weight to the projected 9-mm. program costs which, it says, must be based on estimates. The Department intends to provide the Committee with a report on the current evaluation of candidate 9-mm. pistols and a life-cycle cost analysis of alternatives before entering a large-scale production contract for 9-mm. pistols. However, in light of Defense's recent decision to cancel the current procurement, we did not include our originally proposed recommendation in this report.

According to Defense, although it considered cost to be an important factor, it decided to initiate the 9-mm. pistol procurement primarily on the basis of the 9-mm.'s superior performance compared to the .38's and the .45's. Defense also said it disagreed with a statement in our draft report that the advantages of the 9-mm. pistol were marginal over the current inventory of handguns. According to Defense, after rigorously studying and considering all significant factors, the Army, Navy, and Air Force agreed with the standardization of a 9-mm. handgun. Defense believes we should give greater consideration to the joint services operational requirement for the 9-mm. pistol. We agree with Defense that our characterization of the 9-mm. pistol's advantages as being marginal may have been too strong, and we have revised the report accordingly.

Except for the conversion of the .45 to 9-mm., Defense told us that our report raises no issues that have not already been addressed by the Joint Services Small Arms Program. Defense rejected the conversion option because converted pistols would not comply with the joint services operational requirements.

Defense said its position could change if the results of the current evaluations indicate the 9-mm. is not significantly better than the .45 or if the price of the 9-mm. pistol is unreasonably high. However, it did not believe these events were likely. On February 19, 1982, the Army advised us it was canceling the proposed 9-mm. handgun procurement because the results of the evaluation of candidate 9-mm. pistols indicated that all the sample pistols failed. Defense said it is reexamining the program.

If the Defense inventory of handguns were zero, we would tend to agree with the adoption of a 9-mm. handgun standardization for all services and with our NATO allies. However, large quantities of handguns are in the inventory--the exact condition of all these weapons has not been determined. The joint service operational requirements, in our view, provide uncertain performance over the current .45 pistol. We question whether those requirements have been fully considered by Defense.

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As arranged with your Office, we are sending copies of this report to the Secretaries of Defense, Army, Navy, and Air Force, and to the Director, Office of Management and Budget. Copies will also be made available to other interested parties upon request.

Sincerely yours,

Charles A. Bowsher

Comptroller General
of the United States

# Contents

## INTRODUCTION

In response to a July 27, 1981, request from Congressman Richard C. White, Chairman, Subcommittee on Investigations, House Committee on Armed Services, we reviewed the Department of Defense's (DOD's) decision to replace its .45-caliber pistols and .38-caliber revolvers with 9-mm. pistols. Our examination included a review of the alternatives considered in making this decision and the feasibility of converting .45-caliber service pistols to use 9-mm. ammunition.

The Defense inventory of sidearms contains firearms intended for target shooting, law enforcement/security, combat, and survival. The bulk of the inventory consists of weapons in the latter three categories. These weapons are primarily service-standard, .45-caliber semiautomatic pistols and various nonstandard, .38-caliber revolvers, as shown below.

Combined Service Assets of
.45 and .38 Caliber Sidearms

| Sidearm | Serviceable | | Unserviceable | Totals |
|---|---|---|---|---|
| | Issued | In storage | in storage | |
| .45 pistol | 237,790 | 63,159 | 116,499 | 417,448 |
| .38 2" barrel | 10,925 | 13,216 | 9,209 | 33,350 |
| .38 3" barrel | 1,036 | - | 257 | 1,293 |
| .38 4" barrel | 95,307 | 8,247 | 34,532 | 138,086 |
| Total | 345,058 | 84,622 | 160,497 | 590,177 |

About 73 percent of the total sidearms inventory is in serviceable condition, and about 20 percent of the serviceable weapons are in storage. The M1911A1 series .45-caliber semiautomatic pistol makes up the largest portion of the inventory. This weapon, originally produced by the Colt Firearms Manufacturing Company, was adopted by the services in 1911 as their standard sidearm. The .38-caliber revolvers are not standard service sidearms. The revolver inventory includes about 24 separate stock numbers, each representing a slightly different .38-caliber revolver bought by the services using commerical specifications.

## OBJECTIVE, SCOPE, AND METHODOLOGY

Our objective was to assess the alternatives considered by the small arms study group before recommending that DOD buy new weapons. In addition to assessing the small arms study, we

explored the feasibility of converting .45 service pistols to 9-mm. caliber, an alternative not fully addressed by the study group.

