

GAO

Report to the Subcommittee on
Emerging Threats and Capabilities,
Committee on Armed Services, U.S.
Senate

May 2007

DEFENSE ACQUISITIONS

Success of Advanced SEAL Delivery System Hinges on Establishing a Sound Contracting Strategy and Performance Criteria



Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE MAY 2007		2. REPORT TYPE		3. DATES COVERED 00-00-2007 to 00-00-2007	
4. TITLE AND SUBTITLE Defense Acquisitions. Success of Advanced SEAL Delivery System Hinges on Establishing a Sound Contracting Strategy and Performance Criteria				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Government Accountability Office, 441 G Street NW, Washington, DC, 20548				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES 28	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			



Highlights of [GAO-07-745](#), a report to the Subcommittee on Emerging Threats and Capabilities, Committee on Armed Services, U.S. Senate

Why GAO Did This Study

The Advanced SEAL Delivery System (ASDS) is a hybrid combatant submersible providing clandestine delivery and extraction of Navy SEALs and equipment in high-threat environments. The first ASDS has had significant performance issues and has cost, to date, over \$885 million. In May 2006, you requested that GAO review ASDS. This report examines (1) how the Navy managed ASDS risks through its contracts and (2) the status of major technical issues and program restructuring.

What GAO Recommends

GAO is making recommendations to the Secretary of Defense to help ensure that a decision to proceed with ASDS is based on acceptable cost, schedule, and performance criteria; that essential design changes are operationally tested prior to a program decision; and that the future contract strategy appropriately balances risk and promotes better accountability. DOD partially concurred with GAO's first two recommendations and concurred with the third recommendation.

www.gao.gov/cgi-bin/getrpt?GAO-07-745.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Paul Francis at (202) 512-4841 or francisp@gao.gov.

DEFENSE ACQUISITIONS

Success of Advanced SEAL Delivery System Hinges on Establishing a Sound Contracting Strategy and Performance Criteria

What GAO Found

The Navy did not effectively oversee the contracts to maintain, repair, and upgrade the ASDS and failed to hold the prime contractor accountable for results. The Navy took responsibility for correcting the boat's deficiencies while continuing to pay the costs and fees of the prime contractor under cost reimbursable contracts to execute the corrections. Before accepting the boat, the Navy went to sources other than the prime contractor to obtain better designs for the propeller and battery and then paid the prime contractor to install them. When the Navy accepted the ASDS in 2003 in an "as is" condition, it relieved the contractor from having to take any additional actions to correct known problems. Since then, the U.S. Special Operations Command has continued to invest millions of dollars to fix existing problems and address new ones in an attempt to make the boat operational. In making this additional investment, the Navy entered into contracts with the prime contractor that provided little incentive to control costs, authorized work before reaching agreement on the scope and price of the work to be performed, and failed to finalize the terms of the work within required time frames. Meanwhile, the contractor's performance continued to be poor, often exceeding initial estimates for the time and cost required to perform the work. ASDS officials took actions over the past 2 years to address these issues, but acknowledge that it is too early to determine the effectiveness of more recent actions to incentivize the contractor's performance.

Continuing problems with the existing ASDS led to DOD's April 2006 decision to cancel plans to buy additional ASDS boats, establish an improvement program for the in-service ASDS, and conduct an assessment of alternative material solutions to fulfill remaining operational requirements. The problems have seriously degraded the boat's reliability and performance, and the boat is only available for limited operational use. The results of these improvement and assessment efforts are expected to provide DOD the knowledge needed to determine whether ASDS's reliability can be improved cost-effectively to make ASDS an operational asset and whether an alternative development program is needed to meet the remaining operational requirements. A program decision is planned in mid-2008, after the ASDS improvement program and assessment of alternate material solutions are completed.

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Abbreviations

ARAP	ASDS Reliability Action Panel
ASDS	Advanced SEAL Delivery System
BOA	basic ordering agreement
DOD	Department of Defense
FAR	Federal Acquisition Regulation
JROC	Joint Requirements Oversight Council
SOCOM	Special Operations Command

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United States Government Accountability Office
Washington, DC 20548

May 24, 2007

The Honorable Jack Reed
Chairman
The Honorable Elizabeth Dole
Ranking Member
Subcommittee on Emerging Threats and Capabilities
Committee on Armed Services
United States Senate

The Advanced SEAL Delivery System (ASDS), a hybrid combatant submersible, is one of the U.S. Special Operations Command's (SOCOM) largest investments. The ASDS is designed for clandestine delivery and extraction of Navy SEALs and equipment in high-threat environments. In 2006, the Department of Defense's (DOD) *Quadrennial Defense Review Report* revalidated the need for the type of capabilities that ASDS is designed to provide.

The ASDS has encountered a difficult, long, and costly development since the initial contract was awarded in 1994. The first ASDS boat did not meet all technical or performance requirements, yet in 2003 it was accepted by the Navy for operational use. Since acceptance, ASDS has exhibited significant reliability and performance issues during test and operation, and an in-service improvement effort has begun. For the most part, the Navy has used the same contractor to design and deliver the boat, to develop corrections to performance and reliability problems, and to support the boat in the field. Total program costs—including research and development, procurement, military construction, operations and maintenance, and military personnel costs—have reached about \$885 million.

In May 2006, you requested that GAO review the status and problems facing the ASDS program. We subsequently agreed to address the issues in two separate efforts. This report examines how the Navy managed ASDS risks through its contracts and the status of major technical issues and program restructuring.

