United States General Accounting Office

GAO

Report to the Secretary of Defense

AD-A254 991

September 1992

NAVY TORPEDO PROGRAM

MK-48 ADCAP Propulsion System Upgrade Not Needed

92-25778

GAO/NSIAD-92-191

GAO

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

National Security and
International Affairs Division

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September 10, 1992

The Honorable Richard B. Cheney
The Secretary of Defense

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Dear Mr. Secretary:

As part of our ongoing work on antisubmarine warfare programs, we reviewed the Navy's MK-48 Advanced Capability (ADCAP) torpedo propulsion system upgrade program. Specifically, we determined whether (1) the Navy needs to develop an upgrade to the existing propulsion system, (2) the upgrade would meet Navy noise reduction requirements once it is completed, and (3) the Navy has ongoing basic and exploratory research in alternative noise reduction technology.

Background

Navy officials stated that in 1985, studies indicated that ADCAP's effectiveness against the projected Soviet submarine threat through the mid 1990s could be improved by reducing noise generated by the torpedo's propulsion system. In 1986, the Navy established a requirement to reduce ADCAP's noise, and in 1988, began developing a new Closed Cycle ADCAP Propulsion System (CCAPS). In 1990, the Commander, Operational Test and Evaluation Force (OPTEVFOR), Atlantic Fleet, identified the benefits of CCAPS to the performance of the SSN-21 Seawolf, the latest generation nuclear attack submarine. According to a Department of Defense (DOD) official, DOD directed the Navy to ensure that CCAPS was completed in time to meet the SSN-21 delivery schedule.

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However, in early 1991, because of technical problems identified during testing, the Navy reassessed CCAPS. The Navy determined that CCAPS technology could not be developed in time to meet the SSN-21 delivery schedule and that it would be too costly. Consequently, the Navy terminated the CCAPS program. In late 1991, because a quieter torpedo was needed to take advantage of the quieter performance of the SSN-21, the Navy decided to upgrade the ADCAP propulsion system to meet the SSN-21 delivery schedule.

The Navy has ongoing basic and exploratory research programs to address various technologies that could lead to a quieter torpedo propulsion system. The Navy had planned to begin developing a new ADCAP propulsion system in 1996, using technology developed from this research effort. However, in May 1992, DOD told us that no current funding was in place in

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the Navy's fiscal year 1994 program objective memorandum for the development or production of a new torpedo propulsion system.

Results in Brief

The ADCAP upgrade is unnecessary. In January 1992, the Navy stated that the current ADCAP will meet SSN-21 requirements. The Navy now plans to use the upgrade on other submarines capable of firing the ADCAP; however, the higher noise levels of these submarines could limit the upgrade's benefits. The upgrade is not intended to meet and will not lead to meeting the Navy's torpedo noise reduction operational requirements, nor will it significantly contribute to the technology necessary to meet those goals. In addition, the Navy has ongoing research in alternative noise reduction technologies that can be used in developing future propulsion systems.

Reduced SSN-21 Program and Limited Benefit for Other Submarines

In January 1992, the Bush administration announced plans to terminate the SSN-21 program on completion of the first submarine and requested congressional approval to rescind funds for construction of follow-on SSN-21s. In January 1992, the Navy also notified DOD that the current ADCAP would meet SSN-21 requirements. The Congress did not approve the rescission request and restored funding for the completion of a second Seawolf submarine (SSN-22). Additional funding was restored to either provide advance procurement for a third Seawolf submarine (SSN-23), to restart the SSN-688 program, or any other approach the Secretary of the Navy deems most beneficial in preserving the current submarine industrial base.

Nevertheless, the Navy contends that the capabilities of the Commonwealth of Independent States' submarines still justify the need to continue the upgrade program. Therefore, it is continuing development of the ADCAP upgrade and intends to make it available for those submarines capable of firing the ADCAP (such as the SSN-688 Los Angeles-class attack submarine). Although the Navy is upgrading the torpedo launcher system, the SSN-688 attack submarine will still operate at higher noise levels than the SSN-21. As a result, the upgrade's noise reduction could be of limited value to the submarine's operational capabilities. The Navy has not performed any tests or simulations to determine the upgrade's benefit to the SSN-688 class submarine.