To accomplish our objectives, we reviewed two separate Army cost analyses that projected the costs of the proposed procurement and analyzed the DOD inventory of handguns. In addition, we interviewed officials who assisted the small arms study group. We also interviewed user representatives from each of the services and users and small arms manufacturers in the private sector. A list of organizations contacted is provided in appendix II. (See p. 18.)

To determine the feasibility of converting .45 pistols to use 9-mm. ammunition, we solicited the aid of Air Force small arms maintenance personnel who converted a military pistol and then tested the converted weapon for safety and reliability. We also interviewed a small arms manufacturer who had converted a .45-caliber pistol to 9-mm. using different procedures.

We did not evaluate your proposed option of purchasing a smaller number of new 9-mm. pistols to slow down the decision to enter a large scale 9-mm. production contract, because our review indicates that the 9-mm. pistol program is questionable.

We performed our review in accordance with GAO's current "Standards for Audit of Governmental Organizations, Program Activities, and Functions."

## BACKGROUND

The .45 pistol has been in the DOD inventory for over 70 years and has been the services' standard issue sidearm for about as long. The Army, Navy, Marines, and Coast Guard issue .45 pistols as their primary personnel defense weapon and supplement these issues with speciality weapons for unique missions. These speciality weapons may be pistols or revolvers of any of the common calibers and may have special features, including silencers.

The Air Force is the only service that does not have substantial numbers of .45 pistols. Primarily, the Air Force uses the .38-caliber revolver, although the weapon has not been established as a service standard. The Air Force is by far the largest military user of .38 revolvers, but all of the services own some revolvers.

The services' inventory of .38 revolvers is a collection of several different makes and models. The Marine's inventory, for instance, contains four different models of 4-inch barrel

revolvers made by Smith and Wesson and one model made by Sturm Ruger and Company, Inc. The Marines also have another stock number for a 2-inch barrel revolver made by Smith and Wesson.

A lack of standardization and interchangeability of parts exists among revolver types mainly because the services use general purchasing specifications which can be met by several different makes and models of revolver available on the commercial market. If the services believed standardization and interchangeability of revolver parts were necessary and in the public interest, they could have authorized the use of negotiated procurement to buy specific makes and models.

The issue of sidearm and ammunition proliferation was raised by the House Committee on Appropriations in 1978 and addressed by its Surveys and Investigations staff in a 1979 report. This report showed that more than 25 different makes and models of sidearms and over 100 types of sidearm ammunition were in the U.S. military inventories. During 1979 hearings, the House Appropriations Committee again raised the issue of DOD sidearm and ammunition proliferation. The Committee suggested that DOD assess the possibility of standardizing its sidearms and sidearm ammunition to save money on logistics and maintenance costs and to reduce its requirement for numerous ammunition types.

In 1979 and 1980, DOD addressed the handgun ammunition proliferation issue by reviewing its inventories and eliminating about 70 ammunition stock numbers from the inventory (from about 101 to 31). The bulk of the remaining ammunition stock numbers is needed to support the services' .38-caliber revolvers, .45-caliber pistols, and .22-caliber training weapons. DOD addressed the handgun standarization question by directing a study group from the Joint Services Small Arms Program (JSSAP) to review prior studies of the issues, examine the current situations, consider alternatives, and recommend a course of action. The small arms study group was to

> "* * * determine the minimum number of types of handguns to meet essential service requirements and to determine if the United States should adopt the NATO standard 9-mm. handgun cartridge."

Guidelines for the study cited three areas of interest:

--Advantages and disadvantages of using a single family of handguns and ammunition.

--Selecting caliber from three choices--.38, .45, or 9-mm. NATO.

--Method of carrying out a handgun replacement program.

The study concluded that essential military requirements are best served by a single family of weapons using 9-mm. ammunition. Before recommending this approach, the study group considered four alternatives.

## ALTERNATIVES CONSIDERED

### Alternative 1

This alternative called for continued use of both revolvers and pistols, replacing weapons only as necessary. The .45-caliber pistol would remain the standard pistol, and no attempt would be made to standardize .38-caliber revolvers. Using 1980 dollars, the study group estimated that, for a 20-year period, DOD would be required to

--buy 30,000 new nonstandard .38-caliber revolvers at $90 each,

--buy 20,000 new .45-caliber pistols at $185 each,

--replace 10,000 condemned .45-caliber pistols at $190 each, and

--repair 100,000 unserviceable .45-caliber pistols at $60 each.