Results in Brief

The Navy accepted the ASDS in an “as is” condition to make the boat operational, but it has not effectively overseen the contractor’s efforts to maintain, repair, and upgrade the boat, nor has it held the contractor accountable for results, including the contractor’s inability to adhere to its own estimates of the time and cost to do the work. As problems mounted during development and new problems arose after acceptance, the Navy increasingly assumed responsibility for their resolution. Further, the Navy’s choice of contract type provided little incentive to control costs; it authorized work before reaching agreement on its scope and price; and it failed to finalize the terms of the work when that was required. While ASDS officials reported they have attempted over the past 2 years to address these issues, the results of more recent efforts to incentivize the contractor’s performance are not yet clear.

Because of ASDS reliability and performance problems, the boat is only available for limited operational use. These problems prompted DOD’s decision in April 2006 to cancel purchases of additional boats as well as to establish a program to improve the in-service ASDS and assess alternatives to fulfill remaining operational requirements. The results of these two latter efforts are expected to help DOD determine if ASDS can be made reliable enough to maintain it as an operational asset and whether an alternative development program would be preferable. A decision is planned in mid-2008.

We are making recommendations to the Secretary of Defense to help ensure that a decision to proceed with ASDS is based upon acceptable cost, schedule, and performance criteria; that essential design changes are operationally tested prior to a program decision; and that the future contract strategy appropriately balances risk and promotes better accountability.

DOD partially concurred with our first two recommendations and concurred with the third one. In partially concurring with our first recommendation, DOD commented that under its new ASDS management plan, program decisions will be made through management reviews using specified evaluation criteria and not solely at the completion of the critical systems reviews. We believe that, to be complete, such criteria must be based on fully defined scopes of work, and we have clarified the recommendation to include both the management reviews and the stronger criteria. On the second recommendation, DOD noted that some design changes may not be complete by the mid-2008 decision. We have clarified our recommendation to include testing those design changes essential to demonstrating ASDS reliability and maintainability.

Background

The special operations forces' ASDS is a battery-powered, dry interior submersible that is carried to a deployment area by specially configured 688-class submarines. ASDS is intended to provide increased range, payload, on-station loiter time, endurance, and communication/sensor capacity over current submersibles. The 65-foot-long, 8-foot-diameter ASDS is operated by a two-person crew and includes a lock out/lock in diving chamber.¹ SOCOM is the resource sponsor and provides the requirements and funding, and the Naval Sea Systems Command—the Navy's technical expert for major undersea systems—is the program manager responsible for overseeing the prime contractor, Northrop Grumman Corporation. Over the years, the ASDS acquisition milestone decision authority has resided at various levels within DOD.

In 1994, the Navy awarded a \$70 million cost-plus incentive fee contract² to Westinghouse Electric Corporation's Oceanic Division in Annapolis, Maryland, for detailed design, construction, testing, documentation, refurbishment, and delivery of the first ASDS with the option to build one or two more systems. In 1996, Northrop Grumman bought this division and assumed responsibility for the Annapolis division's performance on the ASDS contract. In December 2005, ASDS program management lead was reassigned to Northrop Grumman in Newport News, Virginia, which has greater technical experience in submarines, and Northrop Grumman Electronic Systems in Annapolis is assisting.

The original program's schedule called for delivery of the first boat in July 1997. However, numerous technical problems with key subsystems contributed to performance shortfalls, schedule delays, and cost increases. In August 2001, the Navy program office took what it called "conditional" preliminary acceptance of the first boat from Northrop Grumman under an agreement that all requirements needed for final acceptance would be completed within 1 year, requirements that the contractor was unable to accomplish. On June 26, 2003, the Navy elected to accept the ASDS boat in an "as is" condition, and incorporated additional waivers, deviations, and engineering change proposals into the contract. As a result, acceptance of the ASDS boat did not require any additional actions on the part of the

¹A chamber used to treat divers suffering from decompression sickness, which can be caused by descending below sea level.

²A cost-plus incentive fee contract as a cost-reimbursement contract that provides for the amount a contractor earns as profit or fee to be adjusted based on the contractor's ability to meet established cost targets. Federal Acquisition Regulation (FAR) 16.304.

contractor. Further, the Navy did not seek any consideration from the contractor because Navy officials believed at the time that the ASDS met virtually all of its requirements. By that time, the total costs for the ASDS development contract had already increased from \$70 million to more than \$340 million.

In October 2003, following the Navy's acceptance of ASDS, the Navy negotiated and signed a basic ordering agreement (BOA)³ with Northrop Grumman to provide a range of goods and services to support the ASDS program. For example, the BOA enabled the Navy to order engineering and design services; overhaul, repair, and inspection services; logistical support; and spare parts and materials for a 3-year period. The BOA was extended an additional year in 2006. To expedite the contracting process, the BOA established specific labor rates for different types of service, such as program office, technical, engineering, operations, and quality support. Through March 2007, the Navy issued 26 delivery orders with an estimated value of over \$84 million. The duration of the current BOA extends through September 2007, and the Navy anticipates awarding a new BOA for another 2 years while overall ASDS performance is reevaluated. Under another BOA, Northrop Grumman is also providing ASDS engineering services, such as engineering changes and drawing updates, for Portsmouth Naval Shipyard.

In assessing the ASDS program we drew heavily from our previous work on best practices in defense acquisitions. This work has shown that both a sound business case and effective contracting strategy are essential for success. A sound business case involves firm requirements and mature technologies, a knowledge-based acquisition strategy, realistic cost and schedule estimates, and sufficient funding. An effective contracting strategy involves selecting a contractor with proper expertise, choosing contracting approaches that effectively balance risk, and effectively managing and assessing contractor performance; all of which are intended to promote accountability for outcomes and protect the taxpayers' interests.

