
November 1997

BALLISTIC MISSILE DEFENSE

Improvements Needed in Navy Area Acquisition Planning



**National Security and
International Affairs Division**

B-274679

November 14, 1997

The Honorable William S. Cohen
The Secretary of Defense

Dear Mr. Secretary:

We reviewed the Navy Area Theater Ballistic Missile Defense program to determine whether (1) the program has met its milestones to date and its remaining schedule appears realistic and (2) the tests being conducted or planned will be adequate to demonstrate the system's capabilities before production begins. We are addressing this report to you at this time because the program is now entering the phase during which developmental and operational testing is conducted and low-rate initial production is to begin.

Background

The Area program is a sea-based weapon system being developed by the Ballistic Missile Defense Organization (BMDO) and the Navy to defeat theater ballistic missiles. The system is considered a high-priority "core" theater missile defense program by BMDO and the Congress. It supports the national objective of protecting U.S. and allied deployed forces, population centers, and industrial facilities from theater missile attacks.

The mission of the Navy Area program is to provide a near-term, short-range tactical ballistic missile defense capability until ground forces, including other ballistic missile defense systems, can be set up. The Navy Area system is part of a "family of missile defense systems" that also includes the Army's Patriot PAC-3 system to help defend against short-range missiles and the Navy's Theater-wide and the Army's Theater High Altitude Area Defense systems for defending against long-range missiles.

According to proponents, the advantages of Navy missile defense systems over ground-based systems are that Navy ships (1) are likely to be relatively close to any areas of potential conflict and (2) do not require host nation agreement to be deployed to the area. As a result, the Navy systems can be deployed more readily than other systems.

According to the Navy, its Area program also takes advantage of existing infrastructure. It is to be incorporated into existing AEGIS weapon

systems¹ and consists of a modified AEGIS combat system and modified Navy command and control systems to enable detection, tracking, and engagement of theater ballistic missiles. Changes needed to give the AEGIS system ballistic missile defense capabilities primarily involve software changes and increased computer capability. Modifications are also to be made to the existing Standard Missile-2, Block IV, and are to include adding an infrared seeker and a radio-frequency adjunct sensor to enable the missile to home and fuze on attacking ballistic missiles. This modified missile is designated as the Standard Missile-2, Block IVA. Modifications are also to be made to the ship's vertical launching system. These modifications are intended to provide AEGIS ships with a theater ballistic missile defense capability while allowing them to maintain their ability to conduct anti-air warfare against aircraft and cruise missiles.

