United States General Accounting Office

GAO

Report to The Acting Secretary of the Navy

AD-A258 570

December 1992

UNDERSEA SURVEILLANCE

Navy Continues to Build Ships Designed for Soviet Threat

92-31329

GAO/NSIAD-93-53

GAO

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

National Security and
International Affairs Division

B-249219

December 3, 1992

The Honorable Sean O'Keefe
Acting Secretary of the Navy

Dear Mr. Secretary:

The Navy's Surveillance Towed Array Sensor System (SURTASS) program, like other defense programs, has been caught in the midst of rapidly changing world events. SURTASS sensors "listen" for acoustic signals from enemy submarines in the deep, open ocean. However, the submarine threat for which SURTASS was designed has declined dramatically with the collapse of the Soviet Union. The United States no longer faces a well-defined nuclear submarine threat in the deep water ocean areas where strategic naval conflict and antisubmarine warfare operations were expected to occur. Instead, the Navy faces an ill-defined, less predictable regional threat from diesel submarines operating in shallow water areas. Yet, the Navy continues to build SURTASS surveillance ships designed for the deep water threat.

In light of the recent world changes, we examined (1) how the submarine threat environment has changed and (2) what changes the Navy has proposed regarding its SURTASS program.

Results in Brief

The Soviet global submarine threat has declined dramatically, and is no longer the primary threat to the United States. Instead, the focus is on a still evolving threat of regional conflict in shallow water. The Navy has not yet developed the performance requirements for an undersea surveillance system to counter the shallow water threat. SURTASS was built to counter the Soviet submarine threat in deep water, but the Navy now plans to use it against the regional—shallow water—submarine threat. Navy officials told us that preliminary test results show SURTASS has potential for shallow water detection; however, the Navy has not yet demonstrated SURTASS' shallow water capability through developmental and operational tests. At the same time, the Navy and other Department of Defense (DOD) organizations are exploring alternative ways to detect submarines in shallow water.

Currently, the Navy has 19 SURTASS ships—18 monohull and 1 twin hull Small Waterplane Area Twin Hull (SWATH).[1] The Navy expects to replace its 18 monohull SURTASS ships with 9 twin hull SWATH ships by 1998. SURTASS program officials believe they need the new SWATH ships to develop tactics, define LFA sensor capabilities and limitations in shallow water, and develop environmental data bases for regions of potential conflict. The Navy already uses a modified monohull ship to test LFA capabilities, and it will have four small SWATH ships with a capability to receive LFA signals by 1993, and one large SWATH ship with active LFA capabilities by 1994.

Between fiscal years 1992 and 1998, the Navy plans to spend about $1.2 billion on its SURTASS upgrades and procurement of new SURTASS SWATH surveillance ships.

Background

Before the collapse of the Soviet Union, the Navy's primary antisubmarine warfare target was the open ocean, deep water Soviet nuclear attack submarine. Diesel submarines in coastal, shallow water areas were largely disregarded as threats. To detect and track Soviet nuclear submarines in deep ocean basins and at long ranges, the Navy deployed its integrated undersea surveillance systems—the fixed Sound Surveillance System and the mobile SURTASS. The Navy also designed a shorter range, fixed surveillance system, the Fixed Distributed System, and an active acoustic detection system, Low Frequency Active (LFA), to be used in conjunction with SURTASS, to counter the emerging threat from quiet Soviet nuclear submarines.[2]

SURTASS surveillance ships, equipped with a 6,000 foot towed sensor array, augment the fixed Sound Surveillance System by collecting acoustic data in areas where there is no fixed system coverage. The data SURTASS collects are initially analyzed onboard the ship, then relayed by satellite to shore processing facilities for display, further analysis, integration with other surveillance data, and dissemination to operational users. Figure 1 shows the SURTASS monohull ship, and figure 2 shows the SURTASS SWATH ship.

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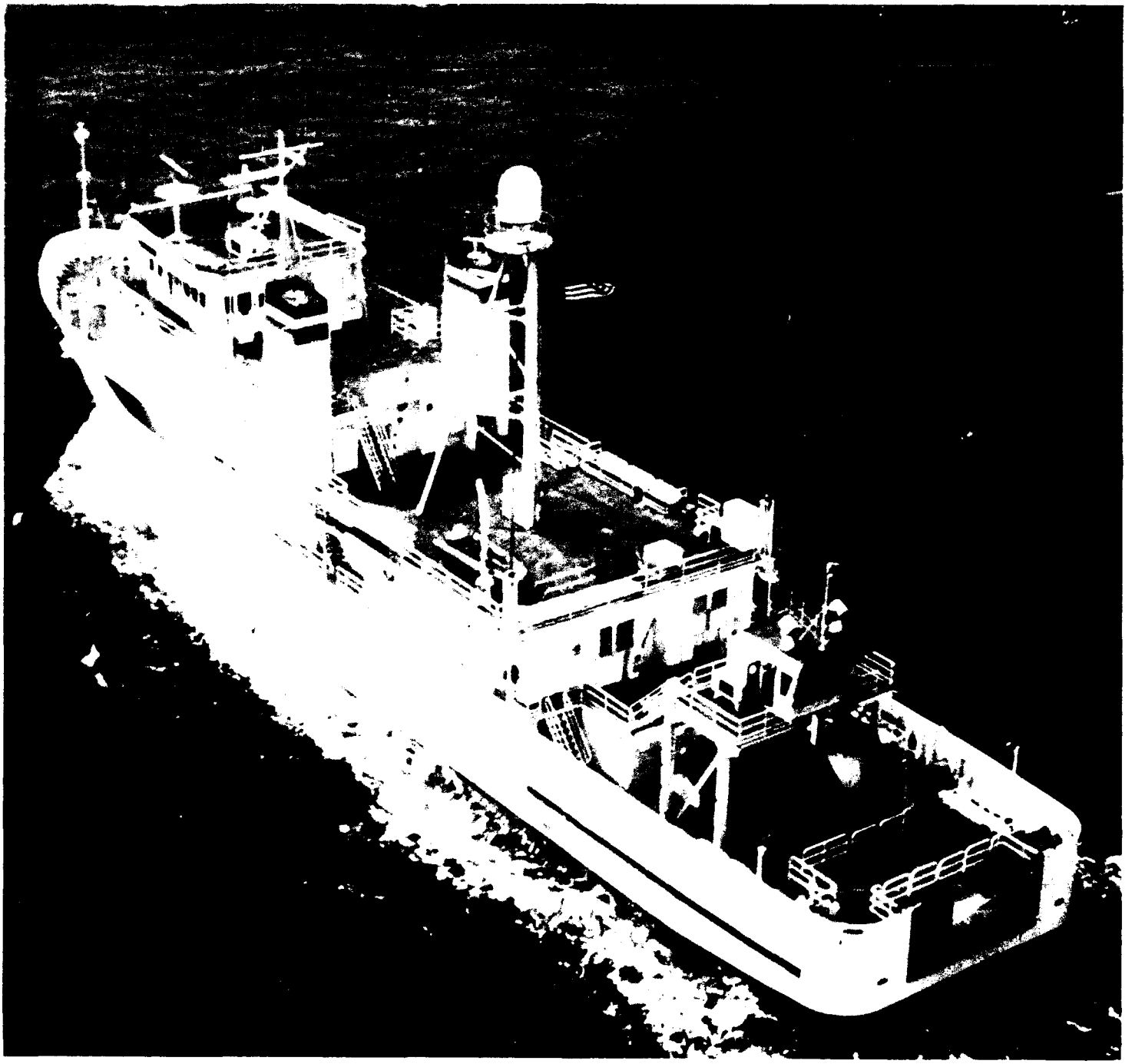
[1]The Navy plans to operate three versions of SURTASS surveillance ships—the current 2,300 ton monohull ships, and both 3,400 and 5,300 ton twin hull ships. The latter two are known as SWATH ships. The Navy currently has one 3,400 ton SWATH ship, which is being tested at sea.

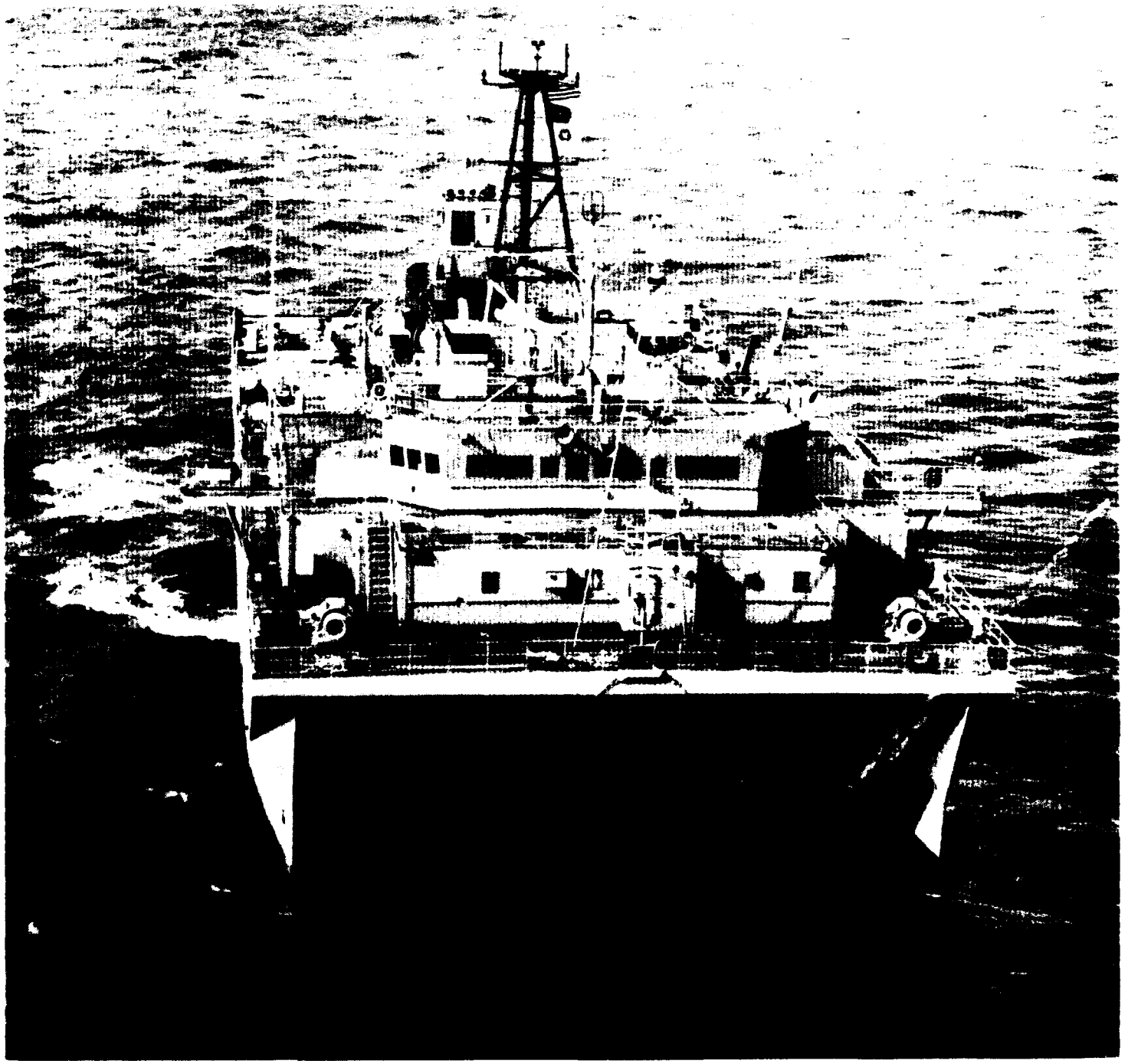
[2]The Sound Surveillance System and the Fixed Distributed System, like SURTASS, use passive acoustic sensors. Active acoustic sensors send out signals to search for enemy submarines. The Navy plans to equip SURTASS with an active capability by the mid-1990s.

