

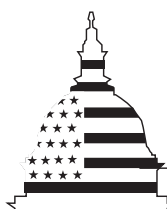
GAO

Report to the Chairman, Subcommittee  
on Defense, Committee on  
Appropriations, House of  
Representatives

June 1999

# MISSILE DEFENSE

## THAAD Restructure Addresses Problems But Limits Early Capability



G A O

Accountability \* Integrity \* Reliability

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B-280755

June 30, 1999

The Honorable Jerry Lewis  
Chairman, Subcommittee on Defense  
Committee on Appropriations  
House of Representatives

Dear Mr. Chairman:

The Ballistic Missile Defense Organization and the Army are developing the \$15.4 billion Theater High Altitude Area Defense (THAAD) system to defeat theater ballistic missiles. Because of the Subcommittee's concerns about repeated test failures and the Department of Defense's (DOD) restructuring of the program, the former Chairman of the Subcommittee requested that we review the status of the THAAD program. Specifically, we (1) identified the underlying problems in the program that led to the test failures, (2) assessed whether program restructuring efforts address these underlying problems, and (3) determined how this restructuring will affect THAAD's User Operational Evaluation System.<sup>1</sup>

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## Results in Brief

Studies conducted by both DOD and independent sources identified the following underlying problems in the THAAD program:

- The program's compressed flight-test schedule did not allow for adequate ground testing, and as a result officials could not detect problems prior to flight tests. The schedule also left insufficient time for preflight testing, postflight analysis, and corrective actions.
- The requirement to be able to quickly deploy an early prototype system diverted the contractor and government project management's attention away from the normal interceptor development process and resulted in interceptors that were not equipped with sufficient instruments to provide optimum test data.
- Quality assurance received insufficient emphasis and resources during the time of component production, resulting in unreliable components.

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<sup>1</sup>Initially, the THAAD program included plans for an early prototype system, called the User Operational Evaluation System, that could be used in a national emergency.

- The contract for developing the interceptor was a cost-plus-fixed-fee contract, a contract type that placed all of the program's financial risk on the government and did not include provisions that could be used to hold the contractor accountable for less than optimum performance.

Flight-test failures have been caused primarily by manufacturing defects rather than problems with advanced technology. These failures have prevented the Army from demonstrating that it can reliably employ the "hit-to-kill" technology critical to THAAD's success.<sup>2</sup>

The restructured program addresses each of the program's four underlying problems. It

- lengthens the flight-test schedule and increases ground testing;
- removes the requirement for the deployable, early prototype interceptors;
- increases the contractor's quality emphasis, including its commitment, leadership, and quality assurance staffing; and
- modifies the cost-plus-fixed-fee contract to provide performance-based incentives and penalties and introduces a degree of competition into the program.

Despite these changes, the reliability of the remaining flight-test interceptors remains a concern because most components were produced when the contractor's quality assurance system was inadequate.

The program restructuring puts into question the need to retain a fully staffed User Operational Evaluation System battalion. The battalion will have little or no capability to intercept ballistic missiles because interceptors will not be available for the prototype system unless interceptors intended for tests are diverted to the battalion. According to the Army Training and Doctrine Command's system manager for THAAD, the THAAD radar could be used for predicting the launch and impact points of enemy missiles, but no requirement exists for THAAD to perform that mission and no independent assessment of the prototype radar's capabilities is planned. The User Operational Evaluation System battalion provides input to system designers, but according to the THAAD project

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<sup>2</sup>"Hit-to-kill" technology allows an interceptor to destroy an attacking missile by colliding with it.

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manager, this input could be provided with significantly fewer soldiers than the 295 currently authorized.

We provide recommendations in this report for the Secretary of Defense concerning (1) the need for and capabilities of the User Operational Evaluation System and (2) the minimum essential military personnel and equipment required to fulfill the defined mission.

