United States General Accounting Office

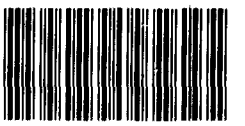
GAO

Report to the Secretary of Defense

January 1993

ELECTRONIC WARFARE

Laser Warning System Production Should Be Limited



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

National Security and
International Affairs Division

B-250665

January 25, 1993

The Honorable Richard B. Cheney
The Secretary of Defense

Dear Mr. Secretary:

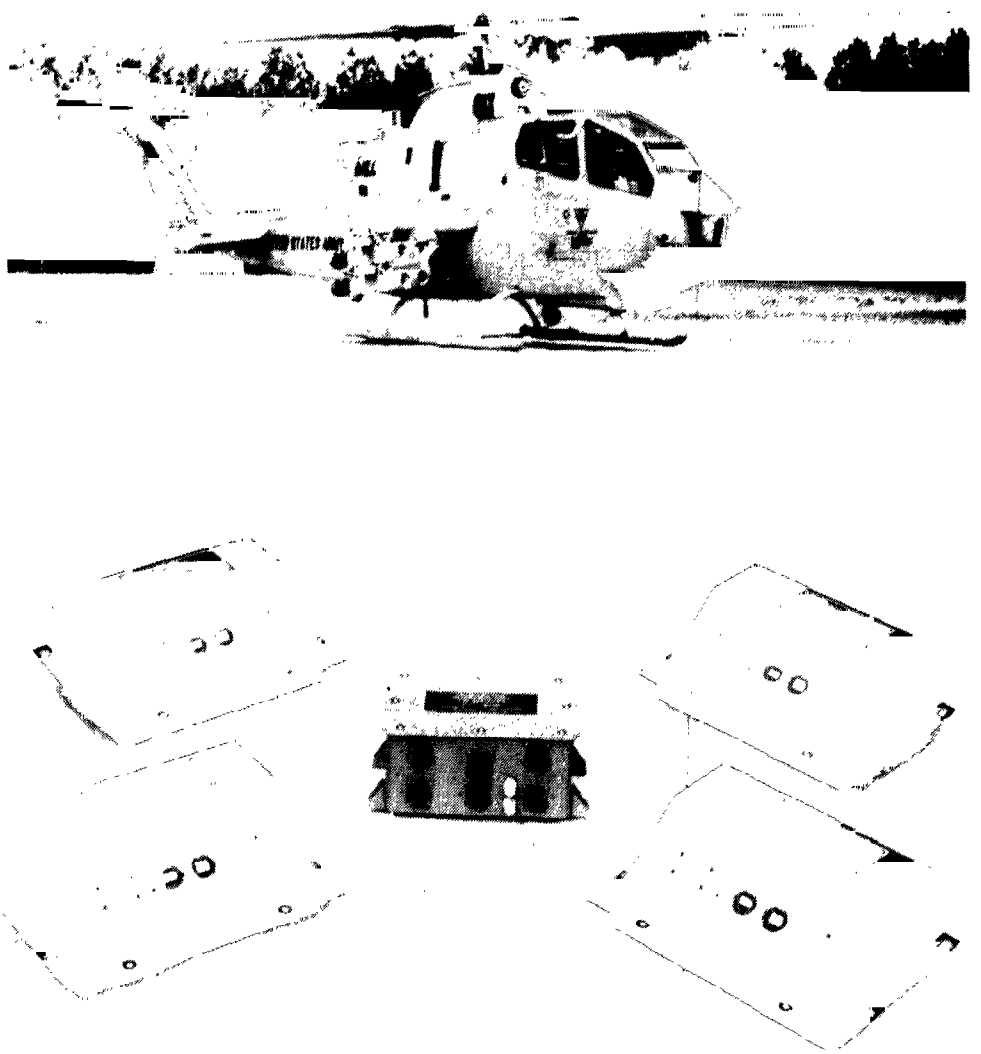
We have evaluated the Army's test program for the AVR-2 laser warning system and a newly modified version designated the AVR-2A. We focused specifically on whether the testing accomplished justifies the systems' full-rate production status.

Background

The AVR-2 and AVR-2A are intended for use on combat helicopters to protect against threat weapons that rely on lasers for their operation. (See fig. 1.) Some of these weapons are guided by lasers while others are aided by lasers in accomplishing such functions as determining the range to target aircraft. The AVR-2 and AVR-2A protect against such threats by detecting laser energy, providing an audio warning, and displaying the type and location of the threat on a screen in the helicopter cockpit. Based on the warning information, the pilot may launch an attack against the threat or attempt to evade it.