Figure 1: SURTASS Monohull Ship



Source: U.S. Navy

Figure 2: SURTASS SWATH Ship



Source: U.S. Navy

Performance Requirements Not Developed for Regional Submarine Threat

The Navy does not have documented and approved requirements for undersea surveillance systems to counter the regional submarine threat. The requirements for surveillance system performance first need to be developed from technical and operational threat information and then used to design equipment for specific missions.

Until 1990, the Navy regarded the shallow water regional threat as a low priority. The former Soviet Union was the primary submarine threat to the United States. This deep, open ocean threat drove the Navy's development of surveillance requirements for undersea antisubmarine warfare. The Navy is now in the process of defining and developing the threat from submarines that could be used in regional conflicts.

Developing performance requirements to respond to a regional threat presents new challenges to the Navy. According to Navy officials and threat documentation, the regional threat could stem from actions by any number of countries, involve one or several of them, require the Navy to engage different submarine types and designs, and potentially occur in many areas of the world. Although the actual events of a potential conflict remain uncertain, the Navy anticipates that antisubmarine engagements are likely to occur in shallow water—an acoustically difficult environment that has not been analyzed as extensively as deep water. The Navy is currently modeling scenarios for regional conflicts and conducting war gaming, sea tests, and fleet exercises to better define how to counter the shallow water threat.

SURTASS Sensors Not Thoroughly Tested in Shallow Water

SURTASS' acoustic sensors are designed primarily to operate in deep open oceans against the Soviet threat. The Navy plans to equip the larger SWATH ships with active sensors—LFA—to enhance deep water submarine detection and location capability and to provide shallow water detection. The small SWATH ships will be equipped with a capability to receive LFA signals.

Although the Navy is planning to use SURTASS to detect submarines in shallow water[3] coastal regions, it has not completed the operational testing needed to demonstrate SURTASS sensor proficiency in shallow water operations. Shallow water has unique characteristics that make acoustic

[3]The Navy was unable to provide us with any single agreed to definition of what constitutes shallow water. However, based on discussions with Navy program officials, and excerpts from threat and test documents, shallow water is generally defined as between 600 and 1,000 feet deep; it includes the continental shelf and mid-latitudes. In addition to depth, other factors such as the topography of the ocean floor and the temperature of the water can affect the travel of sound signals and acoustical sensors' ability to receive them.

detection difficult, and shallow water environmental data have not been quantified.

Deep water promotes sound wave propagation (spreading out) enabling acoustical sensors—like SURTASS sensors—to detect enemy submarines; however, according to Navy officials, shallow water limits sound propagation. Further, we were told that the temperature, depth, and underwater terrain, as well as noise from commercial ships and boats, interfere with SURTASS sensors' ability to detect enemy submarines in shallow water.

The Navy believes that, with the addition of active LFA sensors that emit strong acoustic pulses, SURTASS will provide near-term shallow water detection of submarine targets. However, for SURTASS to detect submarines in shallow water, the Navy requires not only LFA sensors on a SWATH ship but also another ship, aircraft, or other platform to receive the echoes from the LFA pulses.

The Navy has conducted some initial developmental tests[4] and a preliminary operational assessment[5] of a SURTASS advanced developmental model of LFA on a specially modified monohull ship. Most of the developmental tests were performed in deep open ocean areas. Two of the tests used diesel submarines as targets in shallow water; however, test parameters during one of the tests made detection of the target submarine easier than if the test had been conducted in a more realistic environment. According to a March 1990 report prepared by the Navy's Operational Test and Evaluation Force,[6] testing for the operational assessment was conducted in shallow water where environmental conditions were "extremely favorable to LFA operations"—the test was conducted in a relatively flat sound channel between 300 and 800 feet deep.[7] The operational assessment report indicated that LFA shows potential for detecting submarines in shallow water; however, the Operational Test and

[4]Developmental tests identify potential design limitations and risks, substantiate that technical performance requirements have been achieved, and support the decision to certify the system ready for operational test and evaluation.

[5]Operational assessments are essentially observations of trends noted in development efforts, programmatic voids, risk areas, and the ability of a program to support adequate operational testing. They are usually based on computer modeling, simulation, document analysis, or any kind of testing, except operational testing.

[6]The Operational Test and Evaluation Force is the Navy's independent testing organization.

[7]Initial Operational Test and Evaluation of the Surveillance Towed Array Sensor System Low Frequency Active, Mar. 1990, p.7.

Evaluation Force recommended that additional testing be required to resolve critical operational issues and complete the evaluation of LFA's operational effectiveness and suitability. A second operational assessment and final evaluation are scheduled to be conducted from September to October 1992 and from June to December 1995, respectively. By the time these tests are completed, the Navy will have contracted for most of its new SWATH ships.

In commenting on a draft of this report, the Navy provided us with additional information on the results of developmental testing as well as limited results on ongoing operational testing. While we agree that the results of developmental testing provide an early on indication of system capabilities, it is not a substitute for operational testing. Because operational testing is not yet completed, the Navy has no assurance that the LFA sensor will operate as required.

Moreover, because of its focus until 1990 on the deep, open ocean threat, the Navy gathered and quantified large amounts of data on the deep water acoustic environment but did little to develop threat data on shallow water acoustics. The Navy's existing analytical models, which are designed for deep water, are not effective for shallow water testing of LFA performance. Navy officials are in the process of collecting data on the shallow water environment but have not yet collected or quantified sufficient data to develop new analytical models.

Concurrent with the Navy's program to develop LFA sensors, the Navy and DOD are looking into other ways to detect submarines in shallow water. The Navy's Advanced Deployable Systems program office is developing program plans and requirements for a family of systems[8] to provide operational users with quick response (within hours) deployable submarine surveillance capabilities. The Defense Advanced Research Projects Agency is studying what uses unmanned undersea vehicles may have and how their technologies can be applied to deployable surveillance systems. These programs are just getting underway, but the Navy expects them to be developed and/or operational by the mid-1990s. Navy SURTASS program officials believe these dates to be optimistic but could offer no information to support this belief.

[8]The Advanced Deployable Systems family will use and expand on technologies developed from existing undersea surveillance systems and will include acoustic and nonacoustic sensors that could be deployed from air or sea platforms.

Navy Continues to Build SURTASS Ships Designed for the Deep Water Threat

Despite the dramatic changes in the submarine threat, the Navy is continuing to build new SWATH version, SURTASS ships that were designed for the Soviet submarine threat. The nine SWATH ships are designed to be more seaworthy and, therefore, more capable of tracking Soviet submarines in the open ocean in winter, a threat that has declined dramatically and is no longer the primary threat to the United States.

In commenting on a draft of this report, DOD pointed out that, in view of the dramatic change in the Soviet submarine threat, it has reduced the planned procurement of SURTASS ships from 39 to 9. Navy officials noted, however, that, upon satisfactory completion of ship design and initial LFA system testing, they support future planned procurement of SURTASS ships to meet other antisubmarine requirements for deep water. The other requirements supporting future SURTASS ship procurement include the requirement to (1) respond to defense planning guidance that calls for keeping sea lanes of communication open, (2) maintain a watch over the significant number of Russian and third world submarines that remain at sea, and (3) be prepared to deal with future uncertainties should the current state of affairs—Russian goodwill and intentions—change dramatically.

The Navy originally planned to keep its 18 monohull ships and procure an additional 21 SWATH ships to give it a total of 39 ships for conducting undersea surveillance against submarines. With the reduced submarine threat and because of budgetary constraints, the Navy now plans to maintain a fleet of nine active ships for conducting undersea surveillance.[9] According to Navy officials, annual operating costs are about $4.5 million per ship[10] for monohull ships compared to an estimated $4.7 million for small SWATH ships and $5.3 million for large SWATH ships.[11] The planned procurement of nine new SWATH ships is estimated to cost about $1.2 billion.

To date, the Navy has contracted for five new SWATH ships—$487 million—and it plans to spend $674 million more to build four larger ships

[9]The Navy plans to transfer some of the monohull ships to other organizations, such as the National Oceanic and Atmospheric Administration, and convert others for missions such as counternarcotics and oceanographic surveys; however, the Navy will continue to have access to six of the ships for contingencies.

