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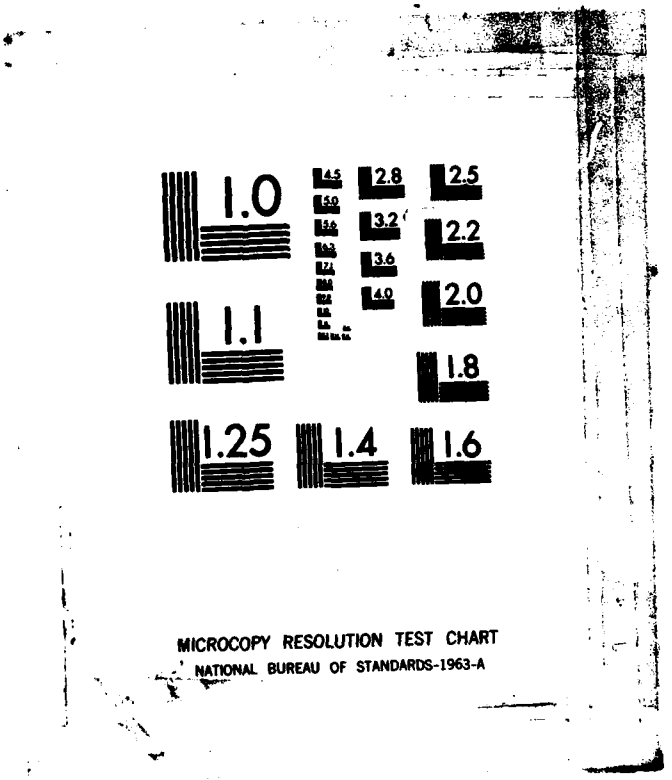
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Report To The Congress

OF THE UNITED STATES

Status Of Trident And SSN-688 Submarine Construction At The Electric Boat Division Of General Dynamics Corporation

GAO/NSIAD-83-10
FEBRUARY 28, 1983

COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-203670

To the President of the Senate and the
Speaker of the House of Representatives

This report presents our views on the major issues concerning the status of submarine construction at Electric Boat Division.

For the past several years, we have reported annually to the Congress on the status of selected major weapon systems. This report is one in a series that is being furnished to the Congress for its use in reviewing fiscal year 1984 requests for funds.

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

for Comptroller General
of the United States

COMPTROLLER GENERAL'S
REPORT TO THE CONGRESS

STATUS OF TRIDENT AND SSN-688 SUBMARINE CONTRUCTION AT THE ELECTRIC BOAT DIVISION OF GENERAL DYNAMICS CORPORATION

D I G E S T

The General Dynamics Corporation, Electric Boat Division, is the designer and sole builder of the Trident class ballistic missile submarine and is one of two builders of the SSN-688 Los Angeles class attack submarine. As of December 1982, Electric Boat has been awarded 3 contracts for 10 Trident submarines, 2 of which it has delivered to the Navy. It has received 5 contracts for 24 SSN-688s and has delivered 13 SSN-688s through December 1982. (See p. 1.) GAO made this review to provide the Congress with an update on the status of submarine construction at Electric Boat.

Through the years and especially in 1981 both programs have experienced delivery delays and construction problems. The situation at Electric Boat now, however, is more stable. (See ch. 2.)

With an increase in skilled workers and productivity improvements, which are underway, contractual delivery dates are achievable. Electric Boat has taken action to increase its skilled work force, and the Navy and Electric Boat are working together in the early stages of a productivity improvement program. (See pp. 4 to 6 and 10.)

Electric Boat continues to experience cost difficulties with its SSN-688 class submarine construction program. In 1981, General Dynamics Corporation realized a $45 million loss attributable to workmanship problems at Electric Boat. In August 1982, it recognized an additional $84 million loss to cover estimated cost overruns on the first two SSN-688 contracts. The Navy believes that these recognized losses more realistically reflect the true cost of these contracts, and that Electric Boat will make a profit on its third SSN-688 contract. (See pp. 6 to 8 and 11.)