The study group estimated the total 20-year weapons cost at $14.3 million, and additional associated costs at $260.3 million, mostly for .38- and .45-caliber ammunition at 11 and 13 cents per cartridge, respectively. The total cost of alternative 1 was $274.6 million.

The study group rejected alternative 1 because it did not comply with the standardization direction because there would be no single caliber for all handguns. Additionally, the .38-caliber revolvers and .45-caliber pistols in use did not offer all the features of the new 9-mm. pistols. However, most of the revolvers and pistols were servicable and had met user needs for years.

### Alternative 2

This alternative called for replacing all .45-caliber pistols with .38-caliber revolvers. Using 1980 dollars, the study group estimated that, for a 20-year period, DOD would be required to buy 664,000 standard .38-caliber revolvers at $59.7 million. The study group estimated additional associated costs

at $205.4 millon, mostly for ammunition at 11 cents per cartridge. The total cost of alternative 2 was $265.1 million.

The study group rejected alternative 2 because it would require standardization on the least desirable weapon in the current sidearms inventory. The marginal lethality of the .38 revolver, using military ammunition, was the major shortcoming cited in the study.

Alternative 3

This alternative called for replacing all revolvers with .45-caliber pistols. The study group estimated that, for a 20-year period, DOD would be required to buy 200,000 new .45-caliber pistols and repair about 100,000 pistols. The total weapons cost under this alternative was estimated at $45.8 million. The study estimated additional associated costs at $287.9 million, mostly for ammunition at 13 cents per cartridge. The total cost of alternative 3 was $333.7 million.

The study group rejected alternative 3 because it would require standardization on a weapon which was designed with century-old technology. Additionally, some consider the .45-caliber pistol to be bulky, heavy, and difficult to shoot.

Alternative 4

This alternative called for replacing all .38-caliber revolvers and .45-caliber pistols with new sidearms which use NATO standard 9-mm. ammunition. The study group estimated that, for a 20-year period, DOD would be required to buy 643,000 9-mm. pistols at $180 each. The total weapons cost under this alternative was estimated at $115.8 million. The study group estimated additional associated costs at $291.8 million mostly for 9-mm. ammunition at 12.6 cents per cartridge. The total estimated cost of alternative 4 was $407.6 million, making it the most expensive alternative.

STUDY GROUP PICKS MOST EXPENSIVE ALTERNATIVE

The study group recommended adopting alternative 4, not because of cost savings, but because of the performance gains the 9-mm. pistol offered. The group pointed out that the 9-mm. pistol was more accurate than the .45-caliber pistol and more lethal than the .38-caliber revolver. The study group also highlighted other advantages of the new 9-mm. pistol, including improved effectiveness, reliability, safety, and operational suitability. Also, the new pistol would use the NATO standard 9-mm. ammunition.

The study showed NATO 9-mm. ammunition to be more expensive than the ammunition now used, but the study group expected that large-scale domestic production of NATO 9-mm. ammunition, which would be necessary if the services were to adopt it, would lower its cost. These cost estimates are very tentative, however, because there is no U.S. production of NATO standard 9-mm. ammunition. In fact, only four NATO countries, we were told, currently produce certified NATO 9-mm. ammunition.

In evaluating the total cost estimates for alternative 4, we found that the initial calculations did not include all 9-mm. program costs. Additional costs for ammunition development and ancillary equipment will be necessary. Ancillary equipment--holsters and magazine pouches--is estimated to cost $30 per weapon. Army research and development officials assured us that an accurate estimate of program costs, including ammunition development and purchase cost, would be developed before a contract was awarded to purchase new pistols.

In summary, the study group selected alternative 4 because the new 9-mm. pistol had advantages over the current weapons. The major disadvantages of this alternative are its high cost and the need to retire about 417,000 .45-caliber pistols and 170,000 .38-caliber revolvers, most of which were in serviceable condition.

## ADVANTAGES OF THE 9-mm. PISTOL ARE UNCERTAIN

We reviewed the stated advantages of the 9-mm. pistol and discussed them with designated user representatives. We found that the stated advantages were not always clearly identified nor was there universal agreement on their value.