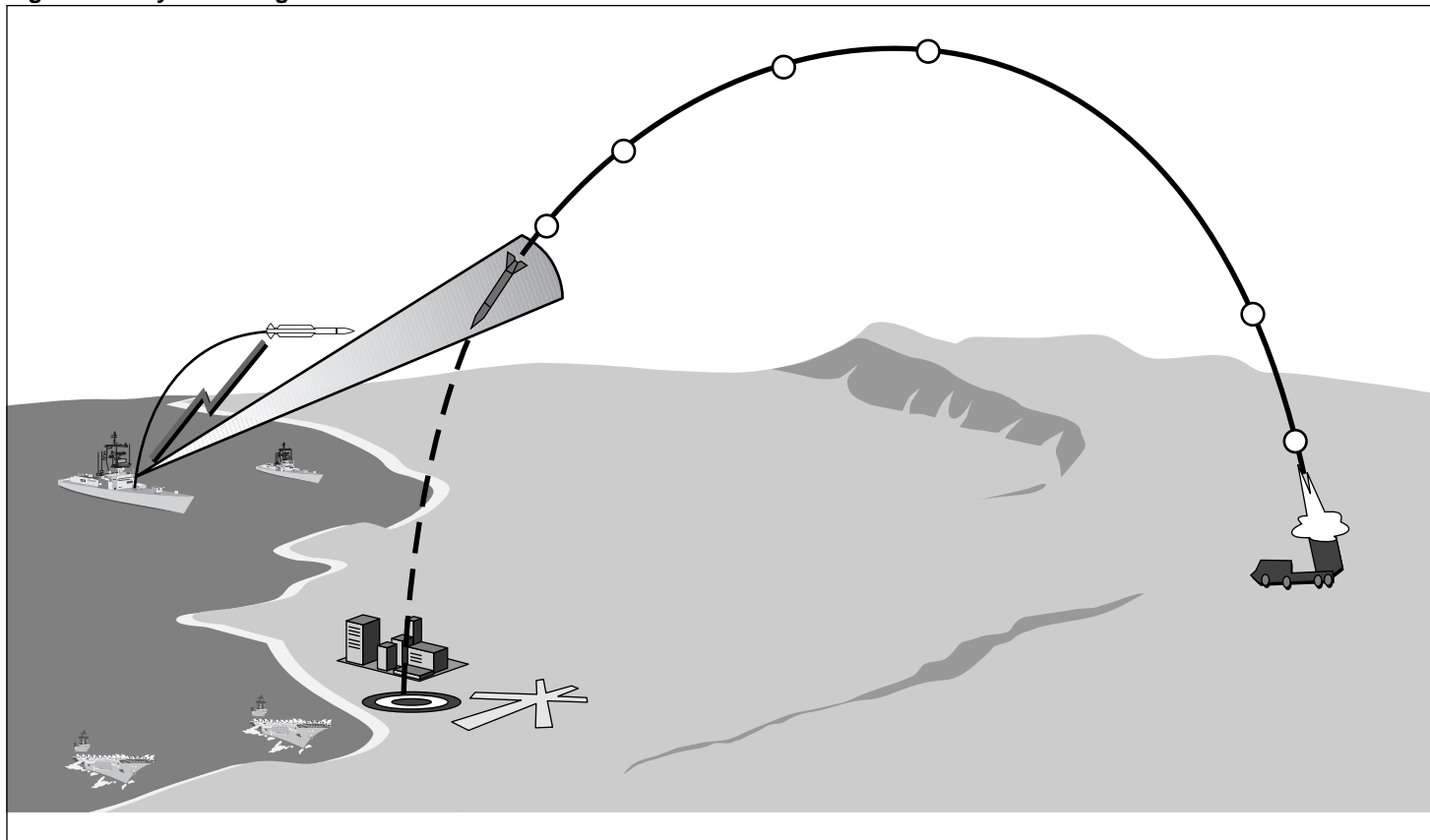
To equip 57 AEGIS destroyers and 22 AEGIS cruisers with theater missile defense capability between fiscal year 1998 and 2011, the Navy plans to buy 1,500 Standard Missile-2, Block IVAs. The Navy also plans to field a prototype system—the User Operational Evaluation System (UOES)—beginning in September 1999. UOES provides for an interim ballistic missile defense capability and allows for fleet personnel to evaluate the system. The Navy plans to equip 2 cruisers with a total of 35 UOES missiles available for testing and/or use in a national emergency.

The total cost of the Navy Area program is projected to be \$8.98 billion, including \$2.05 billion for development, \$4.18 billion for procurement, and \$2.76 billion for operation and support. As of the end of fiscal year 1997, more than \$900 million has been appropriated for system development. The Department of Defense (DOD) requested about \$283 million in fiscal year 1998—\$267.8 million for development and \$15.4 million for production.

Figure 1 shows the concept of the Navy Area program.

¹The AEGIS weapon system allows the ship to perform search, track, and missile guidance functions using (1) the SPY-1 radar, which is an advanced, automatic, detection and track, multi-function, phased-array radar; (2) computer equipment; and (3) advanced software.

Figure 1: Navy Area Program



Source: U.S. Navy.

Results in Brief

The Area program has experienced schedule slips totaling about 14 months due to several reasons, including technical problems in the two flight tests conducted prior to the engineering and manufacturing development phase. Our review indicates that further schedule slips are possible because of the acquisition plan's highly optimistic schedule for conducting operational tests. Slippages in completing these tests could result in the system remaining in a low-rate production phase longer than currently planned.

The Navy plans to begin production of Area program missiles before conducting any operational tests of the system. According to the Navy, it needs to begin low-rate initial production of the missiles in June 2000—5 months before system level developmental and operational tests are

scheduled to begin—because of the urgent need for the system and to maintain an efficient flow in missile production. In our opinion, two factors raise some questions about the Navy's rationale for the criticality of initiating low-rate initial production, namely (1) a prototype system capability consisting of two cruisers equipped with UOES missiles will be in service at that time and (2) an earlier version of the Standard missile will still be in production, diminishing the need for low-rate production of the Block IVA missile to avoid a production gap.