GAO/MASAD-83-10

FEBRUARY 28, 1983

Tear Sheet

Planned modifications on some Trident and SSN-688 submarines will affect progress on construction and increase cost. For example, with the introduction of the new Trident II (D-5) missile on the ninth Trident submarine, the construction period is estimated to be extended 1 year and add some 2 million labor hours to the construction estimate. The effect of the D-5 missile on the Trident submarines and a vertical launch system for Tomahawk cruise missiles on the SSN-688s, however, has not been fully determined. (See pp. 6, 10, and 11.)

AGENCY AND CONTRACTOR COMMENTS

The Department of Defense and Electric Boat generally concurred with GAO's findings and conclusions. They did, however, suggest some changes to the draft for the purposes of clarification, technical accuracy, and updating. These comments were incorporated as appropriate. (See pp. 5 and 11.)

Contents

CHAPTER 1

INTRODUCTION

In the early 1970s, the Navy initiated new construction programs for expanding and upgrading its ballistic missile and attack submarine fleets. The General Dynamics Corporation, Electric Boat Division, is the designer and sole builder of the Trident class ballistic missile submarine. It is also one of two builders of SSN-688 Los Angeles class attack submarine.

PROGRAM DESCRIPTIONS

The Trident and SSN-688 class submarines are the newest additions to the U.S. nuclear powered submarine fleets. Trident class submarines are to replace the present Poseidon ballistic missile submarine fleet. The Trident submarine is larger, faster, quieter, and carries more missiles than its predecessors. When equipped with the Trident II (D-5) missile, the Trident submarine is to be capable of destroying hard targets such as Soviet intercontinental ballistic missile silos. The SSN-688 class submarine is a new generation attack submarine designed to destroy enemy submarines and surface ships. The SSN-688's capabilities are being enhanced by adding a vertical launch system for the Tomahawk cruise missile.

According to the September 30, 1982, Selected Acquisition Report, it will cost an estimated $20.5 billion for 15 Trident submarines (including submarine support facilities at Bangor, Washington) and $24.3 billion for 56 SSN-688s. These estimates do not include costs for Trident and Tomahawk missiles, but they do include costs for vertical launch systems on the SSN-688s. The following table summarizes the contracts awarded to Electric Boat for these submarine programs as of December 1982.

	SSN-688	Trident
Number of contracts awarded	5	3
Number of submarines contracted for	24	10
Number of submarines delivered	13	2

Through the years, both these programs have experienced problems that have raised congressional and public interest and have been the subject of numerous congressional hearings. Our last comprehensive report on this subject was "Cost Growth and Delivery Delays in Submarine Construction at Electric Boat Are Likely to Continue" (MASAD-82-29, Apr. 19, 1982).

OBJECTIVES, SCOPE, AND METHODOLOGY

We reviewed the Trident and SSN-688 programs at Electric Boat to provide the Congress with the current status of submarine construction at the shipyard. To accomplish this we

--determined the status of the programs with respect to Electric Boat actions to improve productivity and expedite timely delivery of submarines to the fleet,

--documented the cost and schedule status of the programs, and

--identified areas of potential impact on the status of submarine construction at Electric Boat.

In conducting our review, we interviewed and submitted questions to the Department of Defense officials associated with the management or oversight of the SSN-688 and Trident submarine programs at the Naval Sea Systems Command in Washington, D.C.; the Supervisor of Shipbuilding, Conversion and Repair in Groton, Connecticut; and Defense Contract Audit Agency at Groton, Connecticut. The Supervisor of Shipbuilding, Conversion and Repair, is the Navy's representative at assigned contractor facilities responsible for performing contract administration functions and repair alterations on Navy ships.

We also reviewed the Department of Defense's and Electric Boat's documents related to the Trident and SSN-688 submarine programs and discussed them with cognizant contractor and Defense officials at the contractor's facilities in Groton, Connecticut, and Navy Headquarters in Washington, D.C.

Our review was made in accordance with generally accepted government auditing standards. However, in obtaining and analyzing the computer-generated cost information provided by Electric Boat, we did not assess the reliability of this data.