The Navy estimates that the propulsion system upgrade will cost about $127 million ($47 million for research, development, test, and evaluation, and $80 million for incorporation into new production units). Additional

costs are possible if the upgrade is incorporated into previously produced torpedoes. The Navy is funding this program with $1.5 million of its fiscal year 1992 research, development, test, and evaluation appropriations and has requested $13.6 million for fiscal year 1993.

Upgrade Will Not Meet or Contribute to Noise Reduction Goals

The ADCAP upgrade will use existing technology, such as sound dampening materials, to achieve its noise reductions. It is not intended to meet and will not lead to meeting the Navy's 1986 noise reduction requirements. While the upgrade will provide some improvement, it will not significantly contribute to the technology needed to meet those goals.

Ongoing Research in Alternative Noise Reduction Technologies

Current Navy basic and exploratory research programs are addressing the technologies needed to meet noise reduction goals for a future torpedo propulsion system. For example, current research is exploring the use of stored chemical energy, electrical energy, and battery-powered technology to reduce noise. This research is being conducted at independent laboratories, government facilities, and universities.

Canceling the upgrade and continuing the ongoing basic and exploratory research would also be in line with DOD's revised weapons acquisition strategy. This strategy emphasizes longer periods of research and development and going to full-scale development only after demonstrating capabilities and proving the concept.

Recommendation

We recommend that you direct the Secretary of the Navy to terminate the MK-48 ADCAP propulsion system upgrade program.

DOD Comments and Our Evaluation

DOD disagreed with both our findings and recommendation that the interim propulsion system upgrade for the MK-48 ADCAP torpedo is not needed and should be terminated. DOD stated that the near term improvements are needed because of threat capabilities, the benefits of the improvements to all submarines, and the status of ongoing research to support initiating acquisition of the next generation torpedo.

DOD's position appears to contradict the Navy, which stated that the current MK-48 ADCAP meets the operational effectiveness requirement of the SSN-21 and that the proposed near term improvements will not address the causes of alerting the target identified in OPTEVFOR testing. We

continue to believe that the propulsion system upgrade is not needed and that it would be more economical for the Navy to focus on ongoing research to achieve its long-term goals.

DOD's detailed comments and our response are included in appendix I.

Scope and Methodology

We collected and analyzed data from DOD and the Navy to determine the status of the MK-48 ADCAP development program and to identify ongoing research in alternative noise reduction technologies. We also discussed and reviewed data provided by the Commander, Operational Test and Evaluation Force, Atlantic Fleet, the Navy's independent test agent, and the Naval Undersea Warfare Center. We held discussions with representatives from various offices, including the Naval Sea Systems Command; the Office of Naval Technology; the Assistant Secretary of the Navy for Research, Development, and Acquisition; the Chief of Naval Operations; the Department of Defense; the Congressional Research Service; and the Congressional Budget Office.

We conducted our review from November 1991 to July 1992 in accordance with generally accepted government auditing standards. We are sending copies of this report to the Secretary of the Navy, appropriate congressional committees, the Office of Management and Budget, and other interested parties.

If you or your staff have any questions, I can be reached on (202) 275-6504. Major contributors to this report are listed in appendix II.

Sincerely yours,

Martin M Ferber
Director, Navy Issues

Contents

Abbreviations

ADCAP	Advanced Capability
CCAPS	Closed Cycle ADCAP Propulsion System
DOD	Department of Defense
GAO	General Accounting Office
OPTEVFOR	Operational Test and Evaluation Force

Comments From the Department of Defense

Note: GAO comments supplementing those in the report text appear at the end of this appendix.

OFFICE OF THE UNDER SECRETARY OF DEFENSE

WASHINGTON, DC 20301-3000

ACQUISITION

22 JUN 1992

Mr. Frank C. Conahan
Assistant Comptroller General
National Security and International
Affairs Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Conahan:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report entitled--"NAVY TORPEDO PROGRAM: MK-48 ADCAP Propulsion System Upgrade Not Needed," dated April 24, 1992 (GAO Code 394447/OSD Case 9047). At the May 21 meeting with your staff to discuss the draft report, an advance copy of a more detailed classified version of the response was provided. After the meeting your staff advised that, because the report itself is unclassified, only the unclassified cover letter portion of the classified response would be published with the final report. As a result, the DoD prepared this unclassified response. As noted at the meeting, the Department disagrees with both the report findings and the recommendation.