³A basic ordering agreement (BOA) is a written understanding between a government entity and a contractor that contains the terms and clauses applying to future orders; describes the types of supplies and services to be provided; and contains the methods for providing, issuing, and delivering future orders. A BOA is not a contract. FAR 16.703. For example, a BOA differs from a standard contract in that the specific goods and services to be provided, their cost, and the delivery schedule or period of performance are not established until an order is issued.

Critical flaws in the Navy's initial business case contributed to ASDS's acquisition challenges and increased the government's risk. We have previously reported⁴ that the capabilities required of the boat outstripped the contractor's resources in terms of technical knowledge, time, and money. The Navy's overly optimistic assumptions about the contractor's ability to readily incorporate existing submersible and commercial technology into the ASDS resulted in a mismatch between technologies and needed capabilities and an ill-advised decision to combine developmental and operational testing. Further information on the technical, cost, and management issues that undermined the ASDS's initial business case may be found in appendix I.

Navy Assumed Responsibility for ASDS Problems through Its Decisions and Contracting Approach

As existing problems mounted during development and new ones arose after acceptance, the Navy increasingly assumed responsibility for resolving them. This responsibility required additional time and money over the targets that had been established by the ASDS development contract. Since accepting the ASDS in June 2003, SOCOM has continued to invest millions of dollars to fix both old and new problems. The prime contractor has had little incentive to control costs given the Navy's choice of certain cost-reimbursable contract types. Navy officials say they accept more risk of performance because ASDS relies on new, highly technical subsystems that are inherently risky. The Navy's risk also increased because it authorized work before reaching agreement on key contract terms and conditions and failed to finalize them in a timely manner, indicating a lack of discipline in the contracting process.

Over Time, the Navy Assumed the Cost and Responsibility for Correcting ASDS Problems

Resolving the flawed initial business case required additional time and money, far exceeding the target cost and delivery time frames established under the ASDS September 1994 development contract. For example, the development contract was awarded for about \$70 million with an expected delivery date of the first ASDS boat in July 1997. When the contractor proved unable to meet these time frames, the Navy found itself having to rebaseline the program in 1998 and 1999, more than doubling the estimated development cost and extending the delivery schedule by more than 2 years. Ultimately the development cost almost quintupled.

⁴GAO, *Defense Acquisitions: Advanced SEAL Delivery System Program Needs Increased Oversight*, [GAO-03-442](#) (Washington, D.C.: Mar. 31, 2003).

During the course of ASDS's development, the Navy gradually assumed responsibility for addressing ASDS's technical problems by awarding separate contracts to other organizations to develop key components. The contractor's lack of expertise in key technologies, such as the propeller and battery, contributed to the Navy's decision to seek outside expertise to develop alternative solutions. More information on these actions is provided in appendix I.

The Navy finally accepted the first ASDS boat in June 2003 in an "as is" condition. Since the June 2003 acceptance, however, SOCOM has continued to invest millions of dollars to address old and new technical and reliability issues. Through March 2007, the Navy has issued delivery orders with an estimated value of about \$84 million under the BOA with Northrop Grumman. Much of the funding has been for efforts to correct design deficiencies and to improve ASDS's reliability.

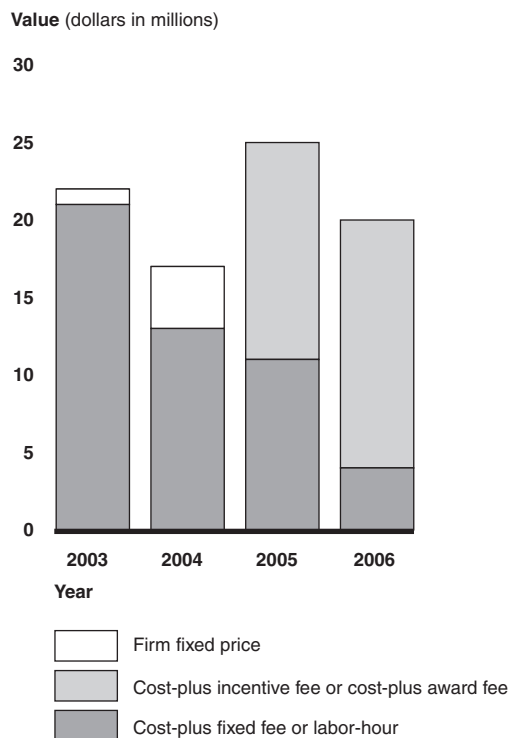
Navy's Cost-Reimbursable Contracts Provided Little Incentive to the Contractor to Control Costs

Arrangements that appropriately share risk, incentivize performance, and provide for accountability promote successful acquisition outcomes. The government can choose from a range of contract types available to it that gives it flexibility to acquire goods and services. The selection of contract type is generally a matter of risk allocation: fixed-price contracts place the risks associated with performing the contract on the contractor; cost-type contracts share the risk between the contractor and the government. The risk associated with performance shifts between the parties depending on the type of cost contract selected. In selecting the contract type, the government must consider the difficulty of providing the goods and services in the time allocated for contract performance. For example, when the risks are minimal or can be predicted with an acceptable degree of certainty, such as when the government and the contractor have sufficient knowledge of the effort required, then the government uses a fixed-price contract, and the contractor has full responsibility for the performance costs and the resulting profit or loss. In contrast, when the extent of product knowledge is more limited, the government uses a cost-reimbursable contract; the government assumes more risk and may try to motivate the contractor's performance by using various incentive or award fee provisions.