CHAPTER 2

POSITIVE STEPS TAKEN TO IMPROVE THE STATUS OF SUBMARINE CONSTRUCTION AT ELECTRIC BOAT

Electric Boat's submarine construction program issues involving insurance reimbursement and estimated delivery dates have been resolved. Moreover, we believe that the Navy and Electric Boat relationships have improved, and Electric Boat has taken several actions to improve the status of submarine construction.

FAULTY WORKMANSHIP REIMBURSEMENT REQUEST RESOLVED

Welding and painting deficiencies were of principal concern to the Navy and Electric Boat in 1981. It culminated in Electric Boat submitting an insurance reimbursement request to the Navy. This, however, was resolved in early 1982.

Electric Boat sought to recover from the Navy, under the builder's risk insurance provision of the contracts, the costs it incurred to correct faulty workmanship by its employees. Since 1942, the Navy has acted as a self-insurer of builder's risk associated with new ship construction. On June 16, 1981, Electric Boat submitted to the Navy an initial insurance reimbursement request to cover $18.9 million in costs associated with defective welding for only the SSN-698--the 11th submarine of the SSN-688 class submarines. The Navy expected that this request would be followed by others for the SSN-699 and the remaining submarines on these contracts, but this did not occur.

In February 1982 the Navy awarded Electric Boat a new contract for additional SSN-688 class submarines. At the same time, contract modifications were negotiated on existing contracts whereby Electric Boat agreed not to pursue the insurance reimbursement issue. In its annual report for 1981, General Dynamics, Electric Boat's parent corporation, recognized a $45 million loss, which it attributed to workmanship problems at Electric Boat.

REVISED CONTRACTUAL DELIVERY DATES ESTABLISHED

For a period of time in 1980-81, the Navy was unable to secure firm delivery schedules from Electric Boat. In August 1981, the Navy and Electric Boat agreed to revised contractual Trident submarine delivery dates. With the award of the SSN-688 class contract in February 1982, the Navy and Electric Boat reached an agreement on revised contract delivery dates for all previous SSN-688 class submarines. Consequently, submarine delivery dates are not now in dispute.

RELATIONS BETWEEN THE NAVY AND ELECTRIC BOAT ARE IMPROVED

The working relationship between the Navy and Electric Boat has improved since 1981. In addition to settling the insurance reimbursement and delivery date issues, other actions indicate a more constructive atmosphere.

Electric Boat claimed that the post-shakedown availability 1/ work done on the first Trident submarine delivered would affect delivery of the following two Trident submarines. As a result, the Navy and Electric Boat executed a contract modification extending the delivery dates for these two submarines a maximum of 28 days at a maximum cost of $2 million. The exact delay and cost were subject to further negotiation once the first Trident submarine post-shakedown availability work was completed. However, post-shakedown availability work went well and Electric Boat and the Navy signed a contract modification which stipulated no increase in contract price and no delay to delivery of the following two submarines.

The Navy and Electric Boat are working together in the early stages of a productivity improvement program under the Naval Sea Systems Command Shipbuilding Technology Program. This program involves implementing technology modernization projects with the Navy and Electric Boat sharing the risks, costs, and benefits. The Navy has provided $500,000 toward this effort; however, the Navy believes congressional budget considerations may endanger further funding of this program.

In July 1982 Electric Boat completed the self-assessment study phase of the productivity improvement program. The study identified high-cost areas in submarine construction with the greatest cost savings potential. This study is to contribute to the overall program benefits of improved productivity, reduced cost, reduced leadtime, improved quality of construction, and enhanced industrial preparedness posture. Electric Boat is currently evaluating these areas, and is to submit a list of prioritized proposals for funding consideration by the Navy.

Electric Boat has taken other steps to improve the status of submarine construction. As of November 30, 1982, a recruitment program undertaken in early 1982 has increased the number of shipbuilders by 1,300 in Groton, Connecticut, and Quonset Point, Rhode Island. This includes 600 skilled workers in seven major departments. From January 1981 through June 1982, the ratio of skilled

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1/Post-shakedown availability is a period of time spent making fixes and modifications to the submarine in the shipyard after a cruise to test performance and operational characteristics.

workers to the work force for Electric Boat's Groton and Quonset yards has improved by 6 and 12 percent, respectively.