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## Background

When operational, THAAD will support the national objective of protecting U.S. and allied deployed forces, population centers, and industrial facilities from theater missile attacks. The THAAD system consists of four major components: (1) truck-mounted launchers; (2) interceptor missiles; (3) a radar; and (4) the battle management/command, control, communications, computers, and intelligence system. The launcher is intended to provide rapid reloading of interceptors. Each interceptor consists of a single-stage booster and a kill vehicle that is designed to autonomously home on an enemy missile during the last phase of interceptor flight and destroy the missile by colliding with it, a concept called "hit-to-kill." The radar is designed to support the full range of surveillance, target tracking, and fire control functions and to provide a communications link with THAAD interceptors in flight. The battle management/command, control, communications, computers, and intelligence system is designed to manage and integrate all THAAD components and link the THAAD system to other missile defense systems to support an interoperable theater missile defense architecture.

THAAD is currently in the program definition and risk reduction phase.<sup>3</sup> Through March 1999, the system had failed in the first six attempts to intercept a target. In June 1999, THAAD successfully intercepted its target during the seventh intercept flight test. DOD plans to continue THAAD testing and make a decision in the second quarter of 2000 on whether to proceed into the next acquisition phase—engineering and manufacturing development. A low rate initial production decision for the system is planned for the third quarter of 2005, and initial fielding is currently scheduled for the third quarter of 2007. DOD's budget submission for fiscal year 2000 requests \$611.6 million for the program. Primarily because restructuring extended THAAD's development schedule by 21 months, the

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<sup>3</sup>DOD's acquisition phases are (1) concept exploration, (2) program definition and risk reduction, (3) engineering and manufacturing development, and (4) production.

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program's estimated acquisition cost increased to \$15.4 billion, an increase of \$1.3 billion over the December 1997 estimate. Through April 1999, DOD spent about \$3.3 billion on the THAAD program.

The Army established a THAAD User Operational Evaluation System battalion at Fort Bliss, Texas, in 1995. The User Operational Evaluation System—an early prototype version of the final THAAD system—was intended to (1) allow military users to influence the THAAD system design, (2) permit an early operational assessment of the system's capabilities, and (3) provide a system that could be deployed in a national emergency. The initial plan called for the prototype system to have 40 interceptors; 4 launchers; 2 radars; 2 battle management/command, control, communications, computers, and intelligence units; and associated support equipment. Except for the interceptors, these components were acquired and delivered to the THAAD battalion under the existing program definition and risk reduction contract at little or no additional cost. Under the initial plan, the 40 interceptors were to be produced after the first successful intercept test at an estimated cost of \$225 million.

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## Underlying Reasons for Past Intercept Failures

Several quality assurance audits and other independent reviews have highlighted problem areas in the THAAD program. In our review of these studies, we identified four underlying reasons for the program's difficulties. First, a compressed flight-test schedule and inadequate ground testing delayed the program and failed to detect problems prior to flight tests. Second, the requirement for a high priority but high risk User Operational Evaluation System capability using an early prototype interceptor design diverted the attention of the contractor and government project management and limited the ability to more fully test the interceptor. Third, an inadequate quality assurance system failed to detect defective components. Fourth, the cost-plus-fixed-fee contract did not include provisions to hold the contractor fully accountable or provide the government with the ability to directly influence the contractor's efforts. Early flight-test failures have prevented the Army from determining whether it can reliably employ the "hit-to-kill" technology essential to THAAD's success.

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## Compressed Flight-Test Schedule and Inadequate Ground Testing

According to Army officials, DOD accepted an ambitious flight-test schedule with a reduced emphasis on ground testing because of the urgent need for improved missile defenses. Several studies identified this schedule as a source of the program's problems. In September 1994, for example, an independent contractor reported that the program's initial schedule—which allowed only 30 days between each of the last seven flight tests—did not permit adequate time for failure analysis, corrective actions, and retest.<sup>4</sup> In July 1996, another independent panel reported that insufficient time to perform ground testing between flights represented an unacceptable technical risk.<sup>5</sup> Also, according to this panel, problems discovered in one flight test were not fully understood before conducting the next test and the number of problems being experienced may have indicated a process breakdown caused by schedule pressures. According to DOD's Director of Operational Test and Evaluation, testing through March 1997 emphasized schedule over success. The aggressive flight-test schedule proved to be overly ambitious; technical problems encountered during testing resulted in program delays.