Our review found that nearly all of the \$84 million in design, integration, and reliability improvement work authorized under the Navy's October 2003 BOA with Northrop Grumman used some form of a cost-reimbursable contract. About 6 percent were conducted under a fixed-price type arrangement. Of the first 18 delivery orders issued through early May 2005,

14 were either cost-plus fixed fee or labor-hour orders. Cost-plus fixed fee arrangements negotiate the fee at the inception of the contract and do not vary with the actual costs incurred by the contractor. Labor-hour contracts provide for direct labor hours at specified fixed rates that include wages, overhead, general, and administrative expenses. As profit and other expenses are already included in the rates charged to the government, the orders provided no profit incentive for the contractor to control costs or work efficiently. Correspondingly, our analysis found that the ASDS contractor often exceeded the initial estimates of the time and cost required to complete the work: 12 of the 26 delivery orders issued under the BOA exceeded the initial cost estimates, while the delivery schedule was extended on 20 of the 26 orders. Figure 1 shows the value of all delivery orders and subsequent modifications by contract type through March 2007, based on the year the order was initially issued.

Figure 1: ASDS Delivery Order Arrangements through March 2007



Source: GAO analysis of ASDS delivery orders.

Navy officials told us that they chose cost-plus fixed fee or labor-hour orders, in part, because ASDS relied on many new and highly technical

subsystems that were inherently risky. The ASDS contracting officer told us that the choice of cost-plus fixed fee or labor-hour orders reflected the perceived risk in the efforts, that is, the technical requirements and the work that needed to be done were not always well-defined or known in advance. Navy officials reported, however, that to get the contractor to more actively manage and be accountable for success, the Navy has increased the use of award and incentive fee provisions on its cost-type orders, placing at least some of the contractor's potential fee at risk. For example, Navy officials noted that two of the three delivery orders issued in 2006—representing about 80 percent of the value of ASDS work ordered under new delivery orders during the year—contained award or incentive fee provisions. While the Navy officials acknowledged that it was too early to quantify the results of these approaches, preliminary indications are that the contractor's performance has improved and that the arrangements are providing sufficient risk sharing and monetary incentives to motivate contractor performance. Further, the contracting officer anticipated that the Navy would use more fixed-price arrangements as more experience is developed with ASDS repair and maintenance requirements.

Authorizing Work before Reaching Agreement on Key Terms and Conditions Increased the Navy's Risk

Our analysis also found that the Navy often initiated work using undefinitized contract actions; that is, before the Navy and contractor had reached agreement on key terms and conditions of the delivery order, such as the scope of the work to be performed and the price of that work. While this approach allows agencies to begin needed work quickly, it also exposes the government to potentially significant additional costs and risk. For example, in September 2006 we reported on how DOD addressed issues raised by the Defense Contract Audit Agency in audits of Iraq-related contract costs.⁵ We found that DOD contracting officials were less likely to remove costs questioned by auditors if the contractor had already incurred those costs while the contract action was undefinitized.

Our analysis found that 10 of the 26 ASDS delivery orders—accounting for about 14 percent of the work—were initiated as undefinitized contract actions. In most cases, the Navy justified the use of this approach by stating that the work needed to begin immediately to meet urgent operational requirements. For 7 of these 10 orders, the Navy failed to definitize the orders within the 180-day time frame required under defense

⁵GAO, *Iraq Contract Costs: DOD Consideration of Defense Contract Audit Agency's Findings*, [GAO-06-1132](#) (Washington, D.C.: Sept. 25, 2006).

acquisition regulations, taking instead from 228 to 509 days. In three cases, the Navy definitized the orders after the work had been completed.

The delivery order to replace the ASDS's hydraulic reservoir illustrates the need to clearly define the scope of the work, provide effective management and oversight, and hold the contractor accountable for outcomes. The delivery order issued to the contractor on June 10, 2005, was a \$1.0 million cost-plus fixed fee undefinitized contract to replace the ASDS's hydraulic reservoir. In October 2005, the contractor reported it would need about \$444,000 extra to complete the project. Rather than provide additional funds, the Navy elected to reduce the scope of the work, and the order was definitized on March 1, 2006—nearly 9 months after the work was initially authorized—at a cost of about \$937,000. Two days later, the contractor reported that the projected cost of the work had almost doubled to more than \$1.85 million. In a letter to the contractor, the Commander, Naval Sea Systems Command, noted that at no time during negotiations had the contractor identified the potential cost growth. Nevertheless, as of December 20, 2006, a further modification to the delivery order increased the estimated cost to \$2.8 million and extended the delivery date by 60 days.

Navy officials acknowledged that the use of undefinitized contract actions and the failure to definitize them in a timely fashion indicated a lack of discipline in the contracting process, but noted that officials had taken a number of actions to address the issues, including taking more time to define requirements and requiring the contractor to submit more realistic cost and schedule estimates. Furthermore, the Navy has not issued an undefinitized contract action since July 2005.

DOD Evaluating Future Options for Meeting Required Capabilities

Continuing reliability problems led to a DOD decision to cancel purchases of additional ASDS boats, following on an earlier decision to decertify ASDS for operational test readiness because of considerable performance and reliability issues that required significant additional resources for new development, investigations, rework, and design changes. Instead, DOD directed the establishment of an ASDS improvement program and an assessment of alternate material solutions to fulfill remaining operational requirements. The results of both should allow DOD to make an informed decision as to its future needs by mid-2008.