CONCLUSIONS

The issues concerning the insurance reimbursement request and estimated delivery dates have been resolved. Electric Boat contractually agreed not to pursue the insurance reimbursement issue, and settled on contractual delivery dates for both programs. The Navy and Electric Boat are working together on a program designed to improve shipyard productivity. Moreover, Electric Boat has improved its skilled work force profile, which may have long-term benefits to both Electric Boat and the Navy.

AGENCY AND CONTRACTOR COMMENTS

The Department of Defense and Electric Boat generally concurred with our findings and conclusions. They did, however, suggest some changes for the purposes of clarification, technical accuracy, and updating. These comments were incorporated as appropriate.

CHAPTER 3

COST AND SCHEDULE STATUS OF TRIDENT AND SSN-688 PROGRAMS AT ELECTRIC BOAT

Electric Boat's estimate of Trident submarine contract growth is less than reported last year. Contract growth continues, however, on the SSN-688 class submarine program. With an increase in skilled workers and productivity improvements which are underway, contractual delivery dates are achievable. Construction time frames for the 9th, 10th, and 11th Trident submarines, however, will be extended with the introduction of the D-5 missile.

ELECTRIC BOAT REPORTED COST CHANGES SINCE JUNE 1981

In our April 1982 report on Electric Boat, we reported on the cost status of Electric Boat's submarine programs as of June 27, 1981. We used this date as the baseline for measuring Electric Boat estimated growth on contracts because the cost reports issued on that date reflected, for the first time, the latest schedule revisions and costs to correct quality assurance problems. Growth represents the difference between Electric Boat's contract baseline for each program and the total amount Electric Boat budgeted for the work (allocated budget). The contract baseline includes current target cost and negotiated changes plus Electric Boat's estimates of authorized, unpriced work and material, and labor escalation. Electric Boat's allocated budget covers the same scope of work and escalation. The June 26, 1982, cost report data used in this report also reflects the addition of 1982 contract awards and Electric Boat's reprogramming actions since June 1981.

As of June 1982, Electric Boat reported an estimated growth above baseline of $173 million (4 percent) and $74.2 million (3 percent) for the Trident and SSN-688 class submarine programs, respectively. Table 1 summarizes Electric Boat's estimated costs above the SSN-688 class and Trident submarine contract baselines as of June 26, 1982. These costs do not include costs for seven submarines under the first SSN-688 contract (SSN-688 I), all of which were delivered by June 1981. These costs also do not include costs for 2 submarines under the recent SSN-688 VIII contract or for the 10th Trident submarine.

Table 1

Reported Cost Status of Submarine Construction
by Electric Boat Division as of June 26, 1982 a/

Contracts	Number of submarines	Current target cost	Est. of authorized, unpriced work and escalation	Contract baseline	Electric Boat's allocated budget	Estimated growth above baseline
		(thousands)				
SSN-688 II	11	$1,687,095	$ 88,591	$1,775,686	$1,837,961	$ 62,275
SSN-688 V	2	234,975	127,357	362,332	374,248	11,916
SSN-688 VII	2	397,035	149,582	546,617	546,617	-
Total	15	2,319,105	365,530	2,684,635	2,758,826	74,191
Trident I	4	944,677	684,748	1,629,425	1,826,896	197,471
Trident II	3	931,210	526,948	1,458,158	1,432,689	(25,469)
Trident III	1	351,302	165,365	516,667	517,643	976
Trident IV	1	444,200	171,447	615,647	615,647	-
Total	9	2,671,389	1,548,508	4,219,897	4,392,875	172,978
Total	24	$4,990,494	$1,914,038	$6,904,532	$7,151,701	$247,169

a/Does not include recent award of SSN-688 VIII contract for 2 submarines or award of contract for the 10th Trident submarine.

