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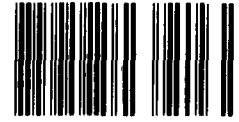
UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

NATIONAL SECURITY AND
INTERNATIONAL AFFAIRS DIVISION

FEBRUARY 14, 1984

B-213544

The Honorable Warren B. Rudman
United States Senate



123379

Subject: Department of the Army's Competitive Test and
Evaluation of Alternative Light Antiarmor
Weapons (GAO/NSIAD-84-57)

Dear Senator Rudman:

We have reviewed the Army's competitive test and evaluation of alternative light antiarmor weapons (LAWS) as requested in your letter of February 16, 1983. The test began on April 5, 1983, and was completed on July 27, 1983. Six types of LAWS were tested.

After evaluating the test results and the price proposals provided by the weapon system's contractors, the Army, on September 28, 1983, informed the Congress that it had selected a weapon developed in Sweden, the AT-4, for further testing. The Marine Corps, which is also seeking a light antiarmor weapon, chose the same weapon. The Army also submitted a report to the Congress containing the detailed test results.

We (1) were on site throughout the full test cycle observing the tests, (2) verified the recorded test results, and (3) reviewed the source selection data that the Army and Marine Corps used to select the winner. In our opinion, the test and evaluation were conducted objectively and the report provided to the Congress accurately reflected the test results.

In selecting the AT-4 as the winner, the Army and Marine Corps have committed themselves only to further test the weapon, but not necessarily to procure it. They plan to perform a limited test of 36 AT-4s, including 24 to be modified for deficiencies revealed in the portability test, before proceeding with a development and operational test of 1,000 rounds. The Army does not consider corrections of the deficiencies to be complex and estimates the modified AT-4s will be delivered for testing by the end of February 1984.

Our evaluation of the test is presented in the enclosure. On December 27, 1983, we requested the Department of Defense to comment on this report. The Department has not yet responded and, accordingly, we are issuing the report without comments. If the comments, when received, raise any significant issues that we have not considered in this report, we shall bring them to your attention.

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We have prepared a more detailed account of the tests which we have submitted to the Department of Defense for the purpose of identifying any material that may be competitive sensitive. As soon as the Department's review is completed, we will send it to you.

In your letter you expressed concern that the weapon chosen, though meeting the 1975 required operational capability, might still be inadequate as an antiarmor weapon against the current threat. A week before announcing its selection of the AT-4 the Army dropped its long-standing requirement for a light, portable antiarmor weapon. Instead, it will rely on its medium- and long-range antiarmor weapons, such as TOW and DRAGON, to kill tanks frontally.

On October 11, 1983, the Army started action to terminate its procurement of Viper. The Army now plans a product improvement of its M72A3 which up to now has been its basic light antiarmor weapon but, as expected, could not meet the test requirements. The M72A3 will now be referred to as a multipurpose weapon to be used against a variety of targets, including the more easily penetrable sides and rear of tanks. The Army will evaluate the AT-4's potential as an eventual replacement for the M72A3. It appears that initial procurement of the AT-4 may be for the Marine Corps which has said that, although the weapon does not meet its kill probability requirement, it is still the best light antiarmor weapon available.

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As arranged with your office, we are distributing copies of this report today to the Chairmen of the Armed Services and Appropriations Committees, the Secretary of Defense, the Secretary of the Army, and other interested parties.

Sincerely yours,



Frank C. Conahan
Director

Enclosure

DEPARTMENT OF THE ARMY'S
COMPETITIVE TEST AND EVALUATION
OF ALTERNATIVE LIGHT ANTIARMOR WEAPONS

BACKGROUND

Light antiarmor weapons (LAWs) are referred to as "last ditch" weapons. They are used primarily against armored vehicles by the infantry when they are being overrun. The weapons are fired from the shoulder. LAWs are part of the family of antiarmor weapons, the heavier ones being referred to as "medium" (such as the Dragon) and "heavy" (such as the TOW). LAWs are the lowest cost antiarmor weapon and are expected to be effective out to approximately 300 meters. The heavier antiarmor weapons require a crew to transport them, and their range and lethality are greater than those of the light antiarmor weapons.