The Army started development of the AVR-2 in the 1970s. After the system completed initial operational tests in 1985, the Army modified its design to overcome performance problems and awarded the initial production contract in 1988. The AVR-2A subsequently evolved from additional design changes to the AVR-2. Full-rate production of the AVR-2 was approved in February 1992. The AVR-2A is expected to be phased into production in early 1993 and deliveries are scheduled to start in July 1993. So far, the Army has contracted for 940 systems, including 519 AVR-2s and 421 AVR-2As. Total program requirements are for 1,782 systems (1,472 for the Army, 254 for the Marine Corps, and 56 for the Navy) at an estimated program cost of $261 million.

Figure 1: Cobra Attack Helicopter and AVR-2 Laser Warning System



Results in Brief

Production of the AVR-2 and AVR-2A should be minimized until successful completion of operational tests. The AVR-2 failed to demonstrate acceptable performance in its operational tests and was redesigned. Even though half of the total quantity required has been procured, neither the redesigned AVR-2 nor the further redesigned AVR-2A has been subjected to operational tests to ensure satisfactory performance. This is contrary to Department of Defense (DOD) acquisition policy, and as a result, the Army risks procuring an inventory of systems that could prove defective.

AVR-2 and AVR-2A Have Not Demonstrated Acceptable Performance in Operational Tests

The performance capability of the redesigned AVR-2 and AVR-2A now being procured is unproven because neither system has been subjected to operational tests. At the time of our review, the Army did not plan to conduct any such operational tests, contrary to DOD policy.

Importance of Operational Testing

Operational testing is DOD's primary means of evaluating weapon system performance in a combat representative environment. It can help reduce risks in acquisition programs by identifying defective systems before they are produced and by verifying the correction of performance deficiencies. Operational testing is distinguished from developmental testing, which is done to verify that technical performance specifications are met and to determine whether a system is ready for operational testing.

DOD's acquisition policy provides that operational testing shall be structured to determine the operational effectiveness and suitability[1] of a system under realistic combat conditions and to determine if the minimum acceptable operational performance requirements have been satisfied. The policy further provides that a system may not enter full-rate production until test results provide reasonable assurance that the design is operationally acceptable. It also provides that one of the objectives of the production phase is to conduct follow-on operational testing to confirm system performance and verify the correction of deficiencies.

[1]Operational effectiveness refers to the ability of a system to accomplish its mission in the planned operational environment. Operational suitability is the degree to which a system can be placed satisfactorily in field use considering such factors as reliability and maintainability.

No Operational Tests Planned

During operational tests in 1985, the original AVR-2 failed to demonstrate acceptable performance. Major shortcomings included an inability to detect multiple threats, an inability to operate properly with the helicopter's APR-39A radar warning receiver,[2] and a tendency to provide false warnings. The system also failed to demonstrate that it met reliability requirements. In addition, the system configuration tested weighed 22.2 pounds, or 2.2 pounds over the maximum allowable weight.

Following the 1985 operational tests of the AVR-2, the Army made design changes to improve the system's performance and reduce its weight. These changes included redesigning the system's receiver and electronic components at a cost of $3.4 million, or 30 percent of the system's original development cost of $11.4 million. The changes also increased unit production cost by $3,890, to $125,251 each.

In early 1991, the Army began a series of additional design changes to the AVR-2 to improve the system's sensitivity and thereby allow detection of certain threat systems at greater ranges. Modifications were also made to incorporate a device that will allow its use with a training system for Army pilots. The modifications cost about $8 million, or 70 percent of the system's original development cost, and increased unit production cost by $9,061, to $134,312 each. The resulting system was designated the AVR-2A.

Despite the changes in system design and DOD's stated policy, the Army decided that follow-on operational testing was not necessary. Consistent with DOD policy, the Army did plan to conduct follow-on operational testing in 1991 using production models of the redesigned AVR-2. According to the test plan, several critical issues were to be evaluated, including the system's operational effectiveness and reliability. However, the follow-on test was canceled because of Operation Desert Storm.

Substitute Testing Is Inadequate

Rather than conduct follow-on operational testing, the Army planned to rely on technical tests to demonstrate system performance. However, these tests are not a valid substitute for operational tests.