In its February 1998 report, the Panel on Reducing Risk in Ballistic Missile Defense Flight Test Programs labeled THAAD's aggressive schedule and insufficient attention to flight-test failures a "rush to failure."<sup>6</sup> This group, which had been chartered to study risk in the flight testing of Ballistic Missile Defense Organization programs, pointed out that THAAD's flight tests were conducted without complete component qualification and ground testing.

THAAD program officials agree that the initial schedule was overly optimistic. The contractor's chief engineer for the THAAD program told us that if the schedule had allowed for better ground testing of the interceptor, at least some of the problems that caused flight-test failures would have been caught. The Army's initial plans allowed only 1 month between flight tests. In hindsight, according to the program manager, additional time to test components might have prevented some flight-test failures.

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<sup>4</sup>THAAD Independent Program Assessment, Final Report, Garber International Associates, Inc., September 30, 1994.

<sup>5</sup>Final Report, THAAD Independent Review Panel, July 29, 1996.

<sup>6</sup>Report of the Panel on Reducing Risk in Ballistic Missile Defense Flight Test Programs, Institute for Defense Analyses, February 27, 1998.

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**User Operational Evaluation System Requirement Diverted Attention and Limited Ability to Test Interceptor**

The User Operational Evaluation System was intended, in part, to provide an interim defense capability that could be used until the final system was ready. However, the planning and implementation of the User Operational Evaluation System diverted THAAD program management to some extent from its primary task of developing the interceptor and resulted in an interceptor designed more for deployment than for testing.

According to the Panel on Reducing Risk in Ballistic Missile Defense Flight Test Programs, the requirement for an early prototype system capability led program management to focus some of its attention on operational issues (such as training soldiers) rather than concentrating solely on developing and testing the interceptors. The User Operational Evaluation System requirement essentially demanded an operational capability before the interceptor was fully designed. This resulted in interceptors built for wartime use rather than equipped with sufficient instruments to provide optimum test data. According to the panel's report, because of the requirement for a User Operational Evaluation System, the program used parallel testing to save time rather than best practices, such as a sequential find-and-fix approach. The panel recommended eliminating the requirement for deployable prototype interceptors because acquiring such an early operational capability was inconsistent with the complexity of the task of developing the THAAD system.

THAAD program management agreed that the requirement for a User Operational Evaluation System was a distraction and reduced its ability to test the interceptor. The contractor's THAAD chief engineer told us that because of the requirement, the developmental interceptors were designed with fewer ways to test components and subsystems on the ground and the ground tests were made more difficult because test points were less accessible. The THAAD project manager also acknowledged that planning for User Operational Evaluation System interceptors had been a distraction to his team.

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**Inadequate Quality Assurance**

Inadequate quality assurance allowed problems to go undetected, and test analyses show that those problems caused most, if not all, of THAAD's six failures to intercept a target. According to DOD's Director of Operational Test and Evaluation, for example, quality control deficiencies in the manufacturing of the interceptors were a major factor in all but one of the



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first five flight-test failures.<sup>7</sup> Some of the failures were caused by debris that was allowed to get into components during the manufacturing process. A better quality assurance system could have prevented or caught these problems.

Although the government identified inadequacies in the contractor's quality assurance system, the contractor did not make improvements in a timely manner. As early as February 1994, the Army's first quality assurance audit of the THAAD contractor cited 11 areas in which the contractor did not comply with the quality assurance provisions of the contract. These included findings that the contractor had not performed internal audits or followed approved procedures. In addition, the audit team reported that the approved reliability program had not been fully implemented. The auditors noted that these deficiencies could result in flight-test failures, test program delays, and lower hardware reliability. Over 2 years later, in August 1996, another quality assurance audit showed that problems had not been resolved. That audit report cited quality system weaknesses, including a lack of quality assurance resources, and an inadequate system for reporting problems and related corrections. Between contract award in September 1992 and July 1995, the contractor reduced the number of staff performing quality assurance functions by two thirds. The audit report recommended a rededication and commitment by contractor management to the concept of quality.

