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General Accounting Office
Washington, D.C. 20548

National Security and
International Affairs Division

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March 27, 1997

Congressional Committees:

Subject: Ballistic Missile Defense: Prototype THAAD System

During our ongoing review of the Army and the Ballistic Missile Defense Organization's development of the Theater High Altitude Area Defense (THAAD) missile program, we raised issues about the procurement of the prototype THAAD–the THAAD User Operational Evaluation System (UOES). In July 1996, we reported[1] our concern that funding will be committed to THAAD UOES interceptors well before testing provides a basis for assessing the UOES's operational effectiveness. We expressed an additional concern regarding THAAD UOES test limitations in a Letter of Inquiry to the Secretary of Defense.[2] In that January 6, 1997, inquiry, we questioned the Army's current plan to base a decision on UOES interceptor production on the results of test flight 7, then scheduled for late February 1997, using a different focal plane array[3]–platinum silicide–in the interceptor's seeker than the focal plane array–indium antimonide –which would be installed in all UOES interceptors. We asked the Department of Defense (DOD) to respond to questions relating to the risk of basing a production decision on a configuration different from that planned for production.

We provided you copies of that letter and we noted that we would also distribute copies of DOD's response. (See enclosure for DOD's answers to our questions.)

Test flight 7 was conducted on March 6, and like all three previous THAAD intercept tests, the interceptor failed to hit its target. DOD now plans to base the UOES production decision on test flight 8, scheduled for mid-1997, if it is successful. The interceptor for test flight 8 is to contain the same type seeker

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[1]Ballistic Missile Defense: Issues Concerning Acquisition of THAAD Prototype System (GAO/NSIAD-96-136, July 9, 1996).

[2]Prototype THAAD System (GAO/NSIAD-97-70R, January 6, 1997).

[3]The THAAD focal plane array is a heat-sensitive device that performs thermal imaging for tracking, discrimination, and aim point selection of targets to achieve hit-to-kill engagements.

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that will be installed on the UOES interceptors. As a consequence, our concern about producing a configuration different than the one tested and DOD's response have become moot.

DOD, however, still plans to commit over $200 million to UOES interceptor production on the basis of a single successful intercept and despite four consecutive failures. Therefore, our initial concern about the limited amount of testing planned before UOES interceptor production remains. As we reported in July 1996, based on current plans, DOD will commit funds for producing 40 UOES interceptors well before testing provides assurance of the UOES system's capabilities. Our work has repeatedly shown that when production of weapon systems began on the basis of schedule or other considerations rather than on the basis of technical maturity, major design changes were often needed to correct problems. The design changes frequently led to additional testing and costly retrofit of units already produced.[4] Because sufficient data for a limited assessment of the operational effectiveness of the UOES system will not be available until limited user tests are completed in 1998, DOD risks acquiring a system that might not be capable enough to warrant its deployment in an emergency.

In preparing this letter, we obtained current program schedule and test information from the THAAD project office in Huntsville, Alabama. This review was performed under our basic legislative responsibility. We are addressing this letter to you because the issue we raise falls under your Committee's jurisdiction. We are also making copies of this letter available to others upon request.

If you have any questions, please contact me at (202) 512-4841. Lee Edwards, Assistant Director, and Stan Lipscomb, Evaluator-in-Charge, also contributed to the information in this letter.

Thomas J. Schulz
Associate Director
Defense Acquisitions Issues

Enclosure

[4]See Weapons Acquisition: Low-Rate Initial Production Used to Buy Weapon Systems Prematurely (GAO/NSIAD-95-18, Nov. 21, 1994).

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ENCLOSURE I

OFFICE OF THE UNDER SECRETARY OF DEFENSE

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WASHINGTON, DC 20301-3000

ACQUISITION AND
TECHNOLOGY

February 6, 1997

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

Dear Mr. Schulz:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) Letter of Inquiry GAO/NSIAD-97-70R, "Theater High Altitude Area Defense Prototype Interceptors," dated January 6, 1997 (GAO Code 707232), OSD Case 1275.

The DoD detailed comments in response to the questions are provided in the enclosure.

Sincerely,

George R. Schneiter
Director
Strategic and Tactical Systems

Enclosure

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GAO Letter of Inquiry GAO/NSIAD-97-70R
Dated January 6, 1997
(GAO Code 707232), OSD Case 1275

"THEATER HIGH ALTITUDE AREA DEFENSE PROTOTYPE INTERCEPTORS"

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DEPARTMENT OF DEFENSE COMMENTS

Question 1: How does DoD justify basing a production decision for User Operational Evaluation System (UOES) interceptors on a test of a single intercept (if successful) with a platinum silicide (PtSi) seeker while planning to produce interceptors with the indium antimonide (InSb) seeker?

DoD Response: The decision to award the UOES option is based upon confidence in the extensive testing conducted to date on both the PtSi and InSb seekers and their high degree of component commonality. To clarify statements made in the Background section of the GAO's letter, the InSb seeker is less, not more complex than the PtSi seeker. The InSb seeker components are approximately 95% common with the PtSi seeker. The platform, optics, and gimbals are identical, while other components, such as the seeker electronics assembly and the dewar, are nearly identical.