### Views of user representatives

Army and Navy user representatives said they had no need to replace their current weapons with the proposed 9-mm. pistol and the additional features of the new 9-mm. pistols were not essential to most of their units, but in the interest of unity, they supported the program. The Air Force said that the new 9-mm. pistols were not a high priority and the procurement specification did not provide for major improvements over current sidearms. Marine Corps and Coast Guard user representatives wanted to obtain the new 9-mm. pistols because, they said, they needed the new pistols to replace their .45 pistols, which cannot be repaired because of parts shortages. They also wanted some of the additional features, including increased ammunition capacity and added safety features.

## Improved effectiveness

The measurements of effectiveness considered in the small arms study were range, accuracy, volume of fire, lethality, and lethality against body armor. The recommendation to adopt the 9-mm. was based on a comparison of the pistol's effectiveness with that of the .45 pistol and the .38 revolver.

### Range and accuracy

The approved joint services operational requirements (JSOR) documents, which came out of the small arms study, specify an accuracy range of 50 yards. The 9-mm. is capable of this range, as are the .45 pistol and the .38 revolver; however, the .45 has fixed sights set for accuracy at only 25 yards. Consequently, since its adoption by the services in 1911, the .45 pistol has always been tested for accuracy at 25 yards. The most recent Air Force tests, however, fired the .45 pistol for accuracy at 50 yards. At that range, the .45 was determined to have unacceptable accuracy. The 9-mm. and .38 revolver were found accurate at 50 yards.

The reason for increased range as an operational requirement of the 9-mm. pistol is not clearly identified. Users told us they had not identified the most probable combat engagement range, but would prefer to engage an enemy at the greatest possible range. While the small arms study did not identify combat engagement ranges, the most frequent law enforcement engagement range is about 7 meters, or 21 feet. In testimony before the Investigations Subcommittee on July 27, 1981, an Army spokesman said that most handgun engagements occurred within about 20 feet. On the basis of this data, we believe the 50-yard requirement used to justify the 9-mm. could be questioned.

### Volume of fire

The effectiveness attributed to the 9-mm. volume of fire is directly related to its increased magazine capacity. The .45 has a 7-round capacity; the .38 a 6-round capacity. The operational requirement of the 9-mm. is for a minimum capacity of 10 rounds, and a 15-round capacity is considered desirable. The increased ammunition capacity permits more hits on a target before the weapon must be reloaded.

Users told us they preferred the increased capacity because it allows them to carry more ammunition into situations where it might be needed. The Air Force requested the 15-round magazine capacity because it can carry more than twice as much ammunition as can be carried in existing .38 revolvers. User

preference alone for increased capacity, we believe, would not necessarily justify making it an essential requirement without further demonstrated need.

Lethality and lethality against body armor

The final measurements of effectiveness involved general lethality and lethality against body armor. The operational requirement is lethality greater than that of the .45 pistol or the .38 revolver. Army studies made in 1953 on .45-caliber and 9-mm. pistols addressed lethality and penetration. These studies concluded that the 9-mm. bullet had only about 75 percent of the lethality (defined as stopping power) of a .45-caliber bullet, but would penetrate 5-1/2 inches of test material, compared to 3 inches for the .45-caliber bullet. The study also concluded that the 9-mm. was an acceptable military caliber and recommended adopting a pistol similar to the standard pistol, except in 9-mm. and weighing about 11 ounces less.

The current small arms study concluded that the 9-mm. was more lethal than the .45 or .38. It cited as its support a report produced by the Army's Ballistics Research Laboratory on methods of evaluating relative stopping power and results of various sidearms ammunition. This ballistics report used several factors for determining the Relative Incapacitation Index (RII) of 9-mm., .38-, and .45-caliber ammunition. The data used to produce the frequently quoted "fact" that the 9-mm. is 1.6 times more lethal than the .45-caliber bullet is included in this report. However, as the author of the report pointed out, this "fact" could be misunderstood by anyone not familiar with the entire report.

The relative lethality of standard 9-mm. and .45-caliber ammunition cited in tables 32 and 79 of the ballistics study were 8 and 5, respectively. The 9-mm. bullet's RII of 8 is 1.61 times greater than the .45's RII of 5, but both are extremely low when compared to these calibers' potential for RIIs approaching 100, the point at which immediate incapacitation is almost certain. Also, both RIIs produce essentially the same probability of incapacitation; that is, they render an enemy immediately incapable of posing a threat. The probability of incapacitation for both bullets was 3 out of 10 shots.

The author also pointed out that any increased accuracy obtained from the 9-mm. pistols could increase the RII for 9-mm. ammunition. The report is based on hit probabilities of .45-caliber pistols fired at a range of 6 meters by average shooters under stress. Average shooters under stress frequently miss vital organs at this range and occasionally miss a life-size target. These low damage hits or misses, in part, account for the low incapacitation findings.