According to some analyses, the contractor's management was not sufficiently committed to the program and did not provide the leadership to correct the problems and ensure the program's success. For example, following the 1996 quality assurance audit, the THAAD project manager expressed concerns about the contractor's leadership and management. He wrote that (1) the failure reporting and corrective action system was neither timely nor effective, (2) acceptance test plans and procedures were not defined, and (3) both the quality and quantity of quality assurance personnel were insufficient. The project manager concluded that the contractor's approach to quality assurance was not working and that a basic change in the contractor's management philosophy was required. The contractor responded with a detailed resolution plan in September 1996, but flight-test failures caused by quality problems continued. In May 1998, following the fifth intercept failure, the government's contracting officer

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<sup>7</sup>According to DOD's Director of Operational Test and Evaluation, a software processing error caused the other test failure.

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notified the contractor that its failure to achieve an intercept was endangering the contract. Subsequent agreements between the Army and the contractor addressing project office concerns were incorporated into the restructured THAAD program.

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### Inappropriate Contract Type

THAAD's cost-plus-fixed-fee type contract placed all of the program's financial risk on the government and, short of terminating the contract, did not include provisions that could be used to hold the contractor accountable for less than optimum performance. According to the May 1992 THAAD acquisition strategy report, a fixed-fee contract was used because of the potential for cost increases. The THAAD project manager told us that, at the time of the development contract award, the risks of schedule slips and cost increases were considered high, reducing the likelihood that a contractor would accept an incentive fee arrangement. No incentive on technical performance was believed to be necessary because technical risks were considered to be low. Under the cost-plus-fixed-fee arrangement, the government agreed to reimburse all of the contractor's allowable costs and pay a fixed fee. Because the contractor's fee was fixed at the beginning, it was not tied to accomplishment of cost, schedule, and performance objectives.

In November 1993, the Army Audit Agency cited THAAD as an example of an acquisition that did not use the proper contract type and did not provide appropriate incentives.<sup>8</sup> The audit pointed out that the Army structured contracts for the THAAD system's radar and interceptor differently. Although both components were in the program definition and risk reduction phase, the radar contract included both award and incentive fees, while the interceptor contract did not make use of incentives. The audit agency's report concluded that the approach taken in regard to the THAAD interceptor contract did not comply with sound contracting principles because it did not tie financial incentives to cost, schedule, and performance goals.

The THAAD project office expressed concern that the contractor was not taking the lead in identifying and fixing problems. The purpose of including

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<sup>8</sup>Research and Development Contracting, U.S. Army Audit Agency Report No. 94-700, November 20, 1993.

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incentives and/or penalty provisions is to provide a means of motivating the contractor to proactively identify and fix problems. Award fee contracts, for example, provide the government more control in terms of directly influencing the contractor's efforts.

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**Army Has Not Demonstrated Reliability of THAAD Hit-to-Kill Technology**

To date, THAAD test failures have been caused primarily by manufacturing defects rather than advanced technology problems. For example, a short in an electrical circuit caused one failure. Other failures resulted because debris was allowed to contaminate components such as infrared seeker parts during the manufacturing process. Despite the flight-test failures, independent reviews have concluded that the interceptor design should be capable of accomplishing its mission. However, according to the independent Panel on Reducing Risk in Ballistic Missile Defense Flight Test Programs, DOD initially underestimated the difficulty of performing "hit-to-kill" intercepts. Only 8 of the 24 hit-to-kill intercept attempts conducted since the early 1980s in various missile defense programs have been successful. Although the Army demonstrated THAAD's ability to hit another missile in June 1999, it has not shown that this technology can be reliably employed under all necessary conditions. For example, THAAD is required to intercept targets both inside and outside the atmosphere and under a variety of conditions, such as when targets employ countermeasures. The June 1999 intercept was in the higher regions of the atmosphere and the target did not use countermeasures. Future tests are planned for intercepts lower in the atmosphere and outside the atmosphere. Each region presents unique challenges; for instance, it may be more difficult for THAAD to distinguish between attacking warheads and debris and other objects during intercept attempts outside the atmosphere.

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**Restructured Program Addresses Underlying Problems, but Reliability Remains a Concern**

After the fifth successive test failure in May 1998, DOD restructured the THAAD program. The restructured program addresses each of the four underlying problems. However, because most interceptor components were produced before DOD restructured the program, their reliability remains a concern for future tests.