The fabrication, calibration, and integration of an InSb focal plane is also less complex than with PtSi. Although the InSb focal plane will require different signal processing software (SW), the development and coding is proceeding on schedule. In addition, Hardware-In-The-Loop (HWIL) testing is nearing completion and has demonstrated the ability of an InSb seeker, software, and the flight test computer to successfully perform target acquisition. The similarity between the PtSi and the InSb seekers and their demonstrated performance in stand-alone seeker testing provide confidence in the decision to exercise the UOES option.

Additionally, the planned intercept on Flight Test 7 (FT-07) culminates in more than meeting "one minimal criterion." Each flight test is directed at achieving a number of objectives to include the intercept. A large majority of these flight objectives have been met during previous tests. With respect to the missile kill vehicle, objectives already met include shroud separation, target acquisition, and closed-loop tracking and navigation in response to the radar's In Flight Target Update (IFTU). An intercept on FT-07 will confirm the system's end-to-end capability.

Finally, this is not a production decision. The THAAD program is in the Program Definition and Risk Reduction Phase of the acquisition life cycle. The UOES consists of development hardware

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of this early phase of the THAAD development, and lessons learned in subsequent testing have always been contemplated to correct deficiencies, to improve performance, and to gain more insight into the objective system development.

Question 2: How and by whom has the InSb seeker's performance been validated?

DoD Response: Lockheed Martin Infrared Imaging Systems (LMIRIS) has characterized performance of the InSb seeker through a series of engineering development and acceptance tests. The InSb seeker has satisfactorily completed all acceptance test procedures at LMIRIS. Due to the commonality of the seekers, many of the tests for the InSb seeker are similar to those performed on the PtSi seeker. Integration of the InSb seeker with the flight computer has also been demonstrated at Lockheed Martin Missiles and Space (LMMS) in Sunnyvale. Although extensive integration testing is planned prior to the flight, the interfaces and operation of the seeker with the flight computer have been successfully demonstrated. Integrated testing, combined with stand-alone testing, provides confidence in the InSb seeker performance.

Question 3: What is the cost, schedule, and performance risk associated with the InSb seeker? Also, what is the current status of InSb seeker production and the most recent experience with the rejection rate during production of the InSb and the PtSi seekers?

DoD Response: The cost risk associated with the UOES missile option is low. The Dem/Val contract was awarded when the THAAD concept consisted of paper studies. Since then, missiles have been fabricated and undergone extensive component and flight testing, which produced a more mature design. Lockheed Martin provided a proposed estimate, based largely on subcontractor proposals, which compares favorably to a Government estimate based on Dem/Val actuals. Further, Lockheed Martin has worked closely with the subcontractors to understand and refine the cost estimates, thus resulting in a proposal that has essentially been negotiated prior to the option award. The THAAD Project Office is currently investigating options which could further abate the cost risk associated with the UOES option.

The schedule risk for the InSb seeker is lower than for the PtSi seeker. InSb focal planes are two to three times more producible than PtSi. The InSb focal plane arrays are off-the-shelf items and, therefore, have a shorter delivery lead time than PtSi focal planes. In addition, the fact that they are off-the-shelf allows for individual selection of the highest quality focal planes from the on-hand supply.

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With respect to the status of InSb production, InSb seeker manufacturing is underway for the remainder of the Dem/Val flight tests. To date, four units have been fabricated, and time to assemble, integrate, and test the four units has been demonstrated to be shorter than required for the PtSi seeker.

The performance risk associated with this effort is low. The THAAD program initiated the development and introduction of the InSb seeker to reduce program risk based on the marginal performance of the PtSi seekers against known threat scenarios. The InSb seeker is capable of two to three times the acquisition range of the PtSi seeker and meets performance requirements for the objective system, which PtSi does not. Extensive testing conducted on the InSb seeker has confirmed its capability to meet the THAAD program requirements and reduce overall program risk.

Question 4: Will production of UOES interceptors with InSb seekers continue if test flight 8 using an InSb seeker fails to hit its target? If this occurs and production continues, can seekers be retrofitted to correct problems? If production stops, what is the cost of stopping and restarting the production line?

DoD Response: Manufacture of the UOES interceptors may be impacted if the InSb seeker fails to perform on flight test 8. This test is scheduled for June 1997, three months after the UOES contract award is planned. Stopping manufacturing, however, is not anticipated, since the seeker is integrated during the latter portion of the missile assembly process. In the current schedule, all of the remaining Program Definition and Risk Reduction (PD&RR) flights will be completed prior to assembly of the first UOES seeker; this should allow for thorough flight testing of the seeker. Therefore, if a problem occurs during the remaining PD&RR flight testing, there should be sufficient time to incorporate any redesign/retrofit prior to the final seeker integration into the missiles. In the unlikely event of halting seeker manufacture on the UOES missile, it would cost approximately $2.5M a month at LMIRIS, based on the planned expenditure profile for 40 seekers.

A seeker failure during flight testing would not necessarily imply a fundamental design and/or process change that would disrupt manufacture of the missiles. The technical risk associated with the InSb integration effort, and therefore the likelihood of a production halt, is reduced based on a number of factors. InSb focal plane array technology has matured to such a degree that it is a commercially viable, off-the-shelf product. The InSb seeker assembly is less complex and shares 95% commonality of components with the PtSi seeker assembly and will have been successfully demonstrated on FT-07. Further, confidence in performing the InSb seeker integration is derived from the extensive HWIL and flight test experience acquired to date with the PtSi seeker.

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