Schedule Slips Have Occurred and the Planned Test Schedule Is Optimistic

The Area program entered the engineering and manufacturing development phase of the DOD weapon systems acquisition process earlier this year, but the activities that had to be accomplished before the engineering and manufacturing development phase could begin took about 14 months longer than expected. The initial Area program schedule projected that the engineering and manufacturing development phase would begin in December 1995 and that full-rate production would begin in September 1999. Engineering and manufacturing development actually began in February 1997 and the current schedule shows that full-rate production will begin in August 2001. According to program officials, this delay was due to the following reasons:

- The Standard Missile Company—a joint venture between the Raytheon Company and the Hughes Missile Systems Company—took longer than expected to establish, which delayed the Area program in obtaining test missiles.
- A congressional budget cut for fiscal year 1995 and DOD accounting changes slowed the progress of the program.
- Technical problems that occurred in the two flight tests prior to the engineering and manufacturing development phase caused about a 6-month delay.²
- Concurrent with the flight test delay, there was also a delay related to the completion of the Standard missile preliminary design, due to additional time being required to complete cost performance tradeoffs.

The Area program acquisition plan has an optimistic schedule for conducting operational tests, which could result in the system remaining in a low-rate initial production phase longer than currently planned if the

²The delay was due to two test issues. Neither of these test issues was related to the Block IVA missile design. The first was the failure of an electronic component in the booster. The booster was designed as part of the Block IV program and is a nondevelopmental item for Block IVA development. The second test issue resulted from a telemetry problem resulting in range control personnel not being able to receive target data.

test program experiences serious problems. Between November 2000 and March 2001, the Navy plans to conduct developmental and operational tests at the Pacific Missile Range Facility that will involve intercept attempts with a total of 32 missiles, an average rate of about 8 test firings a month.

Program officials told us that such a test schedule is not unusual in Navy testing, which is typically conducted based upon range availability and ship operational commitments. According to these officials, test programs for earlier versions of the Standard missile were also compressed. For example, they indicated that the Block IIIB program conducted 14 operational test intercepts in 3 days and the Block IV program conducted 7 developmental/operational intercept tests in 2 days. However, according to DOD officials, these tests were anti-air warfare tests, with which the Navy has a great deal of experience, and not theater missile defense tests. Navy test officials agreed that the Area system's test schedule is ambitious, but said that it was "doable." They said that some of the testing will involve multiple simultaneous engagements, which will use several missiles in a brief period of time.

Despite the program office's optimism, some DOD testing and program analysis officials expressed skepticism that the Navy could complete the planned test program on schedule. One DOD official said that it was not realistic for the Navy to maintain this test schedule, citing delays with other test programs such as tests of the Army's Patriot PAC-3 system as well as problems with the Area system's earlier flight demonstration tests. An internal DOD analysis noted that DOD "has yet to demonstrate the feasibility of such an aggressive test schedule for a [theater ballistic missile defense] program." According to the analysis, the best demonstrated program schedule experience to date was about 11 weeks between successful intercepts of theater ballistic missile targets. Testing officials agreed that if the test program experiences serious problems, it will cause schedule delays.

Navy Plans to Begin Low-Rate Initial Production Before Conducting Realistic Testing

The Navy plans to begin low-rate initial production of Area program missiles in June 2000 before conducting any operational tests of the system. The combined developmental and operational tests³ scheduled to begin in November 2000 are the first fully integrated shipboard system tests planned for this program. Figure 2 displays the current testing and production schedule.

Figure 2: Schedule of Navy Area System Operational Testing and Production

ID	Task Name	1997		1998				1999				2000				2001			
		Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	
1	White Sands Developmental Test and Operational Assessment																		
2	Low-rate Initial Production Decision																		
3	Developmental and Operational Testing																		
4	Full-Rate Production Decision																		

The Navy indicated that it intends to use the results of the operational assessment in the June 2000 decision to begin low-rate production of the missiles. However, operational assessments will be based on developmental tests conducted by the contractor at White Sands Missile Range rather than on the results of realistic field testing. It will not provide a comparable quality of information for decisionmakers that can be obtained from independent operational tests. For example, according to the Area program’s Test and Evaluation Master Plan, “no critical operational issues will be resolved” during the White Sands testing. According to Navy test officials, critical operational issues can only be resolved during tests at sea such as the operational tests to be conducted

³Developmental tests are conducted by program officials with the help of contractors. Operational tests are conducted by an independent Navy testing organization, without contractors present, in conditions that simulate actual operational conditions.

at the Pacific Missile Range Facility between November 2000 and March 2001. Tests at White Sands are limited because the system is not subjected to conditions found at sea such as salt water and the movement of the ship and because they will not use the AEGIS SPY-1 radar.