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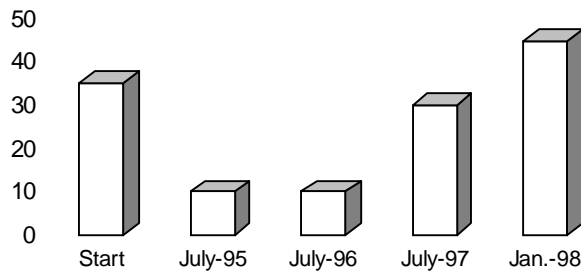
## Restructured Program Addresses Underlying Problems

THAAD's compressed flight-test schedule and inadequate ground testing were addressed by extending the schedule for the current phase of flight testing and adding ground tests. The THAAD project office allowed about 10 months between the fifth intercept failure in May 1998 and the sixth attempt in March 1999 in order to retest and recertify components. In addition, more extensive interceptor ground testing was implemented at the assembly facility prior to shipment to the test range and at the test range just prior to flight testing. Following these actions, THAAD failed its sixth intercept attempt in March 1999, but it successfully intercepted the target in its seventh attempt in June 1999. The remaining three flights of the current test phase are scheduled through December 1999 using the retested components. If two of the three intercept attempts are successful, THAAD will enter the engineering and manufacturing development acquisition phase; in this phase, flight tests are scheduled about 3 months apart to allow sufficient time for preflight testing, postflight analysis, and corrective actions.

Under the restructured program, the Army no longer plans to produce THAAD User Operational Evaluation System interceptors. As indicated previously, the requirement for these interceptors distracted contractor and government program management from its primary tasks of developing and testing the interceptor and resulted in a less testable design. Removing the requirement should eliminate this distraction, but because the design of the interceptor currently being flight-tested is little changed, limits remain on the ability to test it.

THAAD's restructuring also improved the quality assurance program. In September 1996, prior to the restructuring, the contractor issued a detailed plan to resolve concerns about its quality assurance program. That plan called for improvements such as (1) implementing a system for auditing and evaluating the effectiveness and performance of quality assurance contractual requirements, (2) dedicating personnel to support failure reporting analysis and corrective actions, and (3) performing all component acceptance procedures with trained quality assurance representatives. Under restructuring, the contractor reorganized and added a Vice President for THAAD Flight Testing, who, according to the THAAD project manager, has provided the leadership and commitment that was lacking. In April 1999, this official became responsible for the contractor's entire THAAD program. In addition, as shown in figure 1, the contractor has significantly increased the quality assurance staffing levels. Defense Contract Management Command representatives told us that, in their view, the contractor's current quality assurance staffing is sufficient.

**Figure 1: Contractor Staffing Levels Dedicated to THAAD Quality Assurance**  
Staffing levels



Source: THAAD Project Office.

The restructuring also added financial incentives to the development contract and introduced a degree of competition into the program, which may provide even more incentive for a successful program. As part of the THAAD restructuring, the Army and the contractor signed a contract modification in July 1998 that provides cost-plus-incentive-fee and award-fee elements to the original cost-plus-fixed-fee contract. The incentive provisions require the contractor to absorb up to \$75 million of development costs based on flight-test results. The contractor incurred the first \$15 million penalty following the failed intercept attempt on March 29, 1999. Under the remaining incentive-fee provisions, the contractor would also absorb (1) \$20 million if two intercepts have not occurred by July 16, 1999;<sup>9</sup> (2) \$20 million more if three intercepts have not occurred by October 16, 1999; and (3) yet another \$20 million if three intercepts have not occurred by January 16, 2000. However, if the contractor incurs initial penalties followed by successful intercepts, some of the penalties could be reimbursed. The contractor can be reimbursed up to \$35 million for three successful intercepts by January 16, 2000. In addition, the contractor could be awarded up to an additional \$20 million in reimbursement based on the contracting officer's subjective determination of the contractor's cost performance.

<sup>9</sup>One of the two intercepts was successfully conducted on June 10, 1999.