[10]Total operating costs are in fiscal year 1992 dollars.

[11]According to DOD officials, original operating cost data provided to us were incorrect. DOD now believes annual ship operating costs to be $6.3 million per ship for monohull ships, $7.0 million per ship for small SWATH ships, and $7.7 million per ship for the large SWATH ships.

through 1998. Another $47 million will be spent to upgrade the small SWATH ships with a capability to process and exploit target submarines' echoes from sound signals transmitted from LFA—the small SWATH ships will have the receive capability but not the LFA active capability.

Table 1 shows the current procurement and delivery schedules for SWATH ships, as well as their costs, according to the fiscal year 1993 President's budget submission.

able 1: Estimated Procurement and elivery Schedules and Anticipated osts for SWATH Ships

Ship type	Total number of ships	Contract award year	Expected delivery date	Anticipated cost ($ millions)
Small SWATH				
T-AGOS-19[a]	1	1986	1991	86
T-AGOS-20	1	1988	1992	73
T-AGOS-21	1	1988	1992	73
T-AGOS-22	1	1988	1993	73
Large SWATH				
T-AGOS-23	1	1991	1994	182
T-AGOS-24	1[b]	1993	1995	149
T-AGOS-25	1	1994	1997	185
T-AGOS-26	1	1995	1998	170
T-AGOS-27	1	1998	2001	170

[a]SURTASS ships are designated T-AGOS—auxiliary general ocean surveillance ships, operated by the Military Sealift Command. The 19th SURTASS ship is the first small SWATH. The 23rd SURTASS ship is the first large SWATH.

[b]Contract award has been delayed until completion of operational testing in 1993.

The Navy has already built one small (3,400 ton) SWATH ship and is building three additional small and one large (5,300 ton) SWATH ships, and according to the President's fiscal year 1993 budget, it plans to build four more large SWATH ships. The five large SWATH ships will accommodate equipment needed to generate power for the active LFA sensors. The first of the nine SWATH ships (T-AGOS-19) has been delivered to the Navy and is undergoing operational testing. Navy officials told us that the ship has experienced minor problems and that sea testing has not been completed.

The Navy's Operational Test and Evaluation Force expects to report on the results of the testing in January 1993. The three other small SWATH ships are being built and are planned for delivery by 1993. The fifth ship (T-AGOS-23)—first of the larger SWATH ships—is under construction, with an expected delivery date of 1994. The contract for this ship contains options for the four remaining large SWATH ships.[12]

The option to procure the second large SWATH ship (T-AGOS-24) for $149 million expired in August 1992. The DOD Inspector General, in its March 1990 report on the acquisition management of the small SWATH

[12]The Navy is currently leasing a 10th ship—a modified commercial monohull ship with LFA sensors. This ship is being used to test LFA.

ships.[13] recommended that the T-AGOS-19 complete operational sea tests before other ships are built. The DOD Comptroller's office agreed with the recommendation, and it is withholding funds for T-AGOS-24 pending the results of operational testing. Navy program officials told us that they plan to procure the ship once funds are released.

Navy program officials told us that they need more SWATH ships in the near term to develop effective tactics, define th capabilities and limitations of LFA in shallow water, and create environmental data bases for regions of potential conflict. Under the current procurement schedule, the Navy will have, by 1994, six ships for testing LFA detection capabilities in shallow water, developing tactics, and testing ship design. These ships include one existing modified monohull ship, one large SWATH ship to be delivered in 1994, and four small SWATH ships—one has been delivered, two are to be delivered in 1992, and the fourth is to be delivered in 1993.

Navy program officials believe that SURTASS—with passive and active capabilities—will meet future system requirements for regional conflict. They told us that SURTASS procurement should continue, despite the fact that performance requirements have not been developed.

Recommendations to the Secretary of the Navy

We recommend that the Secretary of the Navy postpone the Navy's decision on whether to build T-AGOS-24 until the test results of LFA operational performance and SWATH operational design are fully evaluated.

Moreover, we recommend that the Secretary of the Navy reevaluate plans to buy T-AGOS-25 through -27 SWATH ships—an estimated $525 million to construct—until the submarine threat is better defined, the system requirements to counter the threat are documented and approved, and the contribution of alternative submarine detection systems under development is analyzed.

Agency Comments and Our Evaluation

DOD agreed to postpone the decision on whether to procure the next SURTASS ship (T-AGOS-24) until the results of ship design and initial LFA sensor testing are available. We continue, however, to disagree on the nature of LFA sensor testing—developmental or operational—that needs to be completed before deciding on future ship procurement. The Navy,

[13] Acquisition Management of the Small Waterplane Area Twin Hull Ocean Surveillance Ships, Mar. 1, 1990; No. 90-012

knowing of certain system deficiencies noted during testing, is willing to continue with SURTASS procurement based on the results of developmental testing and only limited results from ongoing operational testing. We maintain that procurement decisions should await the results and evaluation of operational testing, which demonstrates that the system will operate as intended. This course of action appears to be particularly appropriate in the case of SURTASS ships where the urgency of need and threat of submarine warfare has diminished significantly.

DOD, however, argued that to postpone a procurement decision on T-AGOS-24 until LFA sensor operational testing is complete would extend the program, leading to increased costs due to program overhead and inflation. However, Navy program officials provided no documentation on potential cost increases when we asked.

DOD disagreed with our recommendation that the Navy reevaluate its plans to buy T-AGOS-25 through -27 SURTASS ships until requirements are defined and alternative systems are fully evaluated.

In commenting on this recommendation, DOD said that it had already scaled back the SURTASS planned inventory from 39 to 9 ships in recognition of the diminished threat from Soviet submarines, and it added that there are sufficient "other" deep water requirements (see p. 8 and app. I) justifying continued SURTASS ship procurements.

Navy SURTASS program officials told us that the decision to reduce SURTASS procurement from 39 to 9 ships was made because the Navy could no longer afford to operate and maintain its fleet of existing monohull ships. Thus, the decision to significantly reduce the inventory was made for budgetary reasons, and not, as DOD contends, because of the diminished Soviet threat. It should also be pointed out that in the event of a contingency (see p. 9), the Navy continues to have ready access to six SURTASS monohull ships that have been transferred to other defense missions. Moreover, the Navy also has access to acoustic sensor data from an allied nation's ocean surveillance program.

On the matter of DOD's comment that "other" deep water requirements provide continued justification for future SURTASS ship procurements (see p. 8 and app. I), we note that as of the date of this report, the Navy has neither developed requirements for the regional threat nor updated deep water requirements for SURTASS ships. Until this is performed, there is no

assurance that additional ship procurement is justified to meet a deep water threat.

DOD's detailed comments on a draft of our report and our rebuttals are included in appendix I.

Scope and Methodology

We interviewed officials and obtained SURTASS program requirements and budget documentation from offices within the Navy's Space and Naval Warfare Systems Command. We analyzed these documents, compared budget and financial data, and reviewed pertinent legislation and threat documents.

Our examination of the submarine threat was performed primarily at the Defense Intelligence Agency, Washington, D.C.; and the Naval Maritime Intelligence Center, Suitland, Maryland.

We also visited officials at the Office of the Comptroller, Department of Defense; Office of the Chief of Naval Operations' (Undersea Warfare) Undersea Surveillance Division; Office of the Navy Comptroller; the Navy's Tactical Intelligence and Related Activities Office, Operational Test and Evaluation Force, and Oceanographer of the Navy, Washington, D.C., and at the Naval Sea Systems Command and the Defense Advanced Research Projects Agency, Arlington, Virginia; the Naval Oceanographic Processing Facility, Dam Neck, Virginia; and Planning Systems, Incorporated, McLean, Virginia.

We conducted our review between November 1991 and July 1992 in accordance with generally accepted government auditing standards.

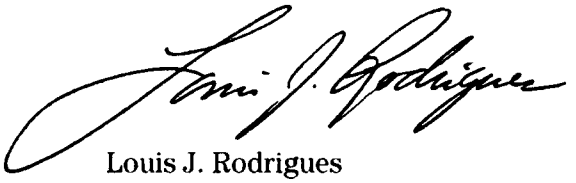
This report contains recommendations to you on page 11. The head of a federal agency is required by 31 U.S.C. 720 to submit a written statement on actions taken on these recommendations to the Senate Committee on Governmental Affairs and the House Committee on Government Operations not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

We are sending copies of this report to the Secretaries of Defense and the Navy, the Director of the Office of Management and Budget, and

congressional oversight committees. We will also make copies available to others upon request.

Please contact me at (202) 275-4841 if you or your staff have any questions concerning this report. Other major contributors to the report were Gary K. Weeter, Assistant Director; Dennis R. White, Evaluator-in-Charge; and Elizabeth G. Mead, Senior Evaluator.

Sincerely yours,



Louis J. Rodrigues
Director, Command, Control, Communications,
and Intelligence Issues

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Abbreviations

SURTASS	Surveillance Towed Array Sensor System
LFA	Low Frequency Active
SWATH	Small Waterplane Area Twin Hull
DOD	Department of Defense

Comments From the Department of Defense

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

ACQUISITION

OFFICE OF THE UNDER SECRETARY OF DEFENSE

WASHINGTON, DC 20301-3000

01 OCT 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--"UNDERSEA SURVEILLANCE: Navy Continues to Build Ships Designed for Soviet Threat," dated August 18, 1992 (GAO Code 395179/OSD Case 9169). The Department partially concurs with the GAO findings, partially concurs with the first recommendation, and non-concurs with the second recommendation.

The GAO report addresses Navy planning to acquire Surveillance Towed Array Sensor System ships in light of recent world changes and the perceived change in the submarine threat.

- The GAO contends that the Navy has not developed undersea surveillance requirements for a regional submarine threat. The DoD agrees that Navy requirements for shallow water are still evolving, and that future conflicts will likely involve shallow water. However, the Defense Planning Guidance requirement to keep Sea Lanes Of Communication open will dictate the ability to conduct deep water anti-submarine warfare as long as modern submarines are present in the global inventory. Further, the Operational Requirement for the Surveillance Towed Array Sensor System/Low Frequency Active calls for capability against diesel and nuclear submarines.