Additional Procurements Canceled Because of Continuing Reliability Problems

The Navy decertified ASDS from operational test readiness in October 2005, following a propulsion-related failure during an attempt at follow-on operational test and evaluation. This failure, however, was among a series of performance and reliability issues identified over the course of ASDS development. These performance and reliability problems have required significant additional resources to support new development, investigations, re-work, and design changes. Some changes have not been fully corrected or verified in operational testing. For example, in December 2003, while transporting ASDS mated to the host submarine, severe damage occurred to the ASDS tail section—the propeller assembly, the stator, and the stern planes. The Navy’s investigation attributed the cause to improper maintenance procedures—inadequate assembly by Portsmouth Naval Shipyard personnel. The propeller assembly and stern plane designs were improved and maintenance procedures were changed. In June 2004 testing of repairs, however, the ASDS propeller stator broke off and damaged the propeller. The investigation found that the stator had been improperly manufactured by a subcontractor. The tail damage was repaired by Northrop Grumman at the Navy’s expense. During follow-on test and evaluation in October 2005, ASDS experienced a propulsion system failure that was attributed to improper assembly/installation of the new titanium tail.

Because of the investigations of the December 2003 and June 2004 ASDS tail casualties, the Navy re-evaluated the effects of unsteady hydrodynamic loads on the boat. Although neither casualty was attributed to this type of load, the Navy determined that, due to fatigue stresses, the aluminum tail was not structurally adequate to last the life of the ASDS. The tail was replaced with a titanium and composite-based tail, but the replacement has not resolved all the tail assembly design deficiencies. To minimize the potential for damage to the tail, the Navy has imposed operating restrictions that limit the speed of the host submarine while transporting ASDS, which will remain in effect until this issue has been resolved.

In September 2005, the Navy and SOCOM chartered the ASDS Reliability Action Panel (ARAP)—consisting of technical experts from government and industry—to conduct an independent assessment of reliability.⁶ After the 2005 propulsion system failure, the ARAP was asked to assess ASDS’s

⁶The charter for the ARAP is to provide an independent assessment of ASDS reliability and provide recommended ASDS design, process, and procedural changes to improve reliability or mitigate shortfalls.

readiness to resume testing. ARAP's report indicated that there were numerous examples of unpredicted component reliability problems and failures resulting from design issues, and recommended not resuming testing until detailed reviews of mission critical systems were completed. In November 2005, SOCOM restructured the ASDS program to focus on improving reliability of the existing boat before investing in additional boats. The existing boat is currently available only for limited operational use.

In April 2006, DOD canceled plans to procure follow-on ASDS boats and directed the Navy and SOCOM to (1) establish an ASDS-1 improvement program to increase the performance of the existing boat to the required level, to insert technologies to avoid obsolescence, and to complete operational testing and (2) assess alternate material solutions to fulfill remaining operational requirements. In May 2006, DOD reported to the congressional defense committees that the first ASDS would be maintained as an operational asset, and that an ASDS improvement program was planned through fiscal year 2008. As currently structured, the ASDS reliability improvement program includes four elements

- ASDS Phase 1 and Phase 2 critical systems reviews,
- technical peer reviews,
- reliability builds or upgrades, and
- verification testing.

The results of the Phase 1 critical systems review are due in June 2007 and are expected to include prioritized corrective actions and associated cost and schedule estimates.⁷ According to Navy officials, the Phase 1 results

⁷The Phase 1 program is intended to address seven systems, including (1) hydraulics; (2) battery and power distribution; (3) main propulsion and thruster maneuvering; (4) life support; (5) variable and freeboard ballast; (6) sensors; and (7) host submarine interface. The Phase 1 program will also address five cross-system technical areas: hydrodynamics (based on a study of the entire vehicle, across all host platforms); vibration; naval architecture (weights); electromagnetic compatibility; and corrosion issues.

are expected to identify critical upgrades to improve reliability and make ASDS-1 a viable operational asset.⁸

At-sea tests to verify that corrections result in improved performance and reliability are being conducted. In October 2006 ASDS completed a successful 2-week underway period operating from a host submarine to verify and test repairs that were made to the propulsion system. In February and March 2007, following installation of 15 reliability improvements, including a newly designed hydraulic reservoir and environmental control unit, ASDS verification testing was conducted. This testing consisted of nine underways for a total 113 operating hours. According to SOCOM, there were no failures. Follow-on operational test and evaluation is scheduled for the second half of fiscal year 2008. It is not certain, however, the extent to which the upgrades identified by the Phase 1 critical systems review will be incorporated into the ASDS for this operational test.

DOD Expects to Make a Program Decision in mid-2008

DOD also directed the Navy and SOCOM to conduct an assessment of alternate material solutions to fulfill remaining operational requirements. An independent cost and capability trade study is under way for the purpose of developing models for both the ASDS and a hybrid combatant submersible to support concept design-level trade studies. A final report is expected by the end of June 2007. SOCOM has completed a requirements analysis that identified undersea clandestine maritime mobility gaps for special operations forces insertion and extraction as well as the conduct of undersea tasks. According to SOCOM, in February 2007, it submitted a memorandum on these issues to DOD's Joint Staff for submission to the Joint Requirements Oversight Council (JROC). Upon JROC approval, the memorandum is expected to serve in-lieu of an Initial Capabilities Document for use in the alternate material solutions analysis. This process is similar to an analysis of alternatives and is expected to assess a broad range of potential material solutions. The joint Navy-SOCOM alternate material solutions analysis is expected to be completed by February 2008.

A program decision is planned in mid-2008, after the ASDS improvement program and alternate material solutions analysis are completed.

⁸The Phase 2 critical systems review is in the planning stage but expected to be complete in December 2007. Technical Peer reviews are ongoing throughout the improvement program. One ASDS Reliability build or upgrade has been completed and two more are planned through 2008.

According to SOCOM and Navy officials, the results of the alternate material solutions analysis, in conjunction with the operational testing of the changes made in response to the reliability improvement program, should provide DOD by mid-2008 with sufficient information to make an informed decision on the direction DOD should take to meet its operational needs.