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DOD also introduced a degree of competition into the restructured program. DOD has proposed that THAAD and the Navy's Theater Wide system<sup>10</sup> compete for funding beginning in fiscal year 2002.<sup>11</sup> In December 2000, the Ballistic Missile Defense Organization plans to review the two programs in terms of cost, schedule, performance, and risk. It then plans to select one of the systems for enhanced funding in order to field that system by fiscal year 2007. The other program would continue in development, but at a slower pace. Regardless of which is chosen, the Army would continue development of the THAAD radar and battle management/command, control, communications, computers, and intelligence system for use in the overall theater air and missile defense mission.

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## Reliability Remains a Concern

The reliability of the interceptors that are planned for use during the current phase of flight-testing is an ongoing concern because most components were produced under inadequate quality assurance conditions. With the exception of the seeker (the component that locates and tracks the target and provides that information to the interceptor's computer), all components and subsystems were produced by 1996, before quality assurance improvements were made.

After the fifth failed intercept attempt in May 1998, all existing interceptor components were subjected to reevaluation and/or retesting. However, according to DOD's Director of Operational Test and Evaluation, retesting is not a substitute for initial production under adequate quality assurance processes. The Director also observed that hardware for the remaining THAAD interceptors was built several years ago, and only minor changes or upgrades can be made to this existing hardware.<sup>12</sup> According to the Director, until new hardware is built that incorporates improved manufacturing, quality assurance, and test processes, there is no reason to expect any significant improvement in the THAAD interceptor's

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<sup>10</sup>The sea-based Navy Theater Wide system is being designed to complement THAAD and help protect U.S. and allied forces against medium- to long-range theater ballistic missiles.

<sup>11</sup>The Senate's version of the fiscal year 2000 Defense Authorization Act (Senate bill 1059, section 221) if enacted into law would effectively bar this planned competition by requiring that the Secretary of Defense establish an acquisition strategy that bases funding and schedule decisions on the performance of each system independent of the other system.

<sup>12</sup>Fiscal Year 1998 Annual Report, Director, Operational Test and Evaluation, February 1999.

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performance. After extensive review, however, DOD decided to continue the current test program. THAAD failed its sixth intercept attempt in March 1999 because of an unreliable component, but it successfully intercepted the target during its seventh attempt in June 1999. The restructured program also provides for redesigning the interceptor with a view toward producing 20 interceptors for testing early in the engineering and manufacturing development phase.

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## Restructured Program Significantly Alters User Operational Evaluation System Concept and Capabilities

Because the restructured THAAD program does not include prototype interceptors intended for early deployment, the THAAD User Operational Evaluation System battalion will have little or no capability for intercepting enemy theater ballistic missiles. The restructured program includes a plan to produce 20 redesigned interceptors, called "risk reduction/contingency" interceptors, but unlike the 40 interceptors initially planned for the User Operational Evaluation System, all 20 of these interceptors are planned for testing in THAAD's next development phase. The risk reduction/contingency interceptors will (1) be designed to incorporate lessons learned from the current development phase, (2) have improved test instrumentation, and (3) consist of all new hardware to improve reliability and performance. Under the restructured THAAD program, the first of these interceptors would be delivered in 2003.

In addition to an interim system that could be deployed to intercept theater ballistic missiles, the User Operational Evaluation System was originally intended to (1) allow military users to influence the system design and (2) permit an early operational assessment of the system's capabilities. The THAAD battalion has provided feedback to influence the system's design, but according to the THAAD project manager, the battalion could accomplish this objective with significantly fewer soldiers than the 295 currently authorized. Restructuring the THAAD program removed the requirement for an early operational assessment of the User Operational Evaluation System.

The Army Training and Doctrine Command's system manager for THAAD has identified two potential military capabilities of the User Operational Evaluation System that might be of value to U. S. warfighters. First, risk reduction/contingency program interceptors planned for testing could be diverted to the User Operational Evaluation System battalion if military operations commence. However, the first of the risk reduction/contingency interceptors will not be available until 2003. Because most, if not all, risk reduction/contingency interceptors will be consumed soon after delivery

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by ground- and flight-testing, few, if any, of them would be available for contingency deployment. Up to 18 months could be needed to produce additional interceptors in excess of the 20 currently planned.