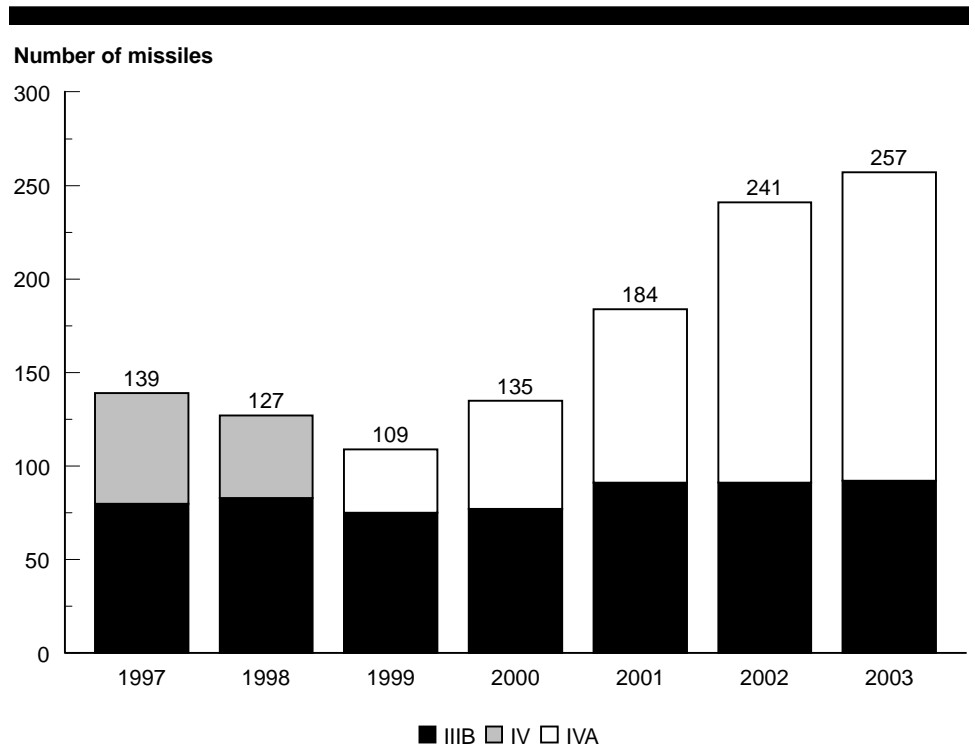
According to Navy officials, the program needs to begin low-rate production in June 2000—5 months before system level developmental and operational tests are scheduled to begin—because of the urgent need for the system and to maintain an efficient flow in Standard missile production.

Our review indicated that the following two factors raise some question about the criticality that the Navy attributes to initiating low-rate initial production.

- The Navy's stated urgent need for the Area program may be met in part by the UOES system. The UOES prototype system is scheduled to be available in September 1999. If the UOES meets its objectives, it will provide some operational capability until the more capable system is available. The Navy plans to provide two cruisers with a UOES capability, and the ships are to be initially equipped with a total of 35 UOES missiles. Although many of these missiles are to be expended in tests, a small number will remain.
- The need to maintain Standard missile production is not solely dependent on the initial production of missiles for the Area program. Even without low-rate production of the Area program's Block IVA missile, Standard missile production will continue. Production of an earlier version of the missile—the Block IIIB—began in fiscal year 1997 and is scheduled to continue at least through fiscal year 2003. Navy officials acknowledge that even though the configurations of the Block IIIB and Block IVA missiles are different, a high degree of commonality exists between the missiles both at the section level and at lower assembly levels. The Navy and the Standard Missile Company have identified minimum sustaining rates for major sections of the Standard missile. In most of the cases we examined, the minimum sustaining rate is met or almost met without production of the Block IVA low-rate initial production missiles. For example, the minimum sustaining rate for the warhead in fiscal year 1999 is 96 units. Total production that year is expected to be 251 units, of which only 34 are Block IVA units. The primary exception is the Block IVA booster, which is not a component of the Block IIIB missile, and thus cannot meet its minimum sustaining rate without Block IVA units.