As of June 1982, Electric Boat's estimate of cost at completion is $4.4 billion for the Trident program and $2.8 billion for the SSN-688 II, V, and VII programs (see table 1 column headed Electric Boat's allocated budget). Electric Boat's estimated growth above baseline for the SSN-688 program in June 1982 of $74.2 million (3 percent) represents an increase of $60.7 million from its June 1981 estimate of $13.5 million. Conversely, Electric Boat's June 1982 estimated growth above baseline for the Trident contracts is $173 million (4 percent), a $38.4 million decrease from its June 1981 estimate of $211.4 million. The Navy believes Electric Boats' Trident estimates are within Navy estimates and budgeted amounts.

The estimated growth above baseline increases in the SSN-688 II and V contracts is the result of increases in Electric Boat's estimates at completion. The growth estimates on these contracts reflect problems which we previously reported. The decrease in the Trident submarine program estimated growth above baseline is

largely attributable to changes in escalation estimates and use of management reserve 1/ for the Trident submarine II contract.

LOSSES ON THE SSN-688 CLASS PROGRAM

In June 1978, Electric Boat and the Navy settled a cost overrun claim on the SSN-688 class submarine program. The settlement covered all 18 submarines under the SSN-688 I and SSN-688 II contracts. As part of Electric Boat's June 1978 settlement with the Navy, General Dynamics Corporation absorbed a $359 million loss. In 1981 General Dynamics reported an additional loss of $45 million attributable to workmanship problems on some SSN-688 submarines under this June 1978 settlement. In August 1982, General Dynamics recognized an additional $84 million loss to cover estimated cost overruns on the SSN-688 I and II contracts. As of December 1982, Electric Boat has delivered 13 of the submarines under these contracts with the remaining 5 scheduled for delivery over the next 3 years.

According to published reports, company officials believe that the $84 million loss should be the last loss incurred for completing the first two SSN-688 class contracts and anticipate that the remaining SSN-688 class and Trident contracts will be profitable. The Navy believes that the above losses on the first two contracts more realistically reflect the true cost of the contracts, and that Electric Boat will make a profit on the SSN-688 V contract. In its Selected Acquisition Report, the Navy excludes its completion cost estimates for the SSN-688 V contract citing that the disclosure of this information is sensitive and could jeopardize the government's negotiating position.

As shown in table 1, the SSN-688 V contract already has an estimated above baseline growth of $11.9 million (3 percent). Furthermore, Electric Boat has committed its entire management reserve for this contract to the contract budget. As of June 1982, Electric Boat's direct labor hour estimate at completion for the two ships in the SSN-688 V contract remains significantly below actual experience on completed submarines. Navy estimates also show a substantial deficit in Electric Boat's direct labor hour budgets for the SSN-688 V contract. Indicative of these events, in a November 1982 letter to the Navy, Electric Boat announced an increase in the budgets for these two submarines effective in 1983.

1/Management reserve represents labor costs which may not be incurred based on current trends but is not firm enough to warrant reducing the total estimated costs.

SCHEDULE STATUS OF THE TRIDENT AND SSN-688 PROGRAMS

As of December 1982, Electric Boat delivered 2 Trident submarines and 13 SSN-688 class submarines to the Navy. One Trident and two SSN-688 class submarines were delivered in 1982.

In August 1981 and February 1982, the Navy and Electric Boat formalized revised contract delivery schedules for the Trident and SSN-688 class submarine programs, respectively. Table 2 summarizes these delivery schedules as of November 30, 1982. According to Electric Boat's monthly progress reports, the remaining scheduled delivery dates shown in table 2 probably can be met. In both the SSN-688 class and Trident construction programs, Electric Boat is behind schedule on some submarines scheduled for delivery after 1984. Electric Boat, however, as it has demonstrated before, may still deliver these submarines on schedule with increased work force levels and improved productivity.