The second use postulated for the THAAD battalion is to use the THAAD radars to predict the launch and impact point of enemy missiles. However, DOD has not established a formal requirement for the THAAD radars to perform launch and impact point predictions. Also, DOD does not plan an independent assessment of the radar's operational capabilities for this mission. Both a formal requirement and an assessment of capabilities would be needed for a decision to deploy the User Operational Evaluation System radars because a wartime commander would have to use five or six C-5 aircraft that might be needed for other purposes.<sup>13</sup>

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## Conclusions

The restructured program addresses each of the THAAD program's four underlying problems. However, the reliability of current flight-test interceptors remains a concern because most components were produced when the contractor's quality assurance system was inadequate. Test failures caused primarily by manufacturing defects, rather than advanced technology problems, have prevented the Army from demonstrating that THAAD can reliably intercept targets in all required regions.

The restructuring of the THAAD program raises the issue of what the purpose of the User Operational Evaluation System battalion at Fort Bliss should now be. Whether all or only part of the battalion would warrant deployment for contingency operations would depend on the capabilities it could provide to warfighters and the priority of the need for one or more of those capabilities. However, there would be little basis for making a deployment determination because DOD does not plan to conduct an operational assessment of the User Operational Evaluation System.

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## Recommendations

We recommend that the Secretary of Defense determine and define which, if any, potential capabilities of the restructured THAAD User Operational Evaluation System are needed by the warfighter community. If warranted by that determination, we further recommend that the Secretary (1) direct

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<sup>13</sup>The Army estimates that 25 C-5, 37 C-17, or 67 C-141 flights would be needed to deploy the entire battalion, including launchers and missiles.



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that an independent operational assessment of the needed THAAD User Operational Evaluation System capabilities be conducted and (2) require the Army to determine the minimum essential military personnel and equipment required to fulfill the defined mission.

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## Agency Comments and Our Evaluation

In commenting on a draft of this report, DOD concurred with our recommendations. DOD said that the Army is currently assessing how the User Operational Evaluation System's capabilities can help meet near-term warfighting requirements. According to DOD, this review might change the battalion's force structure because interceptor missiles for test or possible deployment will not be available until fiscal year 2003. Until then, THAAD's potential contribution will be limited to enhancing surveillance and launch and ground impact point predictions and to providing data to other missile defense systems. The Army is working to determine the minimum number of military personnel and equipment needed to support the User Operational Evaluation System until interceptors are available. DOD also said that it will conduct an early operational assessment of the User Operational Evaluation System's capabilities before beginning THAAD engineering and manufacturing development in fiscal year 2000.

DOD also provided additional technical comments and suggested changes, which we incorporated. DOD's comments are included in appendix I.

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## Scope and Methodology

To identify underlying reasons for the program's difficulties, we reviewed pertinent government and contractor documentation, including contract files, audit reports, schedules, briefings, cost reports, integrated product team minutes, and contractor resolution plans and training plans. We also reviewed independent studies and discussed the studies' findings with knowledgeable officials. We compared the results of our review to the findings of the independent studies.

To assess the latest plans for restructuring the program and the impact of the restructuring on problems identified earlier, we reviewed revised program plans, integrated product team meeting minutes, and other planning documents. We also discussed elements of the restructured program with THAAD program officials, contractor representatives, representatives of the Army's user element, and independent test officials.

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To determine the impact of changes on the THAAD User Operational Evaluation System, we interviewed appropriate government and contractor officials (including user representatives) and reviewed pertinent contractor documents and government planning documents. We analyzed how the changes would affect the project office and potential users.

In Washington, D.C., we interviewed representatives from the Office of the Secretary of Defense; Joint Staff; Office of the Director, Operational, Test, and Evaluation, Ballistic Missile Defense Organization; and the Office of the Army's Deputy Chief of Staff for Operations. We also interviewed representatives from THAAD Battalion and Air Defense Artillery School, Fort Bliss, Texas; Raytheon Corporation and THAAD Battalion, White Sands Missile Range, New Mexico; Lockheed Martin Missiles and Space and Defense Contract Management Command, Sunnyvale, California; and THAAD project office and U.S. Army Space and Missile Defense Command, Huntsville, Alabama.

We conducted our work from August 1998 to June 1999 in accordance with generally accepted government auditing standards. At the end of our review, we updated our work to reflect the successful intercept test on June 10, 1999.