- The GAO stated that the Surveillance Towed Array Sensor System program sensors have not been thoroughly tested in shallow water. The DoD agrees that additional testing remains to be performed on the Surveillance Towed Array Sensor System in shallow water. However, the Navy has conducted successful developmental testing, both passive and with Low Frequency Active sensors in shallow water, effectively demonstrating performance to

detect and maintain contact with nuclear and diesel submarines.

- The GAO contends that insufficient testing of the Surveillance Towed Array Sensor System/Low Frequency Active System has been performed and results are inconclusive. The DoD agrees that additional testing remains to be completed. However, the Surveillance Towed Array Sensor System/ Low Frequency Active has undergone a series of tests, including three proof of operation, six system development tests, and an operational evaluation. The testing has been successful against all target types in a broad spectrum of depths.

- The GAO stated that the Navy continues to build the Surveillance Towed Array Sensor System ships designed for the Soviet threat. The Navy acknowledges the diminished threat and scaled back the size of the inventory, from 39 to nine ships, directed at the open ocean environment. The planned procurement of ships is required to counter third world adversaries operating state-of-the-art submarines. As stated previously, while a conflict may occur in a shallow water environment, maintaining safe passage through the open ocean to the area of conflict will be vital to success in that region. The Surveillance Towed Array Sensor System ships are designed to establish a specific detection capability, and will play an important part in open ocean and regional conflicts.

- The GAO found that the Navy has plans to continue to buy and deliver Surveillance Towed Array Sensor System ships prior to the completion of testing. The Navy plans to complete ship design testing prior to awarding any subsequent ship contracts. Likewise, the Navy plans to test the Low Frequency Active system prior to further equipment awards. Ship design and Low Frequency Active testing is scheduled for September/October 1992.

  Concerning the draft report recommendations, the DoD partially concurs that contract award of the T-AGOS-24 should be made following the evaluation of the design for the Small Waterplane Area Twin Hull Ship and Low Frequency Active testing. Upon satisfactory completion of Operational Test-IIA for Low Frequency Active system and validation

of the hull design on the T-AGOS-19, limited procurement is warranted. If the Low Frequency Active system is demonstrated to be effective, the DoD plans to buy the T-AGOS 25-27. Adjustments to overall Defense funding levels may force a re-evaluation of many procurement plans, but the Surveillance Towed Array Sensor System downsizing that has already been executed (from 39 to nine ships) to meet the diminished threat is the appropriate response to the changes in the open ocean threat. Any further dilution of the Surveillance Towed Array Sensor System fleet size would have to be carefully considered because it could jeopardize the ability of the Navy to maintain open Sea Lanes Of Communication, as well as to perform anti-submarine warfare in the likely areas of regional conflict.

Detailed DoD comments on each report finding and recommendation are provided in the enclosure. The Department appreciates the opportunity to comment on the draft report.

Frank Kendall
Director
Tactical Systems

Enclosure-a/s

GAO DRAFT REPORT - DATED AUGUST 19, 1992
(GAO CODE 395179) OSD CASE 9169

"UNDERSEA SURVEILLANCE: NAVY CONTINUES TO BUILD SHIPS DESIGNED FOR SOVIET THREAT"

DEPARTMENT OF DEFENSE COMMENTS

* * * * *

FINDINGS

- FINDING A: Performance Requirements Not Developed For Regional Submarine Threat. The GAO reported that, with the dramatic decline in the global submarine threat from the former Soviet Union, the current focus is on a still evolving threat of regional conflict in shallow water. The GAO observed that, initially, the Surveillance Towed Array Sensor System program was built to counter the former Soviet submarine threat in deep water--but the Navy now plans to use it against the regional, shallow water submarine threat. The GAO found, however, that the Navy does not yet have documented and approved performance requirements for undersea surveillance systems to counter the regional shallow water threat. The GAO asserted that the performance requirements need to be developed first from technical and operational threat information--and then used to design equipment for specific missions.

  The GAO reported that, until 1990, the Navy regarded the shallow water regional threat as a low priority. The GAO noted that the Navy is now in the process of defining and developing the threat from submarines that could be used in regional conflicts. The GAO observed that the regional threat could stem from actions by any number of countries, and require engaging different submarine types and designs. The GAO also observed that, as indicated, the Navy anticipates that such engagements are likely to occur in shallow water--an acoustically difficult environment, which has not been analyzed as extensively as deep water. The GAO found that the Navy currently is modeling scenarios for regional conflicts, and conducting war gaming, sea tests, and fleet exercises to better define how to counter the shallow water threat. (pp. 5-7/GAO Draft Report)

Now on pp 5-6

DOD RESPONSE: Partially concur. Although the threat of

See comment 1.

submarine warfare against the Russians in the near future is remote, a significant submarine fleet (both nuclear and quiet diesel submarines) with impressive capability still exits and remains at sea. Since the DoD must plan for force needs two to 20 years from now, any uncertainty as to the goodwill and long term intentions of the future owners of the present (and modern) Russian submarine fleet dictates the requirement to counter that threat in the open ocean. Thus, the Nation needs to retain a deep ocean surveillance capability, while concurrently placing an emphasis on expanding technology and proficiency for detection of submarines in shallow water operations.

While the Navy documented requirements for shallow water Anti-Submarine Warfare are still evolving, future conflicts will involve more than shallow water Anti-Submarine Warfare. In most regional conflict scenarios, only a relatively small proportion of the ocean is less than 1,000 feet deep and most of that is less than 30 miles from shore. The attached charts clearly detail that relationship. Controlling the deeper water guarantees battle group operation safety, "bottles up" potential threats in restricted shallow water areas where they are more susceptible to mines and other forces, while ensuring the Sea Lanes of Communication remain open, as required by the Defense Planning Guidance for all regional scenarios. If the focus of Anti-Submarine Warfare is limited to shallow water, the U. S. will become vulnerable to any submarine that ventures out from the "safety" of the shore line.

See comment 2.

In addition, the Operational Requirement for the Surveillance Towed Array Sensor System/Low Frequency Active calls for a capability against conventional and nuclear submarines--not just nuclear submarine, as implied in the report.

See comment 3.

While the present need for deep water anti-Submarine Warfare Systems has been reduced, the requirement for the capability to conduct effective Anti-Submarine Warfare in deep water remains valid, and Operational Testing of the Low Frequency Active system (Operational Test I/Low Frequency Active-3) has proven the capability of the system to detect submarines in an operational environment.

See comment 4

- FINDING B: The Surveillance Towed Array Sensor System Program Sensors Not Yet Tested Thoroughly in Shallow Water. The GAO reported that the Surveillance Towed

Array Sensor System sensors are designed primarily to operate in deep open oceans against the former Soviet threat. The GAO noted that, although the Navy is planning to use the system to detect submarines in shallow water coastal regions, it has not completed the testing needed to demonstrate system sensor proficiency in shallow water operations. The GAO observed that Defense Agencies and the Navy are expending research and development funds for alternative systems to detect submarines in shallow water, including deployable surveillance systems and unmanned undersea vehicles.

The GAO pointed out that shallow water limits sound propagation, and the temperature, depth, and underwater terrain, as well as noise from commercial ships and boats, interferes with the ability of the Surveillance Towed Array Sensor System program sensors to detect enemy submarines in shallow water. The GAO reported it is the Navy position that the addition of Low Frequency Active sensors that emit strong acoustic pulses to the Surveillance Towed Array Sensor System will provide a near-term shallow water detection of submarine targets. The GAO pointed out, however, that in order for the system to detect submarines in shallow water, the Navy requires not only Low Frequency Active sensors on a Small Waterplane Area Twin Hull ship, but the availability of another ship, aircraft, or other platform to receive the echoes from the Low Frequency Active pulses. (pp. 7-9/GAO Draft Report)

ɔw on pp. 6-8

DOD RESPONSE: Partially concur. The Navy is continuing to test the effectiveness of existing technology and systems, as well as new systems, in shallow water environments. For example, analysis of the recent Surveillance Towed Array Sensor System 3X-92 exercise, using a modified passive array in the high clutter of the Mediterranean showed substantial contact holding time against a U.S. nuclear submarine in shallow water areas surrounding the Balearic Islands in the Algerian Sea over a 5-day exercise. Additionally, Low Frequency Active-7 test analysis data from the Advanced Development Model testing conducted in June 1991 in the Mediterranean clearly demonstrated the capability of the Low Frequency Active systems to detect a diesel submarine operating in shallow water along the Malta ridge. The test also demonstrated the Low Frequency Active capability to cue patrol aircraft successfully to gain attack criteria on target submarines.

ɛe comment 5

See comment 6.

Concepts for potential alternatives to Low Frequency Active, such as advanced deployable systems, and unmanned undersea vehicles, are still immature and require considerable development. They are expected to be effective as close-in complements to the Surveillance Towed Array Sensor System/Low Frequency Active. Even if demonstrated to be feasible and funded, they will not be available for widespread fleet use until the year 2000 or beyond.

- FINDING C: Testing of the Low Frequency Active Sensor. The GAO reported that the Navy has conducted some initial developmental tests and a preliminary operational assessment of the Low Frequency Active sensor on a specially modified monohull ship. The GAO noted that most of the developmental tests were performed in deep open ocean areas. The GAO observed that, according to a March 1990 report prepared by the Navy Operational Test and Evaluation Force, testing for the operational assessment was conducted in shallow water where environmental conditions were "extremely favorable to Low Frequency Active sensor operations". The GAO pointed out that, although the operational assessment report indicated the Low Frequency Active sensor showed potential for detecting submarines in shallow water, the Naval Operational Test and Evaluation Force nonetheless recommended additional testing to resolve critical operational issues and complete the evaluation of the Low Frequency Active sensor operational effectiveness and suitability.