The GAO analyzed the need to pursue the MK-48 Advanced Capability Torpedo Propulsion Upgrade Program and concluded that basic and exploratory research to meet noise reduction goals for a future torpedo propulsion system should continue, but the current program should be terminated. That conclusion reflects the GAO failure to recognize the obvious benefits of a quieter MK-48 Advanced Capability Torpedo with existing SSN-688 submarines. The Department's disagreement with the report is based on the following factors:

- the need to quiet the Advanced Capability propulsion system is driven by threat capabilities and operating areas;
- improvements are directly applicable to all current MK-48 Advanced Capability launch platforms;
- the near-term program implements several technologies that will serve as the foundation for future quieting development; and

- while ongoing quieting research is very promising, none of the efforts are mature enough to initiate the acquisition process for the next generation torpedo, thereby failing to offer the opportunity for near-term improvements.

The detailed DoD comments on the findings and the recommendation are enclosed. The Department appreciates the opportunity to comment on the draft report.

for Frank Kendall
Director
Tactical Systems

Enclosure-a/s

GAO DRAFT REPORT - DATED APRIL 24, 1992
(GAO CODE 394447) OSD CASE 9047

"NAVY TORPEDO PROGRAM: MK-48 ADCAP PROPULSION SYSTEM UPGRADE NOT NEEDED"

DEPARTMENT OF DEFENSE COMMENTS

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FINDINGS

- **FINDING A: Reduced SSN-21 Program and Limited Benefit for Other Submarines.** The GAO reported that, in January 1992, the Bush Administration announced plans to terminate the SSN-21 program on completion of the first submarine--and requested congressional approval to rescind funds for construction of follow-on SSN-21s. The GAO further reported that, in January 1992, the Navy also notified the DoD that the current Advanced Capability Torpedo would meet the SSN-21 requirements. The GAO found, however, that the Navy contends the capabilities of the Commonwealth of Independent States submarines still justify the need to continue the current upgrade program and to develop a new quieter Advanced Capability torpedo propulsion system upgrade, starting in 1996. The GAO observed that, as a result, the Navy is continuing development of the upgrade program--and intends to make the upgrade, as well as the new propulsion system, available for those submarines capable of firing the Advanced Capability torpedo--such as the SSN-688 LOS ANGELES class attack submarine. The GAO concluded, however, that the SSN-688 attack submarine will still operate at higher noise levels than the SSN-21; therefore, the noise reduction of the upgrade would be of limited value to submarine operational capabilities. The GAO also found that the Navy had not performed any tests to determine the benefits of the upgrade to the SSN-688 submarine.

  The GAO reported that the Navy estimates the propulsion system upgrade will cost about $127 million ($47 million for research, development, test, and evaluation, and $80 million for incorporation into new production units). The GAO further concluded that additional costs are possible if the upgrade is incorporated into previously produced torpedoes. The GAO also noted that the Navy

Now on pp. 2 and 3

See comment 1

is funding the program with $1.5 million of its FY 1992 research, development, test, and evaluation appropriations, and has requested $13.6 million for FY 1993.

The GAO observed that the Advanced Capability torpedo upgrade will use only existing technology, such as sound dampening materials to achieve noise reductions--and it will neither meet the Navy 1986 noise reduction requirements nor contribute to the technology needed to meet those goals. In summary, the GAO concluded that the Advanced Capability torpedo upgrade is unnecessary. (pp. 3-5/GAO Draft Report)

DoD Response: Nonconcur. The requirement for a quiet torpedo was not driven by the SSN-21, but by the current and projected threat, as follows--

- The Commonwealth of Independent States possesses and operates the advanced submarine force that was developed and produced by the former Soviet Union. Those submarines continued to present a threat, no matter how unlikely war with the Commonwealth of Independent States appears. The specific concern for the near-term quieting upgrade is the increased capability of the mid- to late-1990s threat. Such capability would allow the target sufficient time to detect and classify the current MK-48 Advanced Capability Torpedo, return fire, and evade.