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As arranged with your staff, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from its issue date. At that time, we plan to provide copies of this report to the Honorable William Cohen, Secretary of Defense; the Honorable Lewis Caldera, Secretary of the Army; Lieutenant General Lester Lyles, Director, Ballistic Missile Defense Organization; the Honorable Jacob Lew, Director, Office of Management and Budget; and key committees of the Congress. We will make copies available to others upon request.

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If you or your staff have questions concerning this report, please contact me at (202) 512-4841. The major contributors to this report were Lee Edwards, Stan Lipscomb, and Tom Gordon.

Sincerely yours,

A handwritten signature in cursive script that reads "Allen Li".

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

23 JUN 1999

Mr. Allen Li  
Associate Director, Defense Acquisitions 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, "MISSILE DEFENSE: THAAD Restructure Addresses Problems But Raises Questions About UOES," dated May 11, 1999 (GAO Code 707376/OSD Case 1813).

The Department concurs with both of the draft report's recommendations with comments in the enclosure.

The draft report states (page 14), regarding prediction of the launch and impact point of enemy missiles, "Some additional radar software would have to be developed in order to perform this function . . . ." The Department disagrees since Estimated Launch Point and Ground Impact Point predictions are inherent capabilities of the current system. Also, on the same page, the draft report states, regarding the surveillance mission lift assets, ". . . a wartime commander would have to use significant transportation resources . . . that might be needed for other purposes . . . ." The Department disagrees and believes the report overstates the airframe quantities needed. Preliminary estimates indicate that it would take between five and six C-5 airframes to deploy the surveillance package referenced. The stated airframe assets are representative of the deployment of an entire THAAD UOES battalion including launchers and missiles.

The Department recommends that the GAO incorporate our comments into the final report.

Sincerely,

*George R. Schneiter*  
For: George R. Schneiter  
Director  
Strategic and Tactical Systems

Enclosure



GAO DRAFT REPORT DATED May 11, 1999  
GAO CODE 707376/OSD Case 1813

"MISSILE DEFENSE: THAAD RESTRUCTURE ADDRESSES PROBLEMS BUT RAISES  
QUESTIONS ABOUT UOES"

DOD COMMENTS ON GAO DRAFT REPORT

RECOMMENDATION 1: The GAO recommended that the Secretary of Defense determine and define which, if any, potential capabilities of the restructured Theater High Altitude Area Defense (THAAD) User Operational Evaluation system are needed by the warfighter community. (p. 3, p. 15/ GAO Draft Report)

Now on pp. 3 and 14.

DOD RESPONSE: Concur. The Army is currently assessing how THAAD UOES capability can help meet near-term warfighting requirements. This review might change the required THAAD UOES Battalion force structure. The warfighter community is aware of existing THAAD capabilities, and informational interchange activities continue to allow the community to include THAAD assets in their operational plans, at their discretion. Two UOES radars are operational in support of the THAAD flight test program, and their potential contribution to theater operations has been documented in studies, joint and combined exercises (e.g. Roving Sands 1998), and other interchanges with the warfighter community. In the restructured program, backward-compatible Engineering and Manufacturing Development (EMD) missiles will not be available for test or possible deployment until about FY03. Until then, THAAD's contribution will consist of enhanced surveillance, launch and ground impact point prediction, and lower-tier cueing.

RECOMMENDATION 2: If warranted (by the determination in Recommendation 1), the GAO further recommended that the Secretary of Defense (1) direct that an independent operational assessment of the needed THAAD User Operational Evaluation System Capabilities be conducted and (2) require the Army to determine the minimum essential military personnel and equipment required to fulfill the defined mission. (p. 3, p. 15/GAO Draft Report).

Now on pp. 3 and 14.

DOD RESPONSE: Concur. DOD Regulation 5000.2-R requires an early operational assessment (EOA) to support the Milestone II decision for the overall program. An EOA is planned for THAAD before the DAB milestone review. The assessment will include an evaluation of THAAD's current capabilities. As stated in the response to recommendation 1, the Army is working to determine the minimum number of essential military personnel and the equipment needed to support the reduced functionality available in the THAAD UOES system before mid-FY03.

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