  The GAO concluded, however, that by the time operational assessment (scheduled from September to October 1992) and final evaluation (scheduled from June to December 1995) are completed--the Navy will have contracted for most of its new Small Waterplane Area Twin Hull ships. The GAO also concluded that, because of its focus up until 1990 on the deep, open ocean threat, the Navy has done little to develop threat data on shallow water acoustics. The GAO found that the existing Navy analytical models, which were designed for deep water, are not effective for shallow water testing of Low Frequency Active performance. The GAO noted that the Navy is in the process of collecting data on the shallow water environment but has not yet collected or quantified sufficient data required to develop new analytical models. The GAO also explained that the DoD currently is looking into other ways to detect submarines in shallow water that are now just underway (a family of

systems to provide quick response deployable submarine surveillance capabilities, and unmanned undersea vehicles). The GAO noted that the Navy expects the programs to be developed and/or operational by the mid-1990s, although according to officials from the Surveillance Towed Array Sensor System program, those dates are optimistic. (pp. 9-11/ GAO Draft Report)

ow on pp. 6-8.

DOD RESPONSE: Partially concur. The Navy is proceeding with limited procurement of the Small Waterplane Area Twin Hull Ships through T-AGOS-23 to facilitate completion of testing of the Low Frequency Active sensor; however, it should be pointed out that this expanded testing is addressing a new requirement placed on an existing design.

The "incomplete" testing referred to by the GAO actually consists of the following completed events--(1) three development tests to prove the theory of a Low Frequency Active system, (2) six Low Frequency Active system development tests, (3) one Operational Test, (with the second, Operational Test-IIA being conducted in September/October 1992, and (4) five Critical Sea Test exercises. Total Low Frequency Active System testing has been conducted over 10 years of at-sea evaluations against all target types in all depths and types of water. The documentation from Low Frequency Active tests Six and Seven (conducted in the Sea of Japan and in the Mediterranean, respectively) confirm that, in fact, the Low Frequency Active system has been tested in regional area more than any other new Anti-Submarine Warfare capability in the U.S. Navy.

While it is correct to point out the operational assessment report from the Operational Test and Evaluation Force recommended additional testing of the Low Frequency Active system, the GAO fails to mention the main caveat of the Operational Test and Evaluation Force was that the 1990 system assessed was an Advanced Development Model, and production representative Engineering Development Model testing was required in accordance with normal development practices. That Engineering Development Model testing is ongoing and will be completed by the end of October 1992.

ee comment 7

Other techniques for wide area detection of submarines in shallow water are under development, but unless there is a revolutionary breakthrough involving affordable technology, none are likely to reach production and be introduced to the fleet before the year 2000.

ee comment 6

- **FINDING D: Navy Continues To Build Surveillance Towed Array Sensor System Ships Designed For the Soviet Threat.** The GAO reported that, despite the dramatic changes in the submarine threat, the Navy is continuing to build new Small Waterplane Area Twin Hull-version Surveillance Towed Array Sensor System program ships that were designed for the Soviet submarine threat. The GAO reported that the Navy originally planned to keep its 18 monohull ships and procure an additional 21 Small Waterplane Area Twin Hull ships for a total of 39 ships for conducting undersea surveillance against submarines. The GAO observed, however, that the Navy now plans to maintain a fleet of nine active ships for undersea surveillance. The GAO also noted that, according to program officials, the Navy opted not to retain the 18 monohull ships because of budgetary constraints. The GAO was advised that it costs about $4.5 million per ship to operate monohull ships, as compared to an estimated $4.7 million per ship for small Small Water-plane Area Twin Hull ships and $5.3 million per ship for the larger ships.

  The GAO reported that the planned procurement of nine new Small Waterplane Area Twin Hull ships is estimated to cost about $1.2 billion. The GAO observed that, to date, the Navy has contracted for five new Small Waterplane Area Twin Hull ships, at a cost of $487 million--and it plans to spend $674 million more to build four larger ships through 1998. The GAO noted that another $47 million will be spent to upgrade the small Small Waterplane Area Twin Hull ships with a capability to process and exploit target submarine echoes from sound signals transmitted from the Low Frequency Active sensor. (pp. 12-13/GAO Draft Report)

Now on pp. 8 and 9.

  DOD RESPONSE: Partially concur. As pointed out by the GAO, the Navy already responded to the diminished, simultaneous, global threat by reducing the Surveillance Towed Array Sensor System program from a planned 39 ships to a total of nine ships. While the ships were originally designed to counter the quiet Soviet threat, that design threat encompasses many possible third world adversaries as well: Libya, Syria, India, Iran, China, and Pakistan all operate Soviet-built submarines. In addition, the requirements of the Operational Requirement and the Test and Evaluation Master Plan in meeting the Soviet baseline will make/prove the Low Frequency Active effective against the rest of world submarines of similar size and construction.

See comment 8.

See comment 1.

The current Navy plan calls for maintaining a fleet of four passive/bi-static ships and five active source ships. The reduction from the former plan for 39 ships represents an austere capability which still provides regional conflict support and maintains the Sea Lanes of Communication. A fundamental tenet of U.S. Military strategy is to maintain open sea lanes and the greatest threat to keeping Sea Lanes of Control free for all shipping is still the submarine. "In-region" fleet operating areas must be kept free during a regional conflict to allow unimpeded flow of mission resources into the area. Unrestricted fleet power projection operations must be conducted in "blue" water, as well as "brown" water, in support of the strike and re-supply missions. Accordingly, it is in the national interest to maintain a modern blue and brown water undersea surveillance capability. Those ships that are designed to operate in a wide variety of sea states can provide Fleet Commanders greater worldwide flexibility with fewer numbers. The results of ten at-sea evaluations of the Low Frequency Active system and subsequent modelling indicate the Surveillance Towed Array Sensor System/Low Frequency Active aboard the T-AGOS-23 class will be effective in well over 90 percent (based on depth) of ocean areas of interest, today and in the future.

ee comment 8.

Annual ship operating costs reflected in the report should be revise to reflect the following: In FY-92 dollars, it is estimated to cost $6.3 million per ship to operate monohull ships, $7.0 million per ship for small Small Water-plane Area Twin Hull ships and $7.7 million per ship for the larger ships.

- FINDING E: Surveillance Towed Array Sensor System Ships Delivery and Testing. The GAO found that the first of the nine Small Waterplane Area Twin Hull ships has been delivered to the Navy and is undergoing operational testing. The GAO noted that the ship has experienced minor problems and sea testing is not yet complete. The GAO reported that the Navy Operational Test and Evaluation Force expects to report on the results of the sea testing in January 1993.

  The GAO reported that the three other small Small Waterplane Area Twin Hull ships are being built and are planned for delivery by 1993. The GAO observed that the fifth ship, the first of the larger version, is under construction, with an expected delivery date of 1994. The GAO noted that the contract for the larger version

ship contains options for the four remaining large Small Waterplane Area Twin Hull ships.

The GAO found that the option to procure the second large Small Waterplane Area Twin Hull ship for $149 million expires in August 1992. The GAO pointed out that the Inspector General, DoD--in a March 1990 report on the acquisition management of the small Small Waterplane Area Twin Hull ships--recommended that the T-AGOS-19 complete operational sea tests before other ships are built. The GAO noted that the DoD Comptroller agreed with the report recommendation and is withholding funds pending the results of operational testing. The GAO learned that, according Navy program officials, they plan to exercise the contract option once the funds are released.

The GAO further reported that Navy program officials also maintained they need more Small Waterplane Area Twin Hull ships in the near-term (1) to develop effective tactics, (2) to define the capabilities and limitations of the Low Frequency Active sensor in shallow water, and (3) to create environmental data bases for regions of potential conflict. The GAO noted that, by 1994, the Navy will have six ships for testing detection capabilities, developing tactics, and testing ship design.

The GAO also reported that Navy program officials further maintain that the Surveillance Towed Array Sensor System, with passive and active capabilities, will meet future system requirements for regional conflict. The GAO noted that the Navy also contended that the procurement should continue--despite the fact that (1) performance requirements have not been developed, (2) Low Frequency Active sensor developmental and operational testing has not been completed, and (3) the Small Waterplane Area Twin Hull ship design has not been validated through operational tests. (pp. 14-16/GAO Draft Report)

Now on pp. 10-11

DOD RESPONSE: Partially concur. Delaying the acquisition of ship hulls will increase program costs due to an additional 2 years of program overhead and additional unit cost due to inflation adjustments. It is also incorrect that the Navy contends the procurement should continue even though the hull design of the Small Waterplane Area Twin Hull Ships has not been validated through operational testing. In fact, the Navy position has been that the ship design testing must be completed prior to any further awards of ships; just as the operability of the installed equipment will be tested prior to further Low Frequency Active equipment awards. The

See comment 9.

testing in question is scheduled to be completed in October 1992. Further, the Navy has decided not to exercise the current contract option for the T-AGOS-24 procurement.

With regard to ships available in 1994 for Low Frequency Active testing, the T-AGOS-23 will be delivered to the Navy in mid-1994, but will not be ready for full fleet operations before 1995. Consequently, by 1994, the Navy will be operating four passive Small Waterplane Area Twin Hull Ships (some are scheduled to get bi-static capability by that time) and the CORY CHOUEST, not six active ships, as inferred from the GAO report.

See comment 10

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RECOMMENDATIONS

- **RECOMMENDATION 1:** The GAO recommended that the Navy postpone its decision on whether to build T-AGOS-24 until the test results of Low Frequency Active sensor operational performance and Small Waterplane Area Twin Hull ship operational design are fully evaluated. (p. 17/GAO Draft Report)

  DOD RESPONSE: Partially concur. The Navy does not intend to build T-AGOS-24 until the hull design has been validated through Operational Testing and a satisfactory operational evaluation report has been submitted. Once the Surveillance Towed Array Sensor System/Low Frequency Active has completed Operational Test-IIA (scheduled for September/October 1992), the system will have demonstrated the same thresholds required by the FY 1995/FY 1996 tests. Upon satisfactory completion of Operational Test-IIA for the Low Frequency Active system and validation of the hull design on the T-AGOS-19, limited procurement is warranted.

Now on p. 11.

- **RECOMMENDATION 2:** The GAO recommended that the Navy re-evaluate its plans to buy T-AGOS-25 through 27--at an estimated $525 million to construct--until (1) the regional submarine threat is better defined, (2) system requirements to counter the threat are documented and approved, and (3) the contribution of alternative submarine detection systems under development is analyzed. (p. 17/GAO Draft Report)

Now on p. 11.