Figure 3 shows planned production of the various configurations of the Standard missile.

Figure 3: Standard Missile Production



The Navy plans to produce 185 Block IVA missiles—12 percent of its total planned production quantity—during low-rate production. The estimated cost for these 185 missiles is \$568.2 million. Scheduling low-rate initial production concurrent with testing increases risk. A DOD analysis concluded that planning low-rate production concurrent with the Navy Area test program was risky, noting that if problems are uncovered during the test phase, the program may need to acquire additional hardware and incur redesign costs. Testing problems could also cause the missile to remain in low-rate production longer than currently planned.

Conclusions and Recommendations

Slippage in the development of the Navy Area program has already occurred and the planned test schedule is optimistic. Unless the acquisition plan and/or the testing schedule is revised, the Navy will not have reasonable assurance that the system will adequately perform before the Navy commits itself to the production of the Block IVA interceptor missiles.

The Navy currently plans to contract for the low-rate initial production of 185 Block IVA missiles, at an estimated cost of about \$568.2 million, prior to the completion of any realistic operational testing. The Navy intends to rely on assessments that do not provide the quality of data that realistic field testing provides. We are concerned that the Navy will make a premature commitment to the production of unproven missiles.

The Navy acknowledges that risks are involved but believes it must maintain the existing schedule because of the urgent need for the system and to maintain an efficient flow in Standard missile production. Our review indicates that if the initial production decision on the Block IVA was delayed, the contractor could still generally maintain minimum sustaining rates of production by continuing to work on an earlier version of the Standard missile that will still be in production and has a high degree of commonality with the Block IVA missile. Moreover, the Navy would also have UOES to provide some intercept capability until the fully operational Navy Area program demonstrates its expected capability.

Therefore, we recommend that you direct BMDO to revise the Navy Area Theater Ballistic Missile Defense program's acquisition plan and/or its operational testing schedule to ensure that the low-rate initial production decision on the 185 Block IVA missiles is made contingent on the Director, Operational Test and Evaluation, certifying, based on sufficient independent testing in an operational environment, that the system has the potential to meet its key performance requirements.

Agency Comments and Our Evaluation

In commenting on a draft of this report, DOD disagreed with our recommendation. First, DOD stated that postponing acquisition is contrary to the purpose of low-rate initial production as codified in title 10 of the U.S. Code. Second, DOD said that complying with our recommendation would cause a delay in low-rate initial production missile deliveries, resulting in an inventory of seven UOES missiles—too few to respond to any contingency. Third, DOD said implementing our recommendation would

impact the production of key Standard missile components, resulting in substantial restart costs and risks.

We recognize that title 10 specifies the purposes for low-rate initial production. The statutes, however, do not include specific standards on when programs should begin low-rate initial production, or the type and amount of testing to be done before production begins. The thrust of our recommendation is that conducting realistic testing prior to the production of system components reduces risk and minimizes the procurement of unproven equipment. Further, implementing our recommendation could also reduce the number of Area systems that may have to be modified based on the results of operational testing.

DOD also says that delaying low-rate initial production missile deliveries beyond operational testing would result in an inventory of seven UOES missiles—too few to respond to any contingency. DOD's comments suggest that implementing our recommendation would mean delaying low-rate initial production until all operational testing is completed in March 2001. We are not suggesting such a delay in the program schedule, but rather that the schedule be adjusted so that some operational testing be conducted prior to the low-rate initial production decision currently planned for June 2000. While DOD says that a delay could reduce the number of missiles available for contingency operations for a short period, the current schedule already includes a period of reduced availability. Under the current schedule, only seven missiles will be available for contingency operations from the completion of operational testing in March 2001 until the first low-rate initial production missile delivery begins in June 2001. In addition, under the current schedule, by the time operational testing begins in November 2000, the Navy will have already committed to low-rate initial production at a cost of \$568.2 million. Furthermore, DOD notes that the low-rate initial production missiles are required to respond to a national emergency. Therefore, we believe it is important that the Navy be able to demonstrate the missile system's operational capability to respond in such an emergency.