We discussed this and other report findings with the author, who agreed with our analysis of the report. Also, the author still agrees with the statement contained in the report: "Within the caliber range tested [9mm, .38 and .45 caliber] the stopping power increases with caliber, that is the .45 caliber ranks highest." (Underscoring supplied.)

Concerning lethality against body armor, the small arms study pointed out that special anti-body armor rounds of tubular design are being developed and tested in both 9-mm. and .45 caliber. Both show promise. Currently, standard .45-caliber ball ammunition will not penetrate some protective vests; however, we were told that NATO standard 9-mm. ammunition will penetrate these vests.

On the basis of lethality data, we do not believe a clear-cut case can be made for favoring one caliber over another. Also, significant improvement can be made in either ammunition.

Operational suitability

The small arms study defined operational suitability as a set of handgun criteria, including ambidextrous operation, utility by females, signature reduction feasibility (silencing feature), and portability. The study states that neither the .45 pistol nor the .38 revolver fully meets these criteria and defines a new handgun that would meet user needs. The study defined a double action, ambidextrous, 9-mm. semiautomatic pistol as providing the following advantages:

--Ambidextrous operation; allows both left- and right-handed shooters equal ease of training and provides a person with an injured arm or hand the option to use the weapon easily with the opposite hand.

--Reduced weight and bulk; significant in cramped cockpits and when carrying the normal load of military equipment.

--Acceptability by female users.

--Silencing feature.

As the following sections illustrate, these advantages are, to some extent, available with current sidearms.

Ambidextrous operation

A handgun characteristic desired by the JSOR was ambidextrous operation. Although the .45 pistol, designed for military use, was designed with its operating mechanisms convenient to right-handed shooters, it can also be operated by left-handed shooters. The .38 revolver, not designed specifically for military use, is easy to shoot with either hand, although it was also designed for the convenience of a right-handed operator. The 9-mm. will be convenient for left- or right-hand operation, but as with the other weapons, will require both hands to load and make ready to fire.

The requirement for ambidextrous features, we believe, will satisfy a small portion of the user requirement, but complete one hand operation will not be achieved.

Reduced weight and bulk

Another characteristic desired by the JSOR is reduced weapon weight and bulk. Weight differentials between sidearms generally are expressed in fractions of a pound. For instance, a loaded .45 pistol weighs about 2.7 pounds, a loaded .38-caliber revolver about 2.1 pounds, and a 9-mm. pistol about 2.2 pounds, according to the small arms study. The 9-mm. procurement specification, however, calls for a pistol weighing no more than 2.77 pounds fully loaded--about the same as the .45 pistol. If the 9-mm. will not weigh significantly less, it is doubtful that the 9-mm. is a good candidate to replace the lightweight .38 revolver. The excessive weight of the .45 pistol was, according to the Army's 1953 studies, the driving force in considering lightweight .38 revolvers for special purposes, such as for use by aircrews.

Since many of the proposed new weapon's physical characteristics are based on those of the .45 pistol, without a substantial reduction in weapon weight the 9-mm. does not appear to offer significantly improved operational suitability.

Female user considerations

Weapon weight, bulk, and caliber are relatively important to female users. Caliber choice seems to be the most important female user requirement, based on Army Human Engineering Laboratory tests. These tests showed that, in a test group, females achieved the highest hit probabilities with the .38 revolver, the next highest with a 9-mm. pistol, and the lowest with a .45 pistol. The 9-mm. pistol used in the test was a commercially available pistol with physical characteristics identical to the military .45 pistol. Therefore, the test showed that hit probability is more a function of caliber than of physical

characteristics. However, female users achieved the highest hit probabilities with the current .38 revolvers. If hit probability for the female user group is a high priority, then the current revolvers now issued to most women adequately meet the need.

Silencing feature

The JSOR's stated need for a silencing feature in a handgun also was not well defined. Concerning silencing, the small arms study states:

> "This is an important characteristic in some types of missions for obvious reasons. Silencing is particularly advantageous in a survival weapon. The revolver is the least amenable to silencing because of the inherent gap between the cylinder and the rear barrel face. The 9-mm. pistol is potentially quieter than the .45 because of its smaller projectile and better aerodynamic shape." (Underscoring supplied.)