See comment 3.

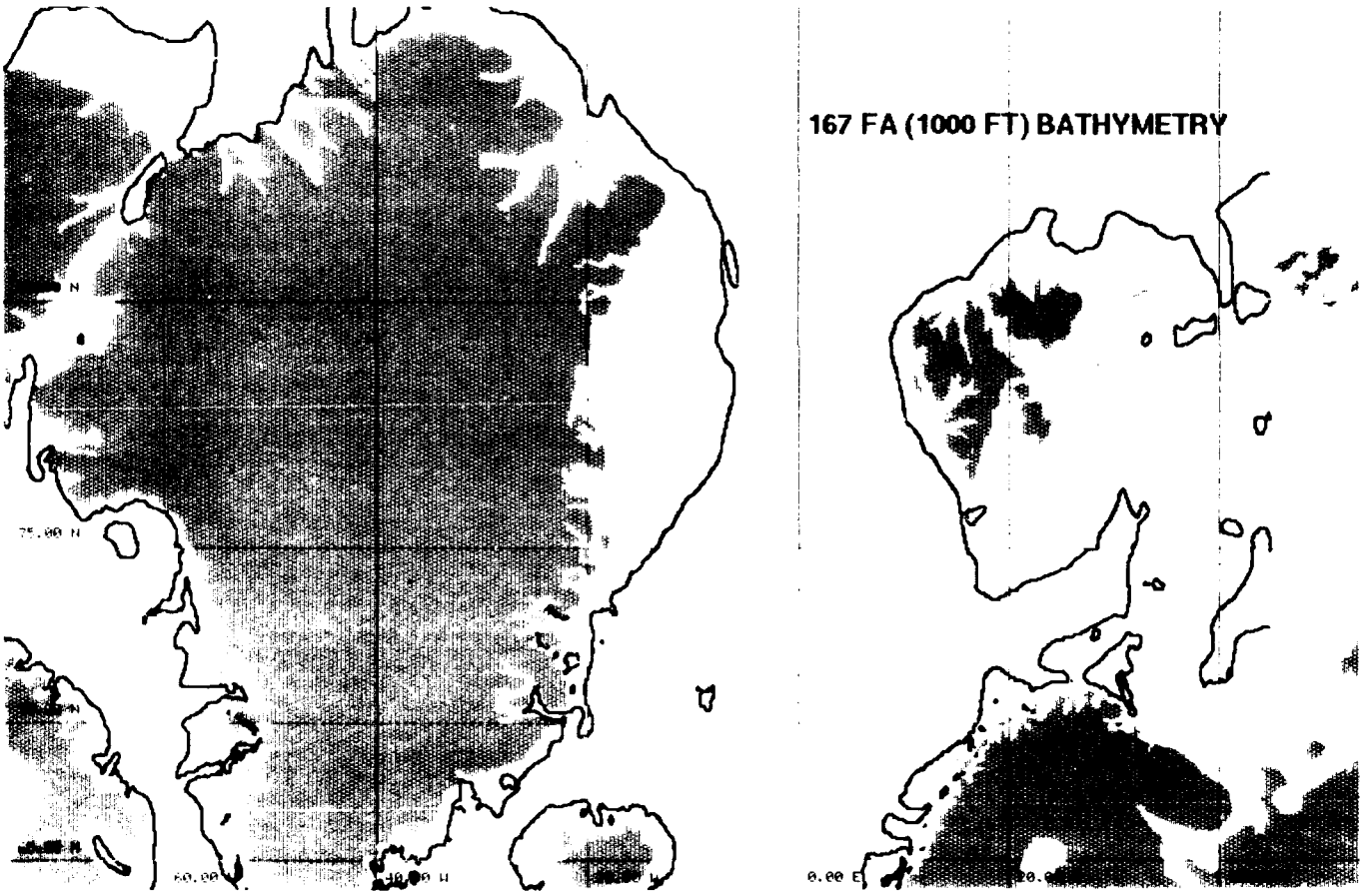
See comment 6.

See comment 11.

See comment 5.

DOD RESPONSE: Nonconcur. While concepts of operations against the regional threat need better definition, the requirement for deep water Anti-submarine Warfare capability and the requirement to maintain open Sea Lanes of Communication remain valid. Therefore, waiting for the analysis of the contribution of alternative Anti-Submarine systems is not prudent. In fact, some alternative Anti-Submarine Warfare systems identified by the GAO, such as the advanced deployable system, are complementary to the wide area surveillance provided by the Surveillance Towed Array Sensor System/Low Frequency Active. Additionally, it will take at least 10 years for those systems to become fully operational and available in quantity--much too long to wait, considering the uncertainties in the world political climate.

