



THE ASSISTANT SECRETARY OF THE NAVY
 RESEARCH, ENGINEERING AND SYSTEMS
 WASHINGTON, D.C. 20340
 RICHARD L. GARWIN

28 MAR 1978

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Mr. Richard L. Garwin
 Post Office Box 218
 Yorktown Heights, New York 10598

Dear ^{Rich} Richard,

I appreciate your thought provoking letter of January 16, 1978, and the subsequent discussions we have had.

Your concerns are very timely as the carefully programmed replacement of POSEIDON submarines with the newer TRIDENT submarines is a subject which is receiving considerable attention throughout the Navy's senior management.

In your letter you mentioned hull rusting and hull fatigue due to depth cycling as two problem areas you are concerned with regarding POSEIDON service life extension. You also asked in your letter how much information regarding these two problem areas has been provided to DOD and to the Congress.

These are excellent questions and I have explored them in some detail. The Navy has a considerably advanced submarine hull material status monitoring and maintenance program which has been successfully in effect for a number of years. This program includes periodic dry docking of submarines (approximately every eighteen months) to allow careful measurements of corrosion and thorough measurement and evaluation of potential hull defects. Acceptability criteria for local corrosion phenomena and potential defects have been established from an extensive history of laboratory and full-scale testing, computer aided stress analysis and nondestructive examination method and process qualification. Based upon these criteria, defects discovered during these dry dock surveys are fully repaired to acceptable standards. Following this examination and local repair procedures, the submarine hull is given a thorough represervation using a sophisticated three element paint-like coating system.

Our experience in these areas now includes careful examinations and records of over a hundred submarine hulls covering ships which have been in the water and subject to depth cycling as long as twenty-three years. Based upon this extensive data base we have seen that, providing the hull preservation system is applied and maintained properly (which we are consistently able to do), general area submarine hull corrosion has been well within the predicted amounts. Sufficient

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hull thickness is allowed by our design standards such that this type of corrosion would not be a limiting item for extended use of these hulls.

Our experience with localized (pit-type) corrosion is that it is a very small problem and that our inspection and weld repair techniques are able to repair defects noted during each examination at very low cost.

With regard to cyclic fatigue, our hull design basis is such that this should not become limiting in the use of our hulls for extended periods. Of more concern is the potential for strain induced propagation of hull defects which are initially below the size detectable by any nondestructive hull inspection technique. Our monitoring program, which includes x-ray and ultrasonic inspection techniques, has shown that the flaws which propagate to a measurable size due to strain cycling and which are larger than carefully established standards are relatively few and repairable by well established hull maintenance methods.

Hence, based upon an extensive hull monitoring inspection program, the Navy has concluded hull corrosion and fatigue are not limiting considerations for extending the life of POSEIDON SSBN's. This is in consonance with the conclusions in your letter. Thus, we have never reviewed the above programs with Congressional representatives. A number of people in the Office of the Secretary of Defense are fully aware of the above cited programs and some have management experience in these programs as part of their background. However, again because these are not limiting areas, we have no records of special briefings on this material for the Secretary of Defense.

However, longer term hull availability does not correspond to longer term military utility of the POSEIDON hulls. The major consideration is that the technology contained in the overall POSEIDON submarine design is over twenty years old. As the Soviets improve their ASW methodology, we have programmed about all we can to improve the POSEIDON ships over the projected service life to maintain their survivability as a secure platform for our sea based leg of the strategic triad. Further major improvements must be continued to maintain the survivability of these essential deterrent forces. To make these further advances in the POSEIDON hulls would require major internal system replacement which would be tantamount to new ship construction. In this I mean major new ship sensor and defense systems will be required, major new communication capabilities, major new propulsion and auxiliary machinery installations and other major improvements would also be required. The size and space constraints of existing POSEIDON hulls would severely limit the scope of improvement achievable. The TRIDENT submarine was designed with and is being built with these technologically available improvements to ensure the sea based leg of the strategic triad maintains its secure deterrent capability.

Like the very successful Fleet Rehabilitation and Modernization (FRAM) Program which kept a number of our World War II destroyers

militarily competitive for over two decades, we plan to maintain our POSEIDON ships militarily current for over two decades. However, like the FRAM destroyers, to maintain the military viability of the strategic submarine force, we must move on to a newer ship design containing an integrated new technology base which will allow the sea based leg of the strategic triad to maintain a survivable force into the next century.

Again, I appreciate this opportunity we have had to exchange ideas.

Sincerely,

David

D. E. MANN