Although the study considered silencing important, user representatives we interviewed neither considered this characteristic essential nor knew of a significant unfilled requirement for this feature. The June 1981 procurement specification does not mention the silencing feature as either a design or evaluation parameter for a new 9-mm. pistol.

Reliability

The semiautomatic pistol is considered the more reliable choice between pistols and revolvers for military use because it is inherently easier to maintain and more reliable when exposed to battlefield conditions. According to the small arms study, the most dominant factor in pistol reliability is ammunition performance, followed closely by magazine reliability.

Since both the 9-mm. and .45 pistols are semiautomatic, it would appear that the most important factor for reliability would be the performance of the ammunition and the magazine. Consequently, since both pistols are semiautomatic, there is not a clear-cut advantage between them.

Safety

Safety is important in the design and operation of any weapon. Some safety features are built into the weapons, such as thumb safety, grip safety, and firing pin block. But safety also depends on how the weapon is used, such as whether the magazine is removed before the gun is cleared. No firearm is

absolutely safe, and any attempt to design an absolutely safe weapon could result in a relatively inert weapon.

The current military .45 pistol was developed through the joint efforts of the manufacturers and the Army and was designed with several safety devices, including a thumb safety, grip safety, disconnector, and one-half cock. Army tests of the .45 pistols and other handguns in 1953 determined that, "All weapons were considered to have dependable and adequate safety devices." This determination was made after the military had used the .45 for more than 40 years.

In defining new 9-mm. pistol requirements, the JSOR required that the pistol incorporate two additional safety features:

--The design must permit the user to completely load, unload, and clear the weapon without activating the trigger.

--The design must permit the user to lower the hammer from a cocked position to an uncocked position without activating the trigger, while at the same time, insuring that a chambered round will not fire.

These features are considered as "absolute" requirements in the proposed handgun. We discussed these requirements with the services' user representatives to determine whether there were safety-related problems unique to the .45 pistol and to determine the basis for the new requirements.

The user representatives we interviewed expressed the desire for additional safety devices on a military handgun. Most could relate stories about accidental firings of the .45 pistol, but they did not know why these incidents had occurred or how frequently they occur.

Most of the incidents of accidental firings occurred while the weapon was being unloaded. The problem, as explained to us, is that when the .45 pistol is unloaded, the slide is pulled to the rear, the chamber is checked, the slide is released, and the trigger is pulled to lower the hammer. The magazine is to be removed before the unloading or clearing process is performed. If a loaded magazine is in the pistol when it is cleared, a cartridge will be chambered, resulting in a fully armed weapon which will fire if the trigger is pulled. Removing the magazine before unloading and checking a weapon is the operator's responsibility.

The proposed 9-mm. pistol would require the same unloading procedure. There is a difference, however, in the method for

lowering the pistol's hammer. The .45 pistol's hammer is normally lowered by pulling the trigger and letting it drop. The proposed pistol will have a feature that allows the operator to lower the hammer on a cartridge without activating the trigger or firing pin. The obvious advantage of this feature is that, if a cartridge is accidentally loaded into the weapon, the hammer will not fire it. The disadvantage of this feature is that operators may not know their pistols are loaded.

Undoubtedly, some degree of safety can be built into the weapon and enhanced through operational procedures. Built-in features, however, should not deter the weapon from performing its primary function. Furthermore, safety procedures are only as effective as the user makes them. In a hostile environment, weapon safety devices and operational procedures will probably yield to the serviceman's desire to have his personal defense weapon ready to fire.

Ammunition

The Air Force did not test ammunition performance because it could not obtain NATO 9-mm. ammunition. Instead, the air Force used commercial 9-mm. ammunition. We were told that current commercial 9-mm. ammunition produced in the United States does not meet NATO standards and that a development program will be required. However, no problems are anticipated in developing satisfactory domestic sources for NATO-qualified 9-mm. ammunition. The United States, we were told, will be only the fifth NATO country to produce NATO-qualified 9-mm. ammunition.

Parts shortages

While the .45 pistol is considered reliable and easy to maintain, parts shortages have repeatedly hampered maintenance of these weapons. Both the Marine Corps and Coast Guard representatives advised us of this problem. The Coast Guard reported delays as long as 3 years in receiving some parts.

These parts shortages are related to procurement problems, not to weapons problems. For several years, the slides and barrels for .45 pistols have been purchased from several small businesses which have not performed well. As of November 1981 the Army had 31,115 slides on order from a new contractor because the prior contractor defaulted on delivery of about 28,000 slides on two contracts. About 73,000 barrels are on order, but only about 3,900 have been delivered. Deliveries are now past due, even though contracts have been repeatedly modified to extend delivery dates.