Conclusions

Had the original business case for ASDS been properly assessed as an under-resourced, concurrent technology, design, and construction effort led by an inexperienced contractor, DOD may have adopted an alternative solution or strategy. Ironically, after having invested about \$885 million in nearly 13 years, DOD may still face this choice. As to lessons learned, DOD's actions to make the boat operational came at great expense to the government. Further, DOD's inadequate program and contract management in essence made the prime contractor's poor performance acceptable. These actions underscore the need to have a sound business case at the start of a program, coupled with an acquisition strategy that enables the government to alter course as early as possible. Instilling more discipline into the contracting process is a step in the right direction, but its success hinges on DOD's willingness to hold the contractor accountable. From this point forward, DOD will be conducting reviews and testing to guide its decisions on how to proceed with the first ASDS boat. It is important that DOD be guided by sound criteria and a sound contracting strategy as it makes these decisions.

Recommendations

We are making three recommendations. In order to prevent the government from accepting additional undue risks and expense on ASDS, the Secretary of Defense should:

- Establish acceptable cost, schedule, and performance criteria, based on fully defined scopes of work, and assess the boat's ability to meet these criteria at the Phase 1 and Phase 2 critical systems reviews and at the management reviews. If, by the time of the program decision in mid-2008, ASDS does not meet acceptable cost, schedule, or performance criteria, we recommend that the Secretary of Defense discontinue the effort and not proceed with further tests.
- Ensure that, if the review results meet acceptable cost, schedule, and performance criteria, the design changes resulting from the Phase 1 critical systems review essential for demonstrating ASDS reliability and maintainability be incorporated in sufficient time to be tested under

operational conditions prior to the planned mid-2008 decision on how to best meet special operations forces' requirements.

- Require the Navy to include provisions in the ASDS contracting strategy chosen when the existing BOA expires that (1) appropriately balance risk between the government and the contractor through the contract types selected, (2) incentivize the contractor's performance and promote accountability for achieving desired outcomes by properly structuring the award and incentive fees, and (3) provide the kind of management and oversight of the program necessary to hold the contractor accountable for performance.

Agency Comments and Our Evaluation

DOD partially concurred with our first two recommendations that it establish acceptable cost, schedule, and performance criteria for ASDS-1; assess the boat's ability to meet these criteria; and test design changes. DOD concurred with our third recommendation on the Navy's contracting strategy to balance risk between the government and contractor; properly structure award and incentive fees to incentivize contractor performance and promote accountability; and provide necessary management and oversight to hold the contractor accountable. DOD's written comments are reprinted in appendix II.

In partially concurring with our first recommendation, DOD commented that under its new ASDS management plan, program decisions will be made through management reviews using specified evaluation criteria and not solely at the completion of the critical systems reviews. The Navy provided a copy of its March 6, 2007 management plan for ASDS-1 improvement. This plan represents a positive step in establishing a structured strategy for the ASDS-1 improvement program, including defining management oversight—roles, responsibilities, and authorities—and providing specific criteria to guide the program's continuation or termination decisions. However, the criteria may not go far enough. Specifically, the criteria may not be sufficient for making an informed program decision—the scope of the proposed ASDS's critical systems upgrades may not be fully defined and realistic cost and schedule estimates may not be developed before the ASDS improvement effort is approved to proceed. Further, the management plan does not address the Phase 2 critical systems review decision. We have clarified this recommendation to incorporate the management program reviews and decisions and added language to focus more directly on the need for fully defined scopes of work. Fully defining the scopes of work is key to realistic cost and schedule estimates.

DOD partially concurred with our second recommendation, but took issue with operationally testing all Phase 1 critical systems review design changes before the planned mid-2008 decision. DOD stated that there are identified changes that will take more time and that a decision on what changes to implement will depend on various factors such as time, funding, and scope. However, it remains unclear the extent to which upgrades that affect performance will be incorporated and tested prior to the mid-2008 program decision. We modified the wording to require testing essential design changes prior to a 2008 decision.

DOD also provided technical comments, which we have incorporated as appropriate.

Scope and Methodology

To assess the ASDS contracting strategy, we reviewed the ASDS acquisition strategy, program documents, contract documentation, and numerous historical documents, including the Navy's 1997 Independent Review Team assessment, the joint Navy/SOCOM 1999 Independent Review Team assessment, and the ASDS Reliability Action Panel's 2006 report. In our assessment of ASDS, we drew upon our large body of previous work on best practices for developing products and developing sound business cases. To determine the status of major ASDS technical issues and program restructuring, we examined program status documents and briefings, test results, technical reports, and various memos and guidance. We did not assess the appropriateness of accepting the first ASDS boat in an "as is" condition. In performing our work, we obtained information and interviewed officials from the U.S. Special Operations Command; the Naval Sea Systems Command's ASDS program and contracting offices; and the Navy's Operational Test and Evaluation Force. We conducted our review from July 2006 to April 2007 in accordance with generally accepted government auditing standards.

We are sending copies of this report to the Secretary of Defense; the Secretary of the Navy; the Commander, U.S. Special Operations Command; the Director of the Office of Management and Budget; and interested congressional committees. We will make copies available to others upon request. In addition, the report will be made available at no charge on GAO's Web site at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-4841 or by email at francisp@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found

on the last page of this report. Contributors to this report include Catherine Baltzell, David Best, Timothy DiNapoli, David Hand, John Krump, Mary Quinlan, and Robert Swierczek.

A handwritten signature in black ink that reads "Paul L. Francis". The signature is written in a cursive, flowing style.