The procurement of the T-AGOS-24 and beyond should proceed upon successful completion of Low Frequency Active/Small Waterplane Area Twin Hull testing. The Surveillance Towed Array Sensor System/Low Frequency Active has demonstrated a deep water capability and is also the only system, either in the fleet or in development that has demonstrated any affordable wide area surveillance capability against the projected quiet threat submarine in regional conflict areas.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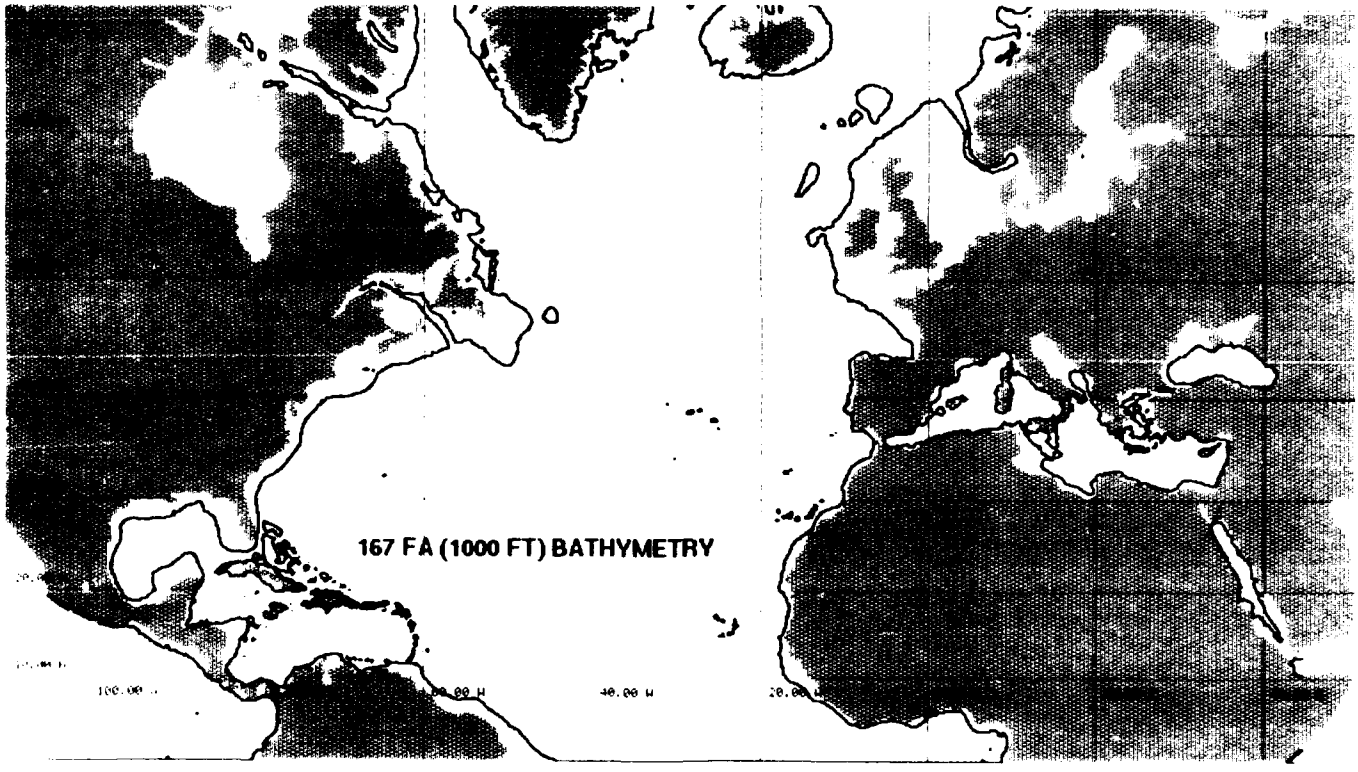
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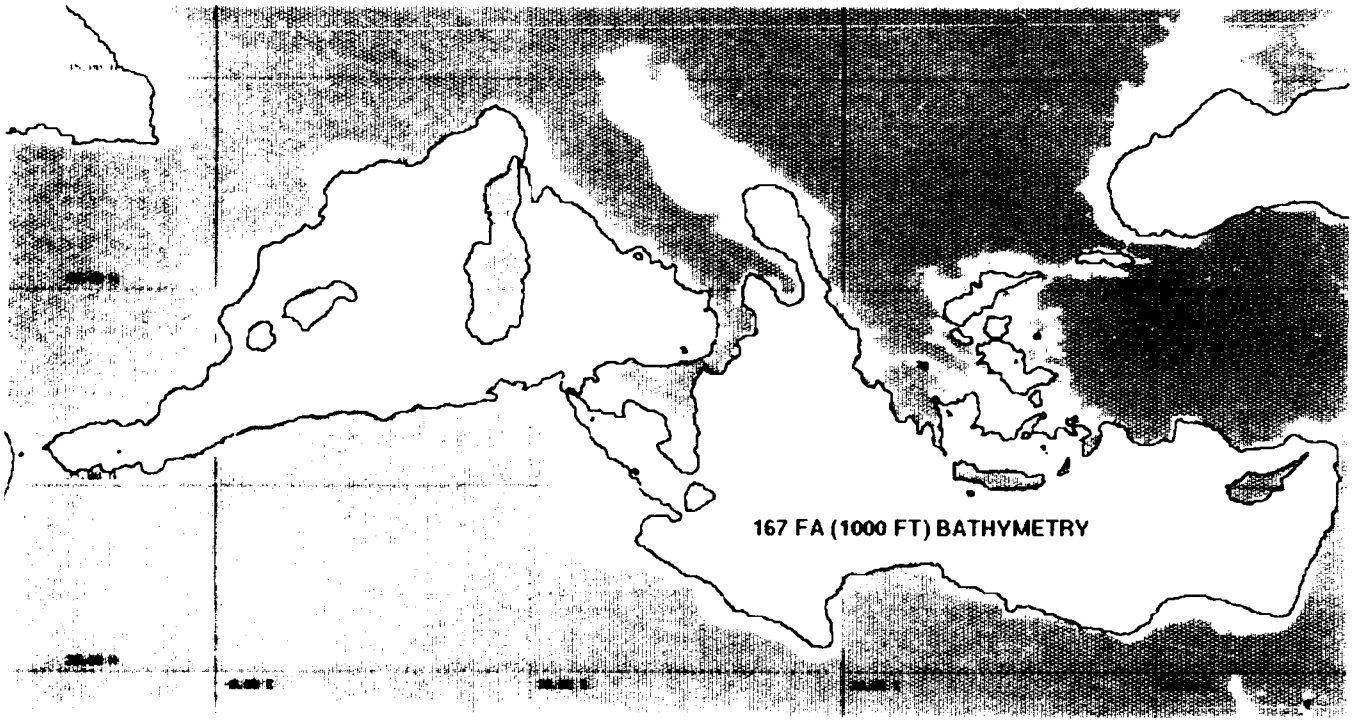
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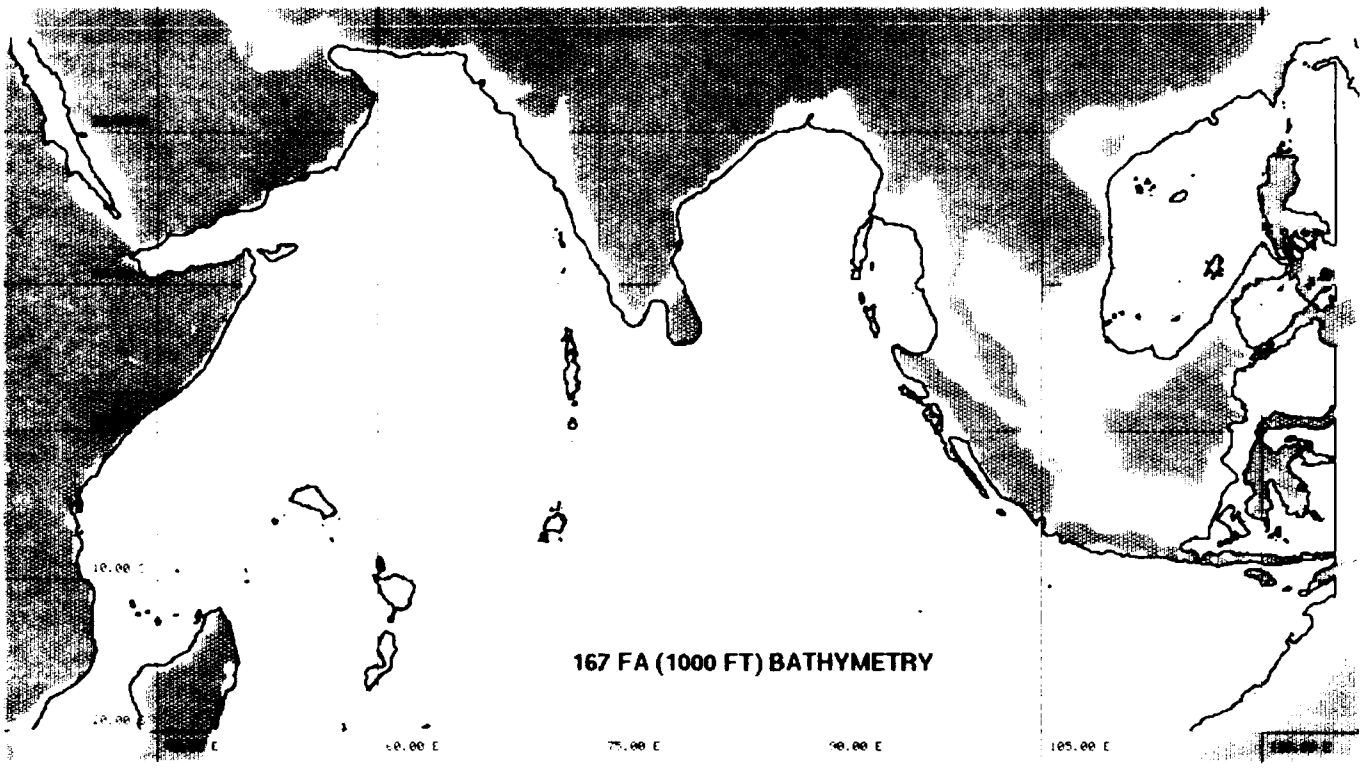
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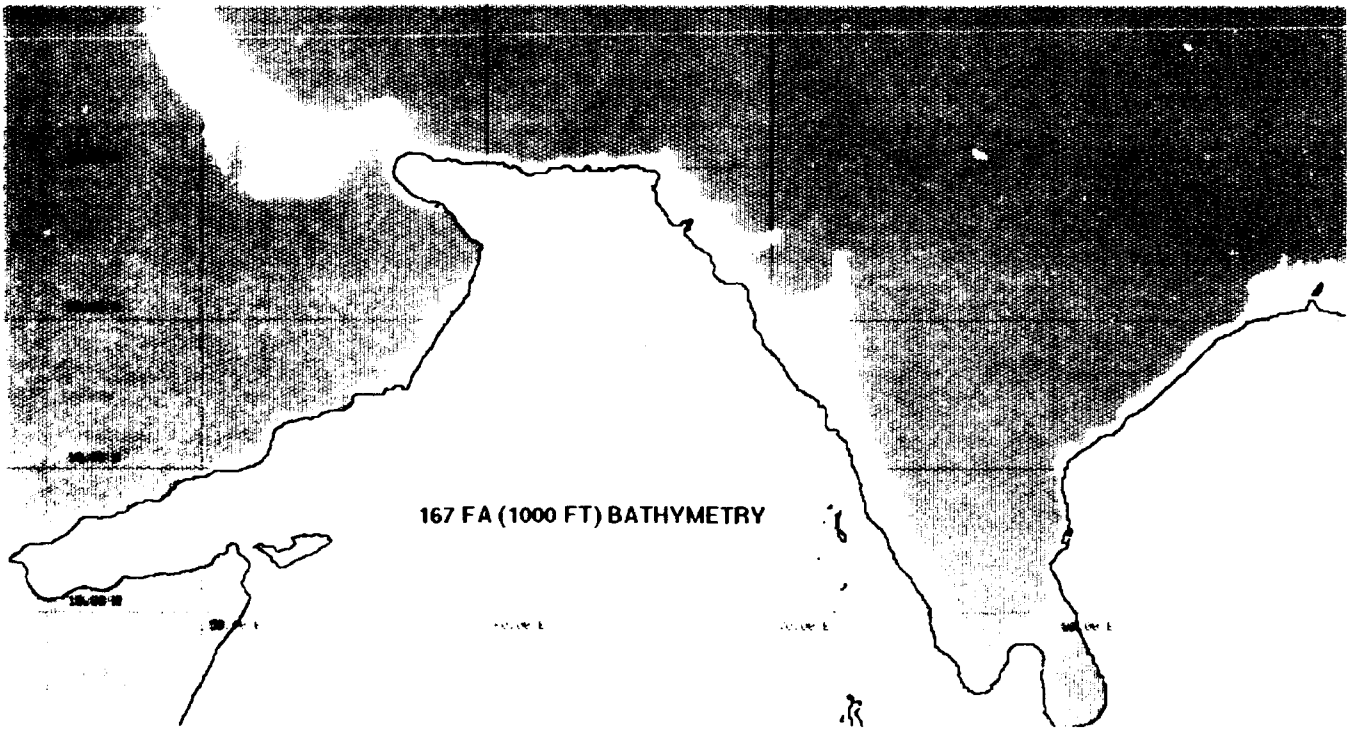
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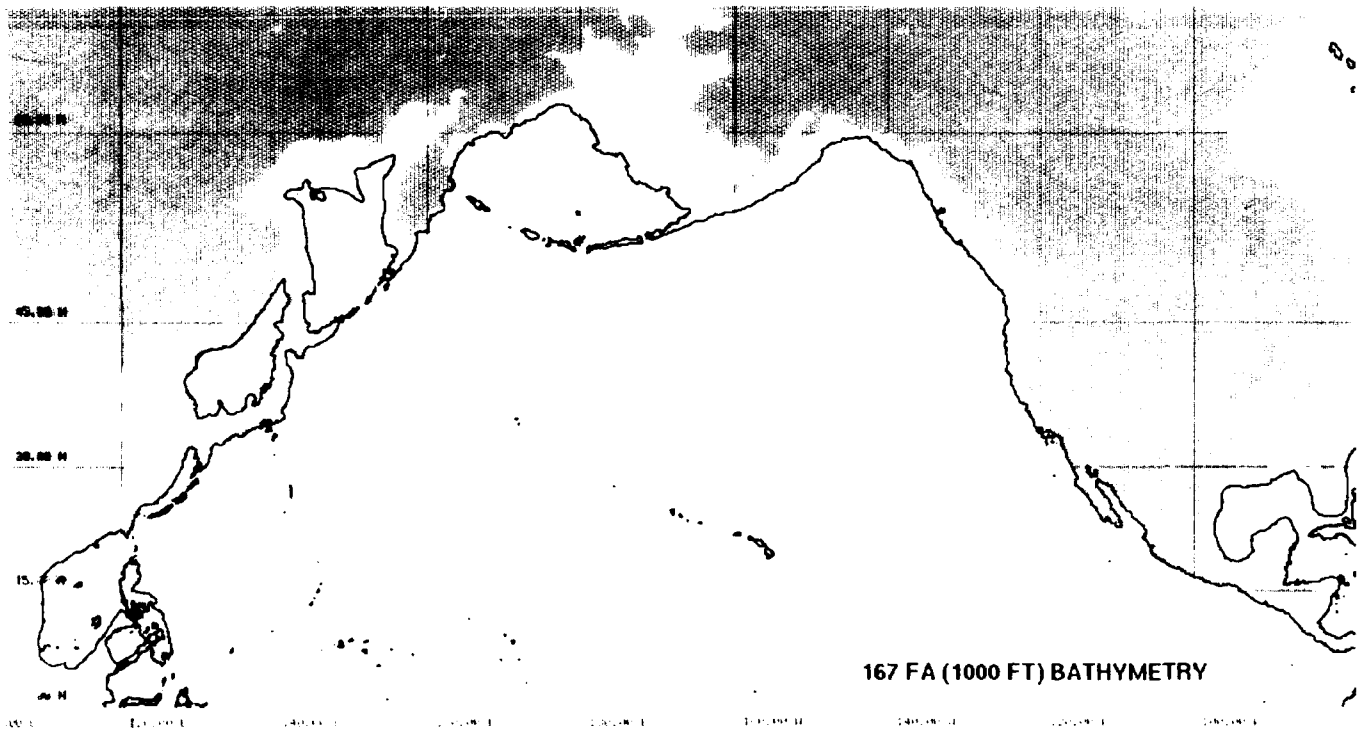
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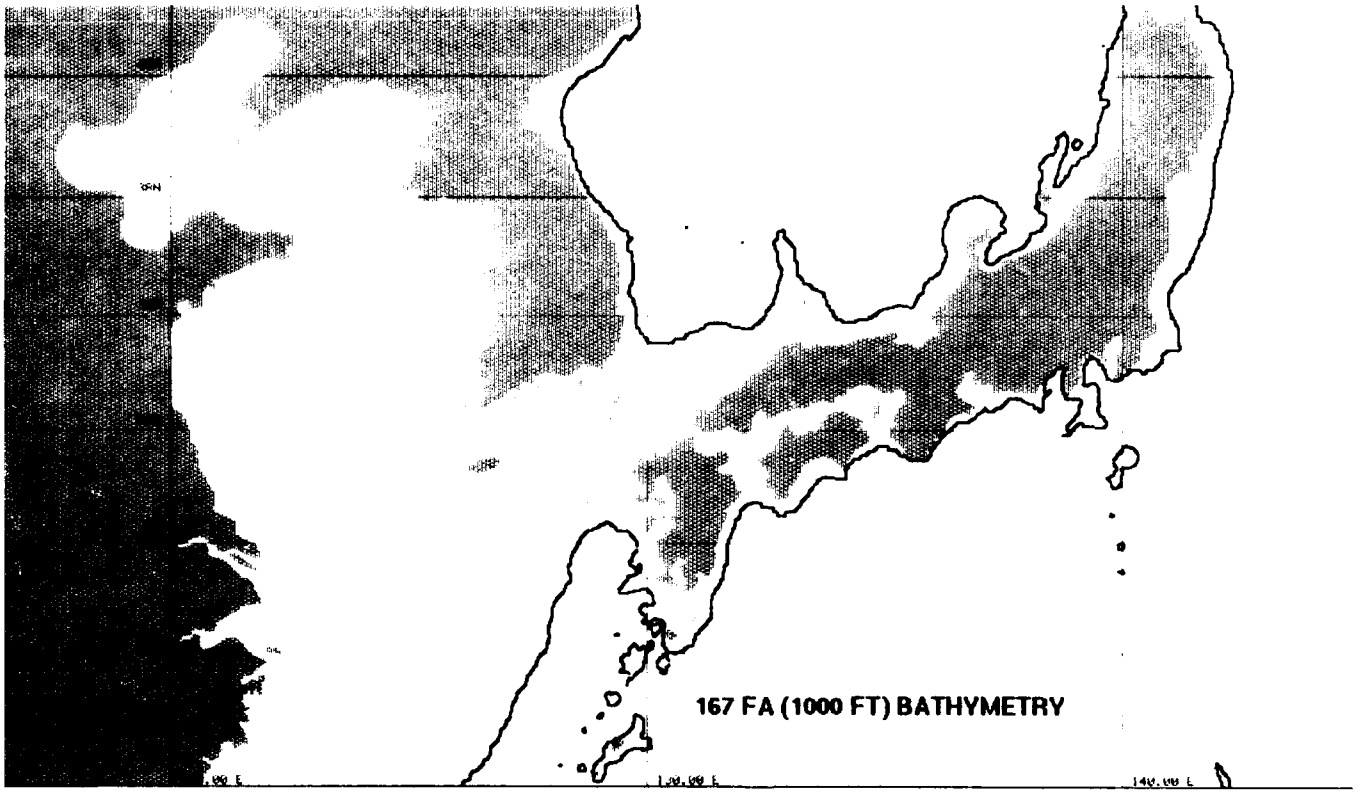
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The following are GAO's comments on the Department of Defense's letter dated October 1, 1992.