Colt Industries, in response to Army procurement requests, offered to supply commercial quality slides but said it was

unable to supply these parts to meet Army specifications. Colt told Army procurement officials that the technical data package for the .45 pistol is out-of-date and offered to update the package to current manufacturing processes and standards. The Army has not yet acted on that offer.

CALIBER CONVERSION FOR THE .45 PISTOL

The .45 pistol is an adaptable weapon. It has been chambered to use .22-, .38-, 9-mm., or .45-caliber ammunition without changing its basic operation or physical characteristics. Several manufacturers, including the original manufacturers, make either conversion kits or pistol parts that can be interchanged with standard pistol parts. All caliber conversions, we found, require only parts replacement and cost less than would buying a new pistol.

DOD's inventory data shows that the services have over 300,000 serviceable and 116,000 unserviceable .45 pistols. Repairable pistols are rebuilt and parts are replaced at the depot. Of the unserviceable assets, only a small number--2 to 3 percent--would be damaged beyond repair based on past overhaul programs. About 25 percent of the pistols require replacement of barrels and slides. The present Army depot overhaul cost for pistols is $63 each for parts, labor, and overhaul.

We found that replacing seven parts, including the barrel and slide, produces a functional, reliable 9-mm. pistol. An Air Force gunsmith, at our request, substituted commercial 9-mm. parts for .45-caliber parts on a serviceable M1911 service pistol. The conversion took less than 10 minutes and, we estimated the parts to cost $100. The gunsmith then test fired the converted pistol and found it to be safe and reliable. The malfunction rate was good, with only 7 malfunctions occuring in 2,000 rounds fired.

Since that test, the Army has received an unsolicited proposal from Colt Industries to make these conversions at $107 per pistol. Colt did not include refinishing or repairing the pistols at the time of conversion.

Another contractor, Kart Sporting Arms Corp., had previously offered to convert .45-caliber pistols, but the Army rejected the offer. The contractor's offer included modifying .45-caliber parts and replacing the barrel and magazine for about $70 per pistol. To demonstrate the feasibility of its approach, the contractor modified one pistol and test fired it satisfactorily. Kart's January 1982 estimate for conversion is $70 to $85 per pistol and does not include refinishing or repairing the pistols.

## DOD COMMENTS AND OUR EVALUATION

On December 18, 1981, we provided a draft of this report to DOD for comment. DOD did not prepare formal written comments within the 30 days stipulated by Public Law 96-226 because it had not received written comments from the services. However, DOD provided oral comments through designees it authorized to speak officially on this subject. The substance of those January 18, 1982, comments and our evaluation are as follows.

### DOD comment

DOD told us that we may not have talked to knowledgeable people in obtaining the statements that the user representatives did not need or want a new 9-mm. pistol.

### GAO evaluation

The military user representatives we interviewed during this review were those persons officially designated by the GAO/DOD liaison officer as the official military service user representatives. At each interview, we confirmed this fact with the people we talked to. In each case, they said they were indeed the user representatives and were authorized to speak on 9-mm. program issues.

### DOD comment

DOD told us it questioned whether any conclusion should be drawn from our converting a single .45 pistol to 9-mm.

### GAO evaluation

Our only purpose in converting a .45 to 9-mm. was to demonstrate the feasibility of this option, and we found it is feasible. We are not advocating that any pistols be converted, but this is an option if the use of 9-mm. ammunition is the most important DOD requirement.

### DOD comment

DOD mentioned that the .45 pistol uses out-of-date technology that was available in the late 1800s and early 1900s.

### GAO evaluation

DOD did not tell us of or offer any evidence of a technological breakthrough or quantum jump forward in the

state-of-the-art for firearms technology. It is our understanding that the 9-mm. pistol dates back to the early 1930s.

DOD comment

DOD said that safety is a very important factor and there is no safe way to remove a chambered round from a .45. DOD said that, under certain conditions, a .45 will fire if dropped on its muzzle. DOD used the example of brightly painted orange sand barrels outside of mess halls as proof the .45s are unsafe. A .45 pistol is unloaded, pointed into the barrel of sand, and the trigger is pulled to be sure the weapon is safe. They said the many bullet holes in those sand barrels is proof that the .45 is unsafe.