In 1975, the Army began developing its newest LAW, the Viper, to replace the M72 LAW series,¹ a weapon which did not measure up to its requirements. The M72 LAW has a low probability of hitting a tank and, when it does, a low probability of disabling it. The total contemplated Viper program called for buying about 1 million rounds over 7 years.

From 1975 to 1981, the Viper design-to-cost estimate had risen from \$78 to \$793 a unit. When Viper entered production in 1981, its total estimated program cost exceeded \$1 billion.

In testing before production, VIPER did not demonstrate any significant superiority over the M72 LAW, particularly against later versions of Soviet tanks. In a July 1981 classified report² to the Secretary of Defense, we concluded that the marginal improvement in effectiveness the Viper showed in development and operational testing warranted a decision not to produce it. We recommended that the Army, instead, consider developing an improved version of Viper and test available European systems that might better meet the Army's requirements.

The Army did not agree and awarded a \$14.4 million production contract to General Dynamics in December 1981 for 1,400 Viper rounds. In December 1981, the Congress directed the Army to test other available LAWs, both foreign and domestic,

¹The M72 has been modified several times, and the Army's inventory now includes the M72A1, M72A2, and M72A3.

²"Concerns About the Army's Light Antitank Weapon" (GAO/C-MASAD-81-19, July 28, 1981).

and report the results to it by September 30, 1983. The Congress also directed that the testing address the needs of all services and that the Office of the Secretary of Defense involve itself in the evaluation.

Still, in February 1982, the Army exercised its first option under the General Dynamics contract for 60,000 additional Viper rounds at a cost of \$87.3 million. However, on October 11, 1983, the Army started action to terminate the General Dynamics contract. This action came after the Army suddenly dropped its long-standing requirement for a LAW, 1 week before announcing its selection of AT-4 as winner of the competitive test. The Army had accepted 96 Vipers for first article testing before deliveries were halted.

Responding to the congressional direction for testing, the Army and Marine Corps consolidated their minimum acceptable performance requirements for a LAW. The primary difference in their requirements had been in weight. The Army's maximum weight requirement was 9 pounds, but the Marine Corps was willing to consider heavier foreign LAWs weighing as much as 20 pounds. For purposes of the test, the two services agreed on the following minimum acceptable performance requirements:

- a total system weight of 20 pounds or less,
- a carrying length of 40 inches or less,
- a capability to penetrate 14 inches or more of armor plate,
- accuracy within 0.5 meters of the target's center when fired from a distance of 250 meters, and
- an ability to hit the target within 1.25 seconds after being fired.

The test's performance requirements differed, in some cases, from the Army's requirements for a light antiarmor weapon. The Army said this paved the way for a greater number of weapons to compete.

The Army was assigned lead service responsibility and issued a solicitation in September 1982 for 12 inert systems (systems that do not contain materials that can explode), 70 live systems, and an additional 15 warhead subassemblies per candidate to be used in the tests. In addition to providing the test hardware, the competitors were required to provide fixed-price options for the 1,000-round test to follow, for a technical data package, and for varying quantities of production rounds for each of 3 years beginning in fiscal year 1985.

Four foreign companies and one American company responded to the solicitation. However, one of the foreign companies, Armbrust (West Germany), could not deliver its system by April 1, 1983, the required delivery date. It was, therefore, disqualified. The systems submitted for the testing were the M72-750 (Norway), the Viper Variant (United States), the AT-4 (Sweden), and the LAW 80 (United Kingdom). The Army decided to include in the test, as baseline systems, two LAWS currently in its inventory, the M72A3 and the Viper, in order to have a frame of reference against which to compare the capabilities of all the systems. The ground rules provided that the Army and Marine Corps could each select the same or different LAWS to enter the next phase, the 1,000-round test.

The testing began on April 5, 1983, and was completed on July 27, 1983. At the time of the tests, none of the systems other than the M72A3 LAW had been rated safe for firing by soldiers. Therefore, they were fired from a test stand by remote control.³ In the more extensive test of 1,000 rounds, some rounds will be fired from the shoulder once the system has been rated safe.

