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BY THE COMPTROLLER GENERAL

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Report To The Congress

OF THE UNITED STATES

Better Navy Management Of Shipbuilding Contracts Could Save Millions Of Dollars

Changes to any shipbuilding program can number in the thousands and increase the price of ships by hundreds of millions of dollars. The Navy makes formal changes by modifying a shipbuilding contract in writing. Constructive changes result from Navy action or inaction which causes the shipbuilder to do additional or different work than specified in the contract. If the Navy and the shipbuilder agree that a constructive change occurred because of the Navy, it can become a formal change. If they disagree, it can form the basis for a shipbuilder's claim. Claims reached \$2.7 billion in 1978.

Some positive Navy actions may avoid claims or at least provide a defense for the Government if a claim were filed. However, other Navy actions may avoid claims, but not necessarily reduce cost to the Government.

GAO makes recommendations that can help keep costs and claims to a minimum.



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

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

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This report discusses the various types of changes the Navy makes to shipbuilding contracts, the cost impact of the changes, how the changes are used as a basis for contractors to file claims against the Government, and some of the action being taken by the Navy to minimize changes and resulting claims.

Our review was made to find out how the Navy processes contract changes and whether the changes are necessary.

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

ASCO0005

A handwritten signature in black ink, appearing to read "Luther A. Starks".

Comptroller General
of the United States



D I G E S T

Over 75 years ago ship construction was not being completed on schedule because of changes in the Navy's program. Today, the same problem exists, contributing to shipbuilding claims that have grown from \$300 million in 1971 to \$2.7 billion in 1978.

GAO reviewed changes made to three major shipbuilding programs--the SSN-688 Class nuclear attack submarine, DD-963 Class destroyer, and FFG-7 Class guided missile frigate--to evaluate the Navy's effectiveness in managing changes. While some changes are preventable, others are unavoidable.

FORMAL CHANGES

Formal changes modify contracts in writing. They are made only to correct deficiencies or errors in design, meet operational requirements, provide for safety of personnel and equipment, or save the taxpayer's dollar.

These changes represent almost 60 percent of the cost growth in the DD-963 program, 100 percent of the cost growth in the FFG-7 program, and only 9-percent of the cost growth in the SSN-688 program.

Although GAO noted instances where the need for formal changes was questionable, generally the Navy is effectively managing them.

CONSTRUCTIVE CHANGES

A constructive change results from Navy action or inaction that causes the shipbuilder to do additional or different work than is required by the contract. If the Navy agrees with the shipbuilder that a constructive change occurred for which the Navy

is responsible, it approves it in writing and makes it a formal change at an agreed price. If the Navy disagrees, the constructive change will probably form the basis for a contractor's claim. For some programs, the cost of constructive changes far exceeds the cost of formal changes--they increased the SSN-688 program by \$630 million and the DD-963 program by \$165 million.

CONSTRUCTIVE CHANGES
SHOULD BE PREVENTED

In 1971, Navy officials assured GAO that they would act to assure that enough time was provided to correct lead-yard plans on the then newly awarded SSN-688 contract, thus preventing follow yards from using defective plans as the basis for a claim. Their efforts were inadequate; a follow yard filed claims in 1975 and 1976 for \$764 million, a part of which was associated with claimed defective and late design data. The claims were settled with the Navy for \$581 million.

The Navy now points to the FFG-7 program as a model lead-yard/follow-yard program because it allowed 2 years for the design to stabilize before awarding the follow-yard contracts. Although no claims have yet been filed on this program, it should not be assumed that a 2-year span for all lead-yard/follow-yard programs is appropriate. A future program of the complexity of an SSN-688 Class submarine may require a span longer than 2 years.

A major Navy control over constructive changes for recent shipbuilding contracts has been contract clauses which put the burden of identifying constructive changes on the contractor. These clauses seem to be ineffective in getting shipbuilders to promptly notify the Navy of constructive changes. Some shipbuilders question the enforceability of the clauses, but they have not been tested in the courts. The Navy should not rely on the contractors to notify it, but should take action to identify and prevent constructive changes. In one instance, the Navy's apparent failure to promptly

notify a shipbuilder of defective equipment resulted in a claim payment of \$5.8 million for a constructive change.

CAUTION SHOULD BE USED IN THE
NAVY'S EFFORTS TO AVOID CLAIMS

Some positive Navy actions may avoid claims or at least protect the Government if a claim were filed. They are:

- Notifying a contractor of its underestimated costs and documenting this notification.
- Assigning personnel at Supervisor of Shipbuilding offices to help monitor changes, particularly constructive changes.