GAO evaluation

The correct procedure for unloading a .45 is to first remove the magazine and operate the slide to make sure a live round is not in the chamber. If a round is in the chamber it can be ejected without firing by operating the slide. We are not aware of any DOD or military study that finds the .45 to be an unsafe weapon. It would appear that if the .45 was an unsafe weapon it would not have remained the standard military sidearm for the last 70 years.

DOD comment

DOD said that safety is even more critical today because of the declining intellectual quality of the average member of the all-volunteer force.

GAO evaluation

It would seem more appropriate to correct any intellectual deficiencies through recruit screening or improved training rather than procurement of a new weapon. Because the .45 has been the standard for 70 years, training programs on that weapon should be well tested and proven.

DOD comment

DOD said we were not objective in our use of quoted material from a ballistics report 1/ which indicates that

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1/Ammunition for Law Enforcement: Part I, Methodology for Evaluating Relative Stopping Power and Results, by William J. Bruchey, Jr., October 1979, U.S. Army Armament Research and Development Command, Ballistics Research Laboratory, Aberdeen Proving Ground, Maryland.

stopping power increases with caliber and the .45 ranked highest. DOD believes the statement was taken out of context and is only true when all other factors (mass, geometry, and velocity) are equal.

GAO evaluation

We discussed this point with the author and advised him how we intended to use the quotation. He did not disagree with the meaning of the quoted material. There are other sections of the same report that also stated that the .45 is ranked highest in stopping power. The basic thrust of the study was to point out the potential for improvements that could be achieved through research and development on bullets. The report recommends the development of a .45 caliber revolver for law enforcement officers.

Recent news items have also disclosed advances in the design of bullets. One such example is the teflon-coated bullet. According to literature printed by the manufacturer, a teflon-coated bullet, fired from a .357 magnum, can pierce 1-3/4 inches of cold-rolled steel.

If stopping power needs to be increased, DOD can explore improvements in the bullets rather than buying a new pistol.

DOD comment

DOD said it must have a 9-mm. pistol because it has not been following and must follow Public Law 94-361, which requires standardization.

GAO evaluation

Public Law 94-361 authorized Defense appropriations for fiscal year 1977. The pertinent section is as follows:

> "(a)(1) It is the policy of the United States that equipment procured for use of personnel of the Armed Forces of the United States stationed in Europe under the terms of the North Atlantic Treaty should be standarized or at least interoperable with equipment of other members of the North Atlantic Treaty Organization. * * *"

The policy also requires DOD to consider the cost, functions, quality, and availability of the equipment to be procured. Public Law 94-361 is a statement of policy; it is not a mandate to retire satisfactory weapons and procure new standardized weapons.

## ORGANIZATIONS CONTACTED DURING OUR REVIEW

### DEPARTMENT OF DEFENSE

#### Research and development sites

Small Arms Program Support Office, U.S. Army Armament Research and Development Command, Dover, New Jersey
Human Engineering Laboratory, Aberdeen Proving Grounds, Maryland
Ballistics Research Laboratory, Aberdeen Proving Grounds, Maryland
Test and Evaluation Command, Aberdeen Proving Grounds, Maryland

#### Procurement site

U.S. Army Armament Material Readiness Command, Rock Island, Illinois

#### Inventory and repair site

U.S. Army Armament Material Readiness Command, Rock Island, Illinois
Anniston Army Depot, Anniston, Alabama
Lackland Air Force Base, San Antonio, Texas
Warner Robins Air Logistics Center, Robins Air Force Base, Georgia
Marine Corps Logistics Base, Albany, Georgia
Naval Rework Facility, Crane, Indiana

#### User representative sites

U.S. Army Training and Doctrine Command, Fort Monroe, Virginia
Marine Corps Headquarters, Washington, D.C.
U.S. Coast Guard Headquarters, Washington, D.C.
Naval Sea Systems Command, Washington, D.C.
U.S. Air Force Headquarters, Washington, D.C.
Air Training Command, Randolph Air Force Base, Texas
Strategic Air Command Headquarters, Offutt Air Force, Nebraska
149th Tactical Fighter Group, Texas Air National Guard

### SMALL ARMS INDUSTRY

Sporting Arms and Ammunition Manufacturers' Institute, Inc., Wallingford, Connecticut
Smith and Wesson, Springfield, Massachusetts
Colt Industries, Hartford, Connecticut
Kart Sporting Arms Corp., Riverhead, New York

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