OBJECTIVES, SCOPE, AND METHODOLOGY

Our objectives were to determine whether the Army's conduct of the test, and subsequent evaluation, were fair and whether the results were accurately reported to the Congress.

From the start, we were continuously in touch with the Army's principal participants in the test and evaluation. They included the Army Materiel Systems Analysis Activity of the Development and Readiness Command; the Test and Evaluation Command; the Missile Command; and representatives of the Office of the Deputy Chief of Staff for Research, Development and Acquisition.

We reviewed and discussed the joint coordinated test plan and the detailed test plan with responsible officials. We observed over 86 percent of the 403 rounds fired at the Aberdeen Proving Ground, 75 percent of the 24 warheads tested for penetration by the Ballistic Research Laboratory, and all 66 warheads tested for penetration at the Jefferson Proving Ground. The events we observed were those assigned the greatest weight in the Army's selection criteria. As the tests proceeded, we collected a significant amount of raw test data that we later compared with the test data reported to the Congress and which the Army used in its evaluation. In addition, we reviewed the procedures and models used to convert the raw test data to the form used by the source selection evaluation board.

³The Viper had been rated safe before procurement began but this rating was withdrawn following a mishap during a test firing of an initial production round in January 1983.

Although we requested the Department of Defense to comment on this report, the Department has not responded.

Our review was made in accordance with generally accepted government auditing standards.

TYPES OF TESTING

The types of tests, the number of times each weapon was tested in each category, and the conditions under which they were tested are shown below.

<u>Test</u>	<u>Number of test items for each weapon</u>	<u>Test conditions</u>
Penetration	15 warheads	Four warheads were tested at Aberdeen Proving Ground, Maryland, by the Ballistic Research Laboratory. The others were tested at Jefferson Proving Ground, Indiana. Depth of penetration was measured after firing into a stack of armor plate.
Precision accuracy	28 rounds	Twenty rounds were fired at ambient temperatures, 4 at hot temperatures, and 4 at cold temperatures (note a). Impact points, air temperature, humidity, wind direction and speed, rocket velocity, and noise levels were all recorded.
Recoil/minimum	6 rounds	Two rounds were each fired at ambient, hot, and cold temperatures. Arming distance tested was the distance claimed by each contractor to be safe in terms of minimum meters the round would travel to a target before it would explode.

^aAmbient temperature was 70 degrees Fahrenheit, plus or minus 10 degrees. Hot temperatures were either 140 or 125 degrees Fahrenheit. Cold temperatures were -40 or -25 degrees Fahrenheit. The temperatures used were closest to the temperatures that the contractors claimed were safe for firing their respective weapons.

High obliquity fuze function/behind armor effects (note b)	5 rounds	One round was fired at 70 degrees of obliquity. Two each were fired at 65 and 0 degrees of obliquity. Temperature and pressure measurements over time were recorded on all of the 0- and 65-degree obliquity shots.
Environment	27 rounds	Three rounds were immersed in water, and 24 were subjected to unrestrained vibration and handling drops at ambient, hot, and cold temperatures. All rounds were fired after the test.
Safety qualifications	2 rounds	Testing was performed merely to gain confidence in the safety of the weapon. The results were not scored.
Portability	12 inert rounds	Soldiers and marines were timed and evaluated while carrying the weapons over the obstacle course representing combat conditions.

b"High obliquity fuze function" test was to determine whether the round exploded when grazing the target at various angles rather than hitting the target head on at 90 degrees. "Behind armor effects" test was to observe the effects of temperature and pressure on interior of a tank.

TEST AND EVALUATION RESULTS

The Army and Marine Corps each selected the Swedish AT-4 as the winner of the test and evaluation. In our opinion, the test and evaluation were conducted fairly and objectively. In addition, the report the Army provided to the Congress on September 27, 1983, accurately reflected the test results.