Paul L. Francis
Director
Acquisition and Sourcing Management

Appendix I: Mismatches in Technology, Resources, and Managerial Capacity Undermined Key Business Case Assumptions

Putting a development program on sound footing from the beginning requires that the selected technology be capable of meeting the government's requirements and able to be developed within needed time frames and available resources. Further, the contractor must have the technical and managerial capacity to effectively execute the contract, while the government must be able to provide effective program and management oversight. On the ASDS program, however, these conditions were not present at the start of or effectively applied during the development effort, undermining the ability to successfully design and deliver an operational ASDS boat.

Technology Assumptions Optimistic

A key to promoting successful acquisition outcomes is matching available resources with the requirements for the proposed system. Specifically, the government must match its needs with technology that has been proven to work in a realistic environment before committing to production. In this case, the Navy assumed that the conceptual design was technically sound and that the design would incorporate a large amount of fully developed submersible or commercially available technology. The Navy's September 1993 acquisition strategy concluded that the low risk of integrating technologies already in use on existing submarines and submersible vehicles eliminated the need for an advanced development model or a demonstration/validation phase with developmental and operational testing. Further, the Navy determined that by concurrently addressing manufacturing and test issues during the design process, lengthy redesign periods would be avoided. Consequently, in September 1994, the Assistant Secretary of the Navy for Research, Development, and Acquisition (the designated program decision authority) approved Milestone II (development) and replaced a sequential test program (development tests, operational tests, technical evaluations, and operational test and evaluation) with a consolidated and integrated test program. At the same time, the ASDS program's Milestone III (production decision) was waived because of the limited number of procurement quantities.

The Navy's confidence in the maturity of technology also played a large role in its assessment of proposed designs for the ASDS, and in turn, in its selection of the contractor. The Navy concluded that the contractor's conceptual design exceeded various requirements, and, based on its

maturity, the proposed design approach was low risk.¹ From the outset, the Navy's assessments of the contractor's design solution, experience, and management capabilities proved incorrect. Incorporating commercial off the shelf components into the ASDS was more challenging than expected. For example, the contractor had difficulty understanding underwater shock performance requirements and eventually subcontracted the shock design efforts to a specialty firm.

During the course of ASDS's development, the Navy gradually assumed responsibility for addressing ASDS's technical problems by awarding separate contracts to other organizations to develop key components. The contractor's lack of expertise in key technologies, such as the propeller and battery, contributed to the Navy's decision to seek outside expertise to develop alternative solutions. In turn, the Navy provided these components to Northrop Grumman as government-furnished equipment, accepting both the cost and the risk for their performance and paid Northrop Grumman millions of dollars to integrate the components onto the ASDS boat. These actions include the following examples:

- The ASDS program has invested over \$26 million since 2000 to design, develop, and integrate a new lithium-ion battery to replace the inadequate silver-zinc battery provided by the prime contractor. In October 2000, the Navy awarded Northrop Grumman a \$2.1 million contract modification to design, develop, test, and incorporate a lithium-ion polymer battery. By September 2003, a series of contract modifications had increased the cost of the prototype battery effort to \$5.9 million and had extended delivery until February 28, 2004. The Navy sought other experts to identify and test an alternative lithium-ion battery that could be housed in the existing ASDS titanium battery bottles. In May 2004, after evaluating three proposals, the Navy awarded Yardney Technical Products a \$9.3 million contract for a complete ASDS shipset battery that was delivered in 2005. To date, the Navy has provided Northrop Grumman more than \$6 million to integrate the lithium ion battery.
- The Navy invested over \$1.5 million to redesign the first ASDS propeller, which was a major source of noise during testing. Rather than task Northrop Grumman to redesign the propeller, the Navy

¹In contrast, while noting that the other two competitors had significant experience in designing, building, and testing submarines, the Navy identified weaknesses in their proposed designs that would have required significant government assistance.

awarded a \$1.5 million contract in 2002 to Pennsylvania State University's Applied Research Laboratory to design and build a new composite propeller. Northrop Grumman installed this propeller in April 2003 at a cost of about \$140,000. Pennsylvania State University has since provided two additional propellers at a cost of about \$576,000.

Initial Cost Projections Harbingers of Difficulties to Come

Another key to successful acquisition outcomes is to accurately estimate the resources needed to develop and produce a system. The Navy had information before awarding the ASDS contract indicating, however, that the contractor's proposed price might not be realistic. Specifically, the contract's negotiated price was about 60 percent less than the Navy's November 1993 cost and operational effectiveness analyses.² The Navy's price evaluation team concluded that the contractor's proposed amounts for ASDS development and production were underestimated and that overruns were likely. Among the lessons learned cited by two independent review teams in 1997 and 1999 were that the program was underfunded, in part because the Navy did not give sufficient weight to concerns raised by cost analysts, and that the contractor "bid to the budget."

Government and Contractor Management Was Ineffective

The government's and contractor's capacity to effectively manage a program is another key determinant in promoting successful outcomes. The Navy concluded in 1994 that overall, the contractor's design, management capabilities, and cost control capabilities were equal to or better than the two other competitors for the ASDS program and that the contractor had adequate experience in submersible design, construction, and certification. This assessment, as well as the government's capacity to provide effective management and oversight of the ASDS program, soon proved incorrect.