- The significant reduction in the level of threat presented by the Commonwealth of Independent States to the U.S. has enabled the U.S. to evaluate the rest of the world threat, which continues to evolve. The force structure of the rest of the world threat is comprised of increasingly sophisticated diesel submarines. The operating areas of the rest of the world threat present acoustic conditions that are much more harsh than those encountered anywhere else in the world. The increasingly sophisticated threats and operations in harsh environments drive the requirement for a quieter torpedo.

See comment 2

A quieted torpedo will reduce the target awareness of an incoming torpedo and will provide the firing ship with the following two distinct advantages--

- The target's delayed actions to evade the torpedo will be less effective, since the torpedo will be closer to the target when it begins the evasion and deploys countermeasures. The target will, therefore, be less likely to avoid the acoustic search of the torpedo.

- The target's delayed reactions will result in a less effective return fire of torpedoes at the U.S. submarine. The delayed firing response will enable the U.S submarine to evade more easily the counterattack and, therefore, will improve the survivability of the U.S. submarine. Although the near-term quieting program was not initiated in response to the SSN-21 requirement, the upgrade will provide significant improvement in the effectiveness of the ship.

It is true that the SSN-688 class submarine exhibits a higher radiated noise level than the SSN-21. However, the current MK-48 Advanced Capability Torpedo propulsion system is significantly louder than the radiated noise levels of an SSN-688 class submarine. Therefore, the resulting improvement in weapon effectiveness, due to quieting the torpedo, will improve the overall effectiveness of the SSN-688 class submarine--further emphasizing the need for the proposed improvement.

See comment 3.

Contrary to the GAO finding, the Navy has studied, and is continuing to study, the benefit of the near-term torpedo quieting program as it applies to 688 class submarines. At-sea exercises conducted specifically to evaluate the torpedo quieting modification have demonstrated the benefits of reducing the target's ability to react to an attack. Full scale underwater laboratory testing, conducted to study the quieting effects of the proposed modifications, confirmed that the quieting goals are achievable. Additionally, the Naval Undersea Warfare Center has run simulated scenarios used for the SSN-21 analysis. Results from the analysis indicated that the near-term quieting of the MK-48 Advanced Capability Torpedo will improve weapon effectiveness.

See comment 4.

The near-term quieting upgrade was never intended to meet the 1986 quieting goals of the Closed Cycle Advanced Capability Propulsion System vehicle. The intent of the near-term upgrade is to rapidly achieve the maximum improvement in quieting possible with the

existing Advanced Capability propulsion system and to do so at the least cost. The near-term quieting program will implement several technologies emerging from Exploratory Development programs. Each will have a positive impact on the possible future development of a quiet torpedo propulsion system. Such improvements are key elements of the long-term quieting program and their inclusion in the near-term propulsion upgrade supports their development and testing.

- **FINDING B: Ongoing Research in Alternative Noise Reduction Technologies.** The GAO reported that the current Navy basic and exploratory research programs are addressing the technologies needed to meet noise reduction goals for the future Advanced Capability torpedo propulsion. The GAO observed. for example, that the current research, being conducted at independent laboratories, Government facilities, and universities, is exploring the use of stored chemical energy and battery-powered technology to reduce noise. The GAO concluded that canceling the upgrade program and continuing the ongoing basic and exploratory research is also in keeping with the revised DoD acquisition strategy, which emphasizes longer periods of research and development and going to full-scale development only after demonstrating capabilities and proving the concept. (pp. 5-6/GAO Draft Report)

Now on p. 3.

See comment 5.

DoD Response: Nonconcur. The DoD reviewed the possibility of a long-term propulsion system development to replace the Advanced Capability Torpedo propulsion system. Such a possibility is contingent upon many things--including (1) an evolving threat environment, (2) whether the technologies being pursued will prove to be satisfactory, and (3) the future availability of scarce funds to budget for such a program. There is currently no funding in place in the Navy budget for the development or production of a new torpedo propulsion system.