The table which follows shows the ranking of the six competing systems in nine test and evaluation categories. Although these categories are not all inclusive of the test and evaluation data considered by the Army and Marine Corps in making their selections, we believe they do contain the most critical data based on the criteria considered by the board making the selection. The rankings coincide with the test scores and evaluations reported by the Missile Command and the Army Materiel Systems Analysis Activity. The actual scores are not shown since most are classified or competitive sensitive.

Ranking Table
(Low number is the better ranking)

<u>Test/evaluation category</u>	<u>M72A3</u>	<u>Viper</u>	<u>AT-4</u>	<u>LAW-80</u>	<u>M72-750</u>	<u>Viper Variant</u>
Cost effectiveness (note a)	5	3	2	6	1	4
Precision accuracy (note b)	3	2	1	6	5	4
Penetration (note b)	6	3	2	1	5	4
Time of flight (note b)	6	3	1	4	5	2
Probability of hitting a stationary tank at 250 meters (note b)	6	2	1	4	5	3
Probability of a mobility or firepower kill given a hit (note a)	6	3	2	1	5	3
Probability of single shot mobility or firepower kill (note a)	6	3	2	1	5	4
Reliability (note a)	1	3	1	5	6	3
Portability (note c)1		3	5	6	2	4

^aRanking reflects scores reported by the Army Materiel Systems Analysis Activity to the Army's source selection evaluation board.

^bRanking reflects test results reported by the Missile Command to the Congress.

^cBased only on preference of soldiers and marines participating in the portability test. The portability test was an extensive test and evaluation which considered more than the preferences of the participants. While the Army assessed various aspects of the weapons portability, it did not indicate which were the most critical nor did it make an overall assessment.

Only three of the six systems, the AT-4, the Viper, and the Viper Variant met all minimum technical performance requirements established for the test. The M72A3 did not meet both the penetration and time-of-flight requirements. These deficiencies in the M72A3 were known before the tests began. The M72-750 and the LAW-80 did not meet the precision accuracy requirements. Although the Viper and Viper Variant met or exceeded the minimum technical performance requirements, the General Dynamics proposals for each system were deficient because rather than proposing a ceiling price, they proposed fixed prices adjustable for escalation. The Army, therefore, judged these proposals to be nonresponsive.

Physical measurements taken revealed that all six LAW weapon systems met the weight and length requirements. One system, the LAW 80, weighed more than 20 pounds in the carrying mode (21.4 pounds) but met the weight requirement in the firing mode.

EVENTS AFTER THE TEST

The Army and Marine Corps commitment to the AT-4 is only for further testing. They plan to perform a noise safety test of 12 AT-4s and another test of 24 AT-4s, modified to correct deficiencies revealed in the portability test. The plan is to then proceed with a more extensive development and operational test of 1,000 rounds.

The Army does not consider the modifications to correct deficiencies to be major. They include adding protective covers, pop-up springs, and lead posts to the front and rear sights; increasing the width of the carrying strap and relocating the attachment points to improve balance; adding foam protective devices to both ends of the weapon; redesigning the cocking lever to strengthen it; and shielding the exposed screws. The modified AT-4s are to be delivered by the end of February 1984. The 36-round test is to be completed in time for a General Officer review scheduled for early May 1984.

The AT-4's kill probability is only about half that of the Marine Corps' stated requirement. However, responsible Marine Corps officials said they would be willing to accept it on the basis of its being the best LAW available.

Except for weight and length, the AT-4 meets all the Army's requirements used to justify the development of the Viper. However, a week before it announced its selection of the AT-4

for further testing, the Army dropped the requirement for a light antiarmor weapon to kill tanks since none of the LAWs have shown an adequate frontal armor penetration capability. Instead the Army will rely on "medium" and "heavy" antiarmor weapons for frontal attack on tanks.

The Army has also decided to retain the M72 as a multi-purpose self-defense weapon. It will continue its further evaluation of the AT-4 as a potential antiarmor weapon for the Marine Corps and, possibly as an eventual replacement for the M72A3. The Viper program manager has been directed to define and develop modifications to the M72 that would improve its performance at a minimum cost. The lightweight multipurpose weapon is intended to penetrate all parts of the tank, except the frontal armor, and to be used against softer targets.