DOD also notes that Block IIIB missile production will not meet minimum sustaining rate quantities for all components. According to DOD, delaying low-rate initial production of Block IVA missiles would shut down booster production and cause the guidance section to fall below minimum sustaining rates for a 2-year period. DOD's comments indicate that restart costs and risks associated with restarting would be substantial.

We recognize that the minimum sustaining rate for the booster will not be met without production of boosters for the Block IVA missile. However, even without the Block IVA missile, expected production of the guidance section would equal 96 percent of the minimum sustaining rate in both fiscal years 1999 and 2000. We asked Navy officials for an estimate of the restart costs and they told us that a minimum of \$9.1 million in restart costs would be incurred for the booster and a component of the guidance section. According to these officials, cost risks associated with requalification of unique Block IVA component sub-vendors are not included in this estimate. Given that each Block IVA missile is expected to cost an average of about \$2 million, it could easily cost more to fix already produced missiles if problems are revealed during subsequent testing, than it could cost to restart production. We believe it may be more cost-effective to incur some restart costs, rather than enter production without adequate testing. Consequently, we believe our recommendation is still appropriate.

DOD's comments are reprinted in appendix I. We have incorporated DOD's technical comments as appropriate.

Scope and Methodology

To determine whether the Navy Area Theater Ballistic Missile Defense program has met its milestones to date and its remaining schedule appears realistic, we interviewed agency officials and analyzed pertinent program cost, schedule, and requirements documentation. We analyzed the status of the program, the various factors that led to the 2-year slippage in the program schedule, and the technical risks that remain.

To determine whether the tests being conducted or planned will be adequate to demonstrate the system's capabilities before production begins, we interviewed agency officials and analyzed pertinent test plans and schedules. We examined how many flight tests will be conducted before deployment of the UOES system, whether planned tests would realistically measure the system's performance, the risks associated with a compressed operational test schedule, and the risks associated with beginning low-rate initial production before conducting any system level operational tests.

We interviewed responsible agency officials at the following locations: the Office of the Secretary of Defense, Headquarters, BMDO, and the Office of the Director, Operational Test and Evaluation, in Washington, D.C.; the Navy's Program Executive Office (Theater Air Defense), Program Office

for Standard Missile and Vertical Launching Systems, and Program Office for the AEGIS Weapon System, in Washington, D.C.; and the Navy's Operational Test and Evaluation Force in Norfolk, Virginia.

We conducted our work from September 1996 to August 1997 in accordance with generally accepted government auditing standards.

As you know, the head of a federal agency is required by 31 U.S.C. 720 to submit a written statement of actions taken on our recommendations to the Senate Committee on Governmental Affairs and the House Committee on Government Reform and Oversight not later than 60 days after the date of this report. A written statement also must be submitted to the Senate and House 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 appropriate congressional committees; the Director of the BMDO; and the Secretaries of the Army, the Navy, and the Air Force. We will also make copies available to others on request.

If you or your staff have any questions concerning this report, please contact me on (202) 512-4841. Major contributors to this report were Tom Schulz, Lee Edwards, David Hand, and Judy Lasley.

Sincerely yours,



Allen Li
Associate Director, Defense Acquisitions Issues

Comments From the Department of Defense



ACQUISITION AND
TECHNOLOGY

OFFICE OF THE UNDER SECRETARY OF DEFENSE

3000 DEFENSE PENTAGON
WASHINGTON, DC 20301-3000

09 OCT 1997

Mr. Allen Li
Associate Director
Defense Acquisition Issues
National Security and International Affairs Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Li:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report, "BALLISTIC MISSILE DEFENSE: Improvements Needed in Navy Area System Acquisition Planning", dated September 4, 1997, (GAO Code 707197), OSD Case 1461. The Department nonconcurs with the recommendation.

The DoD detailed comments in response to the recommendations are provided in the enclosure. Technical comments were provided separately for accuracy and clarification. The Department appreciates the opportunity to comment on the draft report.