The Navy's 1997 and the joint Navy/SOCOM 1999 independent review teams identified weaknesses in the contractor's capacity to effectively address technical issues and manage the ASDS program. One team noted that the contractor had considerable difficulty in interpreting the underwater shock portion of the ASDS performance requirements. The teams attributed these difficulties, in part, to the contractor's lack of

²It should be noted that the other two competing contractors' proposals were also within the same cost range—well below the government's estimate.

experience in submarine design, in contrast to the initial business case assumption. Further, the reviews noted that the Navy's review of the contractor's design products revealed that substandard design methodology was used, resulting in unacceptable system design. The review teams also found that this lack of experience had a detrimental effect on the contractor's overall ability to understand technical nuances and may have prevented the contractor from applying appropriate management attention when needed. For example, the contractor used two different systems for reporting and managing the program; the contractor's cost reports contained errors; and its estimates to complete the effort were updated only every 6 months, resulting in unanticipated and sudden cost increases being reported to the Navy. Additionally, the contractor constrained its estimates by imposing "management challenges," which the team concluded were in reality artificial reductions imposed by the contractor to obscure the contractor's problems and mislead attempts to analyze its projected costs.

Further, the review teams concluded that lapses in effective management by both the government and the contractor contributed to the program's challenges. The teams identified several causes for these lapses, including

- a lack of contractor experience in submarine design and construction;
- the government's lack of influence or visibility into problems between the contractor and the subcontractors;
- a focus on technical rather than management aspects of the program by both the program office and the contractor;
- ineffective oversight by the program office and little attention to the financial performance of the contractor; and
- frequent changes in the contractor's project management team.

The Navy program office and Northrop Grumman have taken steps to improve the program's management. In 2005, the Naval Sea Systems Command reorganized the program office for a greater emphasis on special operations programs. In December 2005, Northrop Grumman reassigned the ASDS program's management lead to its Newport News division, which has greater management and technical experience in submarines. Northrop Grumman Newport News is leading the Phase 1 ASDS critical systems review, and Northrop Grumman Electronic Systems is assisting.

Appendix II: Comments from the Department of Defense



ACQUISITION,
TECHNOLOGY
AND LOGISTICS

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MAY 17 2007

Paul L. Francis
Director, Acquisition and Sourcing Management
U.S. General Accountability Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Francis:

This is the Department of Defense (DoD) response to the GAO Draft Report, GAO-07-745, 'DEFENSE ACQUISITIONS: Success of Advanced SEAL Delivery System Hinges on Establishing a Sound Contracting Strategy and Performance Criteria,' dated April 27, 2007 (GAO Code 120525).

The Department partially concurs with the statements in the draft report, partially concurs with recommendations one and two, and concurs with recommendation three.

The detailed response to the report recommendations are provided in the enclosure. Suggested technical changes have been provided separately.

Thank you for the opportunity to comment on the draft report.

Sincerely,

David G. Ahern
Director
Portfolio Systems Acquisition

Enclosure:
As stated



GAO Draft Report - Dated April 27, 2007
GAO-07-745 (GAO CODE 120525)

"DEFENSE ACQUISITIONS: SUCCESS OF ADVANCED SEAL DELIVERY
SYSTEM HINGES ON ESTABLISHING A SOUND CONTRACTING STRATEGY
AND PERFORMANCE CRITERIA"

DEPARTMENT OF DEFENSE COMMENTS
TO THE RECOMMENDATIONS

RECOMMENDATION 1: The GAO recommended that the Secretary of Defense establish acceptable cost, schedule and performance criteria for the first advanced SEAL delivery system (ASDS) boat and assess the boat's ability to meet these values at the phase 1 and phase 2 critical systems reviews. If at either of these reviews ASDS does not meet acceptable cost, schedule or performance criteria, the GAO recommended that the Secretary of Defense discontinue the effort and not proceed with the 2008 test. (p. 11/GAO Draft Report)

DoD RESPONSE: The DoD *partially concurs* with this recommendation. The Department agrees that there needs to be acceptable cost, schedule and performance criteria. The Navy and Commander, USSOCOM have developed a management plan which adequately details evaluation criteria and establishes routine management program reviews with off ramps. It is at these reviews, vice solely at the completion of the Critical System Reviews (CSR), that future program status will be determined.

RECOMMENDATION 2: The GAO recommended that the Secretary of Defense ensure that, if it does meet acceptable cost, schedule, and performance criteria, that any design changes resulting from the Phase 1 critical systems review be incorporated in sufficient time to be tested under operational conditions prior to the planned mid-2008 decision as to how to best meet special operational forces requirements. (p. 11/GAO Draft Report)

DoD RESPONSE: The DoD *partially concurs* with this recommendation. The Department takes issue with the use of the word "any" in the first sentence. There are identified design changes (e.g. hydro-dynamic mitigation) that will not be complete by the mid-2008 decision due to the time it takes to develop, build, install, and test. The decision on which CSR design changes are implemented and installed will depend upon the relative improvement expected, scope of the effort needed, as well as available time and funding. Testing might be accomplished without some recommended improvements being made to gauge progress and acceptability of the vehicle, and to support an overall program decision. Additionally, unforeseen program issues could result in a decision to discontinue the ASDS effort without any additional operational testing.

RECOMMENDATION 3: The GAO recommended that the Secretary of Defense require the Navy to include provisions in the ASDS contracting strategy chosen when the existing basic order agreement expires that (1) appropriately balance risk between the government and the contractor through the contract types selected, (2) incentivize the contractor's performance and promotes accountability for achieving desired outcomes by properly structuring the award and incentive fees, and (3) provide the kind of management and oversight of the program necessary to hold the contractor accountable for performance. (p. 11/GAO Draft Report)

DoD RESPONSE: The DoD *concurs* with this recommendation. The Department intends to continue the maximized use of incentivized contract efforts to conduct Phase 2 CSR and implementation of reliability improvements into ASDS-1. The incentivized performance will balance risk and promote accountability. Senior department personnel will continue to manage and oversee the program through these phases.

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