However, other Navy actions, such as allowing unrealistically high ceiling prices or allowing escalation payments past contract delivery date, may avoid claims but not necessarily reduce costs to the Government. (See p. 21.)

NEW AND PROPOSED ESCALATION CLAUSES

Escalation provisions in Navy fixed-price type shipbuilding contracts protect the shipbuilder from inflation by payments of cost increases beyond the control of the shipbuilder or the Navy.

A new Navy policy pays escalation on costs which may not be affected or significantly affected by inflation. This policy can result in shipbuilders receiving excess escalation payments.

Another new Navy policy allows escalation payments to continue after the ship delivery date set in the contract and reverses the former Navy policy of stopping escalation at contract delivery date. This new policy should be changed because it rewards contractors with escalation payments even when failure to deliver ships on time is their fault.

The 1978 Naval Ship Procurement Process Study proposed that the Navy reimburse shipbuilders for their actual escalation on labor costs rather than using national averages. GAO believes this policy should not be adopted because it would reduce shipbuilders' incentives to hold down labor costs and impair the Navy's ability to make comparisons of price proposals.

RECOMMENDATIONS

The Secretary of the Navy should:

- Ensure that enough time will be allowed to correct lead-yard plans before they are used by follow yards. (See p. 19.)
- Establish guidelines for use in fixed-price incentive shipbuilding contracts to spread the risk between the contractor and the Navy. (See p. 23.)
- Direct Navy contracting officers to discontinue negotiating shipbuilding contracts which pay escalation on costs not affected or affected to a lesser degree by inflation. (See p. 32.)
- Discontinue paying escalation on costs incurred after the delivery date set in the contract. (See p. 35.)
- Continue using Bureau of Labor Statistics indexes of the shipbuilding industry as the basis for escalation and not adopt the Naval Ship Procurement Process Study recommendation to pay shipbuilders' actual labor escalation. (See p. 37.)

AGENCY ACTIONS AND OUR EVALUATION

GAO requested formal written comments from the Navy on September 20, 1979. Because the Navy was unable to provide written comments in a timely manner, GAO met with Navy officials on October 26, 1979, to discuss GAO's draft report and received their oral comments.

Based on GAO's criticism of escalation clauses, the Navy has revised its policy. It will provide 95-percent coverage of overhead costs for competitive solicitations and provide actual coverage for sole-source solicitations which will be determined by deducting the shipbuilder's depreciation on existing capital assets.

These actions are a step in the right direction, but do not go far enough. The Navy should exclude from escalation coverage all shipbuilder's overhead costs that are not affected by inflation and exclude a proportionate share of those overhead costs that are affected to a lesser degree by inflation.

Navy officials did not provide GAO with the Navy's official position on the other recommendations in this report.

MATTERS FOR CONSIDERATION
BY THE CONGRESS

Before authorizing purchase of a new class of ships under the lead-yard/follow-yard concept, the Congress should seek assurance from the Navy that its acquisition strategy allows an appropriate amount of time for lead-yard plans to be prepared and corrected before they are used by follow yards. In this way, constructive changes can be minimized. (See p. 26.)

The Congress should recognize that the Navy will not necessarily have corrected its constructive-change problem if fewer claims are filed by contractors. It may be the result of the Navy absorbing all the risk and thereby allowing contractors to recover contractor-caused and Navy-caused program cost increases without having to resort to filing claims. (See p. 26.)

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ABBREVIATIONS

BLS	Bureau of Labor Statistics
CCB	Configuration (Change) Control Board
DCAA	Defense Contract Audit Agency
GAO	General Accounting Office
NAVSEA	Naval Sea Systems Command
SHAPM	Ship Acquisition Project Manager
SUPSHIP	Supervisor of Shipbuilding

CHAPTER 1

INTRODUCTION

In 1903, the Secretary of the Navy reported to the Congress that ship construction was not being completed as scheduled, but that the Navy was taking action, such as avoiding changes, to eliminate delay. Today, over 75 years later, the same problems exist. Over the past few years, the Congress has become increasingly concerned with these problems. This concern was highlighted in June 1978 when the Navy requested congressional approval under the provisions of Public Law 85-804 to pay two shipbuilders hundreds of millions of dollars to settle over \$1 billion in claims.

Shipbuilding changes have contributed to the perpetuation of growing costs and schedule delays. In their claims against the Navy, shipbuilders attribute much of the cost growth and schedule delays to numerous and often times unnecessary or avoidable changes that were Navy caused. However, the sheer number of changes to any major shipbuilding program is not necessarily a measure of the Navy's managerial ineffectiveness.