Sincerely,

George R. Schneiter
Director
Strategic and Tactical Systems

Enclosure



Appendix I
Comments From the Department of Defense

GAO DRAFT REPORT DATED SEPTEMBER 4, 1997
(GAO CODE 707197) OSD CASE 1461

"BALLISTIC MISSILE DEFENSE: IMPROVEMENTS NEEDED IN NAVY AREA SYSTEM
ACQUISITION PLANNING"

* * * * *

RECOMMENDATION

- The GAO recommended that the Secretary of Defense direct the Director, Ballistic Missile Defense Organization (BMDO) to revise the Navy Area Theater Ballistic Missile Defense program's acquisition plan and/or its operational testing schedule, to ensure that the low-rate initial production (LRIP) decision on the 185 Block IVA missiles is made contingent on the Director, Operational Test and Evaluation certifying, based on sufficient independent testing in an operational environment, that the system has the potential to meet its key performance requirements. (p.10/GAO Draft Report)

DOD RESPONSE: Nonconcur. The GAO recommendation to delay the Navy Area Theater Ballistic Missile Defense program's plan to acquire 185 LRIP missiles until after the Director, Operational Test and Evaluation, certifies that the missile has the potential to meet its key performance requirements is unwarranted. Postponing the acquisition of these missiles is contrary to the purpose of LRIP as stated in Title 10 United States Code 2399 (10 U.S.C. 2399) and DoD 5000.2-R. The statute authorizes the acquisition of LRIP quantities sufficient to provide production-representative articles required for operational tests, establish the initial production base for the system, and permit an orderly increase in production rate.

According to the report, two factors raise questions about the rationale for the criticality of starting low-rate initial production. The first addresses the Department-wide need for urgent fielding of lower-tier Theater Ballistic Missile Defense (TBMD) systems. The second addresses missile production quantities required to maintain production levels. According to the report, "(1) a prototype system capability consisting of two cruisers equipped with developmental missiles will be in service at that time, and (2) an earlier version of the Standard Missile will be in production, diminishing the need for low-rate initial production of the Block IVA missile to avoid a production gap." The first rationale refers to the User Operational Evaluation Systems (UOES). The UOES enable operators to evaluate the systems and provide comments and feedback prior to full-rate production. In addition, the UOES capability can be used, if an urgent need arises, to respond to contingencies.

Appendix I
Comments From the Department of Defense

Stating that the UOES capability mitigates the need for LRIP missiles fails to recognize that 28 of the 35 UOES missiles will be expended during planned Developmental Testing (DT)/Operational Testing (OT) (FY00 to FY01). The acquisition plan, as discussed at the Milestone II Defense Acquisition Board review, replaces spent UOES missiles with LRIP missile deliveries as the UOES missiles are consumed during DT/OT firings. Delaying LRIP missile deliveries beyond DT/OT would result in an inventory of seven missiles, too few to respond to any contingency. LRIP missile deliveries provide missiles required to respond to a national emergency. The delay in procuring LRIP missiles would significantly impact the achievement of an operational capability.

The GAO report also states that production rates for the missile would not be adversely affected by a delay in starting LRIP. This rationale inaccurately assumes that the production of an earlier version of the missile, the Standard Missile Block IIIB, is sufficient to achieve minimum sustaining rates for the missile production facility. Although a high degree of commonality exists between the two missiles, minimum sustaining rates cannot be met solely by the production of SM-2 Block IIIB missiles. Two critical components of the Block IVA missile are not common to the Block IIIB missile, the MK 72 Booster and the Guidance Control and Autopilot (GC&A) sections. Relying solely on the production of the SM-2 Block IIIB missile would result in a shut-down of MK 72 Booster production and would cause GC&A assemblies to fall below minimum sustaining rates in FY99 and FY00. Restart costs and risks associated with restarting would be substantial. The results of delaying the start of LRIP would be lower production quantities and increases in unit costs due to a significant change in production rates.

The Navy Area TBMD program is in full compliance with OSD policy. All of the issues addressed in the GAO report were discussed and resolved during the Department's Milestone II review of the program. The Defense Acquisition Executive addressed these issues in the Acquisition Decision Memorandum (ADM) dated February 22, 1997. The ADM specifies that exit criteria must be met and approval achieved prior to procurement of LRIP long-lead material or LRIP missile fabrication. These deliberate oversight and control mechanisms provide sufficient program confidence, commensurate with each key decision, to proceed to the next phase. The Ballistic Missile Defense Organization, in close conjunction with other offices in the Department of Defense, will continue to closely monitor and assess the program's progress. Modifications to the approved acquisition plan will be made if required.

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