Table 2

Trident and SSN-688 Submarine Delivery Schedules by Electric Boat As of November 30, 1982

Contracts	Ship	Original contract	April 1981 estimate	Current contract
SSN-688 class:				
688 II	700	10/77	6/81 a/	N/A
	701	2/78	9/81 a/	N/A
	702	7/78	12/81 a/	N/A
	703	11/78	12/81 a/	N/A
	704	1/79	6/82 b/	N/A
	705	5/79	12/82 c/	N/A
	706	9/79	6/83	5/83
	707	1/80	12/83	10/83
	708	5/80	6/84	3/84
	709	9/80	12/84	9/84
	710	1/81	6/85	2/85
688 V	719	8/84	12/85	6/85
	720	3/85	6/86	11/85
688 VII	724	1/87	-	1/87
	725	1/88	-	1/88
688 VIII	751	6/88	-	6/88
	752	11/88	-	11/88
Trident class:				
Trident I	726	4/79	10/81 a/	N/A
	727	4/80	10/82 d/	N/A
	728	12/80	8/83	6/83
	729	8/81	4/84	2/84
Trident II	730	4/82	12/84	10/84
	731	12/82	8/85	6/85
	732	8/83	4/86	2/86
Trident III	733	5/86	12/86	10/86
Trident IV	734	12/87	-	12/88
	735	8/88	-	8/89

a/Actual delivery month.
b/Submarine was actually delivered 7/82.
c/Submarine was actually delivered 11/82.
d/Submarine was actually delivered 8/82.

RECENT DEVELOPMENTS COULD AFFECT CONSTRUCTION PROGRESS

Planned modifications on both the Trident and SSN-688 class submarines could extend some submarine construction time frames. The Trident submarine is to be modified to accept a larger, more powerful ballistic missile. Attack capabilities of SSN-688 class submarines are to be enhanced with the addition of vertical launch tubes for Tomahawk cruise missiles. Initially, these changes are to occur on new construction submarines.

On the Trident submarine, the more advanced Trident II (D-5) missile is to replace the Trident I (C-4) missile. Beginning with the ninth Trident submarine, the D-5 is to be installed on all new construction Trident submarines. The earlier constructed C-4 configured Trident submarines are to be eventually modified during regular overhauls to accommodate the D-5 missile system.

The Navy believes introducing the D-5 missile will extend the construction schedule of the 9th, 10th, and 11th Trident submarines by 12 months, 12 months, and 4 months, respectively, from estimated deliveries as C-4 equipped submarines. It estimates that the D-5 installation on the ninth Trident submarine will also add some 2 million labor hours to the construction estimate. According to Electric Boat officials, the receipt and subsequent installation and testing of the D-5 strategic weapon system equipment represents the critical path controlling the delivery of the 9th, 10th, and 11th Trident submarines. Further, they believe slipping the authorization of the 11th Trident submarine from fiscal year 1983 to fiscal year 1984 will increase its cost and delay its delivery.

A second modification which could extend construction timeframes involves SSN-688 class submarines. Newport News Shipbuilding and Drydock Company, the design agent for SSN-688 class submarines, is designing a vertical launch system for launching Tomahawk cruise missiles for SSN-688 class submarines, including retrofits to in-service submarines. The Navy plans for early introduction of the vertical launch system by having it installed on new construction SSN-688 class submarines. Since the Newport News Shipbuilding and Drydock Company design for the vertical launch system will not be completed in time for new construction installation on the two submarines procured under the SSN-688 V contract, Electric Boat is to design and install the system on these two submarines. Electric Boat has received $28.5 million to design the system. Electric Boat has submitted its proposal to the Navy but negotiations have not yet started regarding the construction work and costs associated with the system.

CONCLUSIONS

While Electric Boat's estimated growth above baseline for its Trident submarine contracts is less than it reported last year, it has continued to experience growth problems on its earlier SSN-688 class contracts. Construction progress is behind schedule on some submarines scheduled for delivery after 1984, but with an increase in the ratio of skilled workers and productivity improvements which should occur from efforts being taken by Electric Boat, the current contract dates are achievable. The effect of the D-5 missiles and vertical launch system installation, however, has not been fully determined.

AGENCY AND CONTRACTOR COMMENTS

The Department of Defense and Electric Boat generally concurred with our findings and conclusions. They did, however, suggest some changes for the purposes of clarification, technical accuracy, and updating. These comments were incorporated as appropriate.

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