Technical testing is essentially developmental testing and is not done in a realistic operational environment needed to evaluate a system's operational effectiveness and suitability. For example, tests to demonstrate the AVR-2's reliability were held in the contractor's plant and were not done under the cognizance of the Army's independent

[2]A radar warning receiver is an electronic warfare system to warn of radar controlled threat systems.

operational test organization. Moreover, DOD policy provides for demonstrating a system's operational effectiveness and suitability in operational tests, not technical tests.

Our work has shown that failure to conduct operational testing to verify the adequacy of redesigned systems can result in adverse consequences. On a recent review of another Army electronic warfare system,[3] we found that design changes were made to correct a serious shortcoming discovered during operational testing. However, no additional operational testing was done to verify the adequacy of the changes. Subsequently, during Operation Desert Storm, the system proved so defective that Army pilots stopped using it.

In addition, at the time of our review, none of the substitute testing had been or was planned to be done on the Army's Apache helicopter, the main aircraft slated to use the AVR-2A. During a recent review of a Navy electronic warfare system, we found that the system had successfully passed operational testing on a certain helicopter. Based on those tests, the Navy procured several hundred systems and then operationally tested the system on another helicopter scheduled to use the system. Those tests showed that the system degraded rather than enhanced the other helicopter's survivability.

Another limitation of the Army's substitute testing is illustrated by the AVR-2's electromagnetic compatibility tests. These tests refer to the capability of systems to operate in their intended environments without causing or suffering from interference with other systems. The AVR-2 electromagnetic compatibility tests were conducted on a Scout helicopter that had much of its electronic equipment either missing or inoperative. In addition, the Scout does not have some equipment, such as the ALQ-136 radar jammer, that is used on the Apache and Cobra helicopters. Thus, the Army has little assurance of the AVR-2's electromagnetic compatibility.

Recommendation

We recommend that the Secretary of Defense require that production of the AVR-2 and AVR-2A be minimized until operational testing provides reasonable assurance that performance is satisfactory.

Agency Comments

DOD partially agreed with the findings in this report but disagreed with the recommendation. DOD stated that adequate operational testing had been

[3]This was reported in a 1992 classified GAO report.

conducted or was planned to reasonably ensure operationally suitable and effective system performance.

However, at the time of our review, operational testing of the AVR-2 had revealed performance deficiencies, and no additional operational testing had been planned. In responding to the draft of this report, DOD agreed that operational testing on the Apache helicopter was needed. DOD officials informed us that this testing was planned in response to the draft report and that it would take place in April to June 1993.

Even though DOD disagreed with our recommendation, we consider DOD's planned test to be partially responsive to our recommendation, assuming that this and other tests indicated in DOD's comments are accomplished as planned. We believe that the tests will reduce the Army's risk of procuring deficient systems. However, we also believe that the risk could be further reduced by minimizing production until the tests are successfully accomplished.

DOD's detailed comments on the draft of this report are reprinted in appendix I.

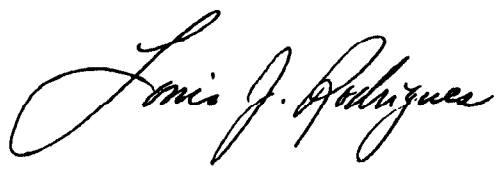
Scope and Methodology

We performed our work at the Army's AVR-2 System Program Office, St. Louis, Missouri; the Army Communications-Electronics Command, Fort Monmouth, New Jersey; the Army Operational Test and Evaluation Command, Alexandria, Virginia; and the Army Aviation Center and School, Fort Rucker, Alabama. We reviewed system test plans and reports, requirements documents, contractual records, system configuration control records, DOD acquisition policy directives, and other records bearing on the issue. We also discussed various aspects of our work with Army officials. We performed our work from February 1992 through September 1992 in accordance with generally accepted government auditing standards.

As you know, 31 U.S.C. 720 requires the head of a federal agency to submit a written statement on actions taken on our recommendation to the House Committee on Government Operations and the Senate Committee on Governmental Affairs not later than 60 days after the date of the report. A written statement must also be submitted to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

We are sending copies of this report to the Chairmen of the above Committees and of the Senate and House Committees on Armed Services, the Secretary of the Army, the Director of the Office of Management and Budget, and other interested parties. Please contact me at (202) 275-4841 if you or your staff have any questions concerning this report. Other major contributors to this report were Jackie B. Guin, Assistant Director, and Donald F. Lopes, Evaluator-in-Charge.

Sincerely yours,



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Director, Command, Control, Communications,
and Intelligence Issues