As discussed in the DoD response to Finding A, the development of certain technologies for the near-term quieting upgrade is essential to support any long-term propulsion system development.

The ongoing development of the near-term torpedo quieting system is in complete consonance with the DoD acquisition strategy. The DoD revised acquisition strategy emphasizes the insertion of proven technologies into existing weapon

systems. It is also the DoD policy to pursue aggressively advanced technologies considered essential to provide the advantages the U.S. needs to deter or prevail in future conflicts.

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RECOMMENDATIONS

- **RECOMMENDATION.** The GAO recommended that the Secretary of Defense direct the Secretary of the Navy to terminate the MK-48 Advanced Capability Torpedo propulsion system upgrade program. (pp. 6/GAO Draft Report)

Now on p. 4.

See comment 6.

DoD Response: Nonconcur. The MK-48 Advanced Capability Torpedo propulsion system upgrade is needed (1) to improve the overall performance of the weapon, (2) to improve the probability of a successful engagement by limiting the target's reaction time, and (3) to improve U.S. submarine survivability.

The following are our comments on DOD's letter dated June 22, 1992.

GAO Comments

1. We agree that the 1986 requirement for a quiet torpedo was not driven by the SSN-21 submarine. However, Navy documentation clearly shows that the upgrade was driven by the need for a quieter torpedo to complement the quieter operating characteristics of the SSN-21 and to more effectively counter the Soviet threat. Since then, the Navy has informed DOD that the current MK-48 ADCAP without the propulsion system upgrade will meet the SSN-21 requirements. Moreover, Navy assessments show that existing U.S. submarines are capable of responding to all threats, including those of third world countries. In addition, the Navy is currently addressing MK-48 ADCAP improvements for shallow water operations through guidance system software program changes.

2. We agree with DOD's statement that a quieter torpedo is more difficult to detect and classify. However, DOD failed to acknowledge that the planned upgrade would not significantly reduce the distance at which an enemy target would identify the MK-48 ADCAP as a torpedo. The results of OPTEVFOR testing on the current MK-48 ADCAP without an improved propulsion system show that the propulsion system is not the major cause of alerting the target. Therefore, we believe it is doubtful that an improved propulsion will result in any significant increase in the effectiveness of the SSN-688 class submarines.

3. DOD said that contrary to our finding, the Navy has, and is continuing to study the benefits of the near term torpedo quieting program as it applies to the 688 class submarines. An official at the Naval Undersea Warfare Center told us that as of June 1992, the Navy had not performed any tests or simulations of the upgrade relative to the SSN-688 class submarine. In-water tests using an SSN-688 submarine were conducted of individual components and potential technologies to identify promising methods to quiet the ADCAP propulsion system. This is consistent with our understanding that a prototype has not been built or tested. Moreover, contrary to DOD claims, the Navy began propulsion system upgrade simulation testing and modeling using the SSN-688 submarine only after our draft report was issued in April 1992. As of June 29, 1992, these tests were incomplete and inconclusive.

4. The near term improvements the Navy intends to make on the MK-48 ADCAP propulsion system will not contribute to achieving the long-term torpedo quieting goals. Replacing ADCAP's noisy open-cycle piston engine

(exhaust products vented to ocean) is the key element in meeting the Navy's long-term 1986 torpedo quieting goals. We agree with DOD's statements that technologies emerging from ongoing exploratory development programs, such as stored chemical energy and electric propulsion systems, are essential for meeting these goals. We believe these technology programs, rather than the near term noise dampening improvements, are the key elements to meeting long-term goals.

5. We agree that ongoing research to replace the current engine is not mature enough to start a new acquisition program. This is why we say that the Navy should continue its ongoing research and development program. We believe that, in line with the intent of DOD's new acquisition strategy, the Navy can cancel the development of the ADCAP propulsion system upgrade with minimum impact on the longer-term plans.

6. Based on the above, we believe that the propulsion system upgrade is not needed and that it would be more economical for the Navy to focus on ongoing research to achieve its long-term goals.

Major Contributors to This Report

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