GAO Comments

1. We did not state or imply that the Navy should eliminate its current deep ocean surveillance capability or that future conflicts would involve only shallow water antisubmarine warfare. Instead, we described a shift in focus from a Soviet global submarine threat to an emerging threat of regional conflict in shallow water. As noted on page 6, the Navy does not have an agreed upon single definition for shallow water, nor has the Navy completed developing regional conflict scenarios for using its Integrated Undersea Surveillance System, of which the Surveillance Towed Array Sensor System (SURTASS) is a key element. Also, the Department of Defense (DOD) did not point out that in addition to SURTASS, the Navy utilizes its existing Sound Surveillance System for deep ocean surveillance.

While DOD commented that a significant submarine fleet with impressive capability still exists and remains at sea, the Director of Naval Intelligence testified in February 1992 before the House Committee on Armed Services, Subcommittee on Seapower, Strategic, and Critical Materials that the Russian submarine force is decreasing in size and that the number of submarines purchased by potentially hostile "rest-of-the-world" states is expected to decline by about 10 percent by the year 2000; other than Iran, few, if any, other developing countries are expected to become new seagoing submarine operators over the next decade.

2. We did not state or imply that the Navy's operational requirement for the SURTASS Low Frequency Active (LFA) system calls for a capability only against nuclear submarines. We described the focus of Navy surveillance requirements for undersea antisubmarine warfare until 1990. This was, according to Navy threat data, operational requirements and acquisition plans, the open ocean, deep water Soviet nuclear attack submarine. Also, we indicated that the Small Waterplane Area Twin Hull (SWATH) ships were originally designed to counter a Soviet threat, as noted in DOD's response to "Finding D".

3. We did not take issue with DOD's statement that there is a requirement for effective antisubmarine warfare in deep water. We continue to believe, based on Navy and Defense Intelligence Agency threat data, that the focus of the threat has changed to that of regional conflict in shallow, coastal waters. Thus, we would expect the Navy's requirements to adapt to and include this aspect of the threat. In this regard, we point out that the Navy's

Surveillance Long Range Planning Study reported in August 1991 that the Navy's requirements for its Integrated Undersea Surveillance System have "never been well defined," and they are changing rapidly. Thus, it would seem wise for the Navy to incorporate recent changes in the threat focus into its requirements for LFA.

4. All but one of the SURTASS LFA deep water tests conducted were developmental tests. As noted on page 7 of our report, developmental tests identify potential design limitations, substantiate that technical performance requirements have been achieved, and support the decision to certify a system ready for operational test and evaluation. Developmental testing is no substitute for operational testing in as realistic an environment as possible. Moreover, although the developmental tests demonstrated some potential LFA capabilities, they also identified several engineering and modeling deficiencies. Finally, in addition to proving some system operational capabilities, LFA-3 (the combined developmental/operational LFA test) revealed certain system instabilities, detection, deployment and processing problems.

5. The Navy's 3X-92 exercise tested passive, not active, capabilities as the Navy states. Further, Navy briefing documents and the LFA-7 test report show LFA system potential, rather than a clearly demonstrated capability to detect diesel submarines. In fact, LFA-7 test data showed system difficulties with information processing and detection.

6. As discussed on page 8, we did not indicate that we expected the alternatives to LFA to be available for widespread use in the mid-1990s. However, the Navy's Advanced Deployable Systems acquisition plan indicates a planned evolutionary development of fieldable prototypes with engineering and manufacturing development models expected to be available as early as 1996. In addition, according to an official at the Defense Advanced Research Projects Agency, unmanned undersea vehicles with certain sensors could be in place by about 1995 or 1996—the mid-1990s.

7. Clarification regarding the testing of an Advanced Development Model was added on page 7.

8. We did not state that "the Navy already responded to the diminished threat" by reducing the SURTASS program from a planned 39 ships to a total of nine ships. Navy program officials told us that the significant reduction in SURTASS ships was made in order to reduce the budget, i.e., because the

Navy could no longer afford to operate and maintain these ships, not because of changes in the threat. Although the Navy continues to maintain that it needs SURTASS for "other" deep water missions, it has not developed requirements for the regional threat or updated existing requirements for a deep water threat. Finally, even though the Navy has transferred some of its SURTASS monohull ships to other non-SURTASS missions, it has access to six of these ships for contingencies (see p. 9) and has access to sensor data from an allied nation's ocean surveillance program.

Clarification regarding ship operating costs was added on page 9.

9. Navy program officials provided no documentation regarding potential program cost increases when we asked. Clarification regarding Navy program officials' point of view on procurement of SURTASS prior to completion of testing was added on page 11.

10. Clarification regarding the number of ships available in 1994 was added on page 11.

11. According to Navy program officials, SURTASS alone is not intended to provide broad area coverage. The fixed Sound Surveillance System is another element of the Integrated Undersea Surveillance System to provide this capability. Moreover, Navy program officials were not able to provide us with any documentation comparing LFA with other systems or demonstrating that LFA is the only system that has demonstrated affordable wide area surveillance capability against the projected quiet threat submarine in regional conflict areas.