The number could vary drastically for many reasons, such as the complexity of the ship, the number of ships being built, the number of shipbuilders involved in the project, or the experience of the design agent hired by the Navy. Furthermore, one project office may follow the practice of issuing a change for each specific action, while another office may consolidate a number of actions under one change. Of course, the relative significance of the change must be considered because the cost of one change could exceed the combined cost of hundreds of others under the same program.

The cost of changes to a program is probably a better yardstick of the Navy's management of change than the number of changes. But, that too can be misleading. An analysis of the changes themselves is needed, especially if the cost of all changes is not included in the cost analysis of a program. Both in its testimony before the Congress and in its July 1978 Naval Ship Procurement Process Study, the Navy showed that the cost of changes for selected ships has averaged only 6.5 percent of original contract price. However, this figure represents only some ships, not the entire program. More importantly, the Navy included the cost of only those changes which it mandated at an agreed price. It did not include the costs of those changes disputed with the shipbuilders and resulting in claims.

In 1972, we issued a report 1/ to the Congress on the causes of shipbuilders' claims and the Navy's plans to prevent those causes. In that report, we identified, as one major cause of claims, that follow shipbuilders received defective working plans from lead shipbuilders. We recommended in that report that enough time be allowed to correct lead-yard plans before they are used by the follow yard. In this report, we analyze the Navy's action to correct this problem.

In 1975, we issued a report 2/ to the Congress on the status of shipbuilders' claims and Navy claim prevention action. We cautioned the Navy about adopting procurement policies which might prevent claims as such, but not eliminate inefficiencies or reduce costs. In this report, we analyze some of those Navy actions and point out that some of them might enable contractors to recover "claim-type" costs under the contract without having to file a claim.

SCOPE OF REVIEW

We made our review at the Naval Sea Systems Command (NAVSEA) and three Supervisors of shipbuilding (SUPSHIPs) located at Groton, Connecticut; Newport News, Virginia; and Pascagoula, Mississippi. We interviewed Navy officials and obtained documentation primarily relating to changes to the three programs we reviewed--the DD-963 destroyer, the FFG-7 guided missile frigate, and the SSN-688 nuclear attack submarine.

We also reviewed the July 1978 Naval Ship Procurement Process Study and analyzed its recommendations to avoid future shipbuilding claims.

1/"Causes of Shipbuilders' Claims for Price Increases"
(B-133170, Feb. 28, 1972).

2/"Status of Shipbuilders' Claims for Price Increases:
--Settlement Progress--Navy Claim Prevention Actions
--Need for Caution" (PSAD-76-24, Nov. 5, 1975).

CHAPTER 2

SHIPBUILDING CHANGES

Changes during a shipbuilding program can number in the thousands for any new class of ships and increase their price by millions of dollars. These changes range from the simple, such as correcting clerical and administrative errors on documents, to the complex, such as adding a fourth diesel generator to the new FFG-7 Class guided missile frigate. Changes can come in so many varieties that looking at the whole picture, or aggregate of changes, can be difficult and misleading.

Still, changes must be looked at not only for their operational/technical necessity but also their effect on contract cost and delivery. For example, under the contracts for the SSN-688 Class submarines, changes have increased costs about \$23 million per ship and have contributed to the 29-month delayed delivery of some earlier submarines.

TYPES OF CHANGES

Formal and constructive are the two types of changes to Navy shipbuilding contracts.

Formal changes

A formal change is one that is made through a formal process and modifies the contract terms in writing. Once such a change is proposed, it is evaluated by the Navy and approved or disapproved. If approved, the Navy's SUPSHIP at the shipyard usually negotiates a settlement with the contractor.

The Navy and the contractor try to agree on the scope of work to be done, the cost of making the change and its effect on all costs, and how the change will affect the ship's delivery date. Because both sides do not always agree on cost and delivery date, different kinds of contractual arrangements have evolved. These fall into two broad classifications, unilateral change orders and bilateral agreements.

Unilateral change orders

When a change is so urgent that quick agreement about its effect on delivery and price cannot be reached, the Navy may issue a unilateral directive or "change order," as it is called. The mandated change is then incorporated right away. Later, the Navy will negotiate costs and schedule changes with the contractor.

Change orders obviously create disruptions in shipbuilding. Costs might exceed the value of the change, and unforeseen disruptions might occur between the time the change is ordered and completed. Change orders do have their place though. For example, to meet changing defense needs, a change order may be essential.

Bilateral agreements

Bilateral agreements occur when the Navy and the shipbuilder agree on the scope of a change. Bilateral agreements may take the form of fully priced, partially priced, maximum-priced, minimum-priced, or unpriced agreements.

The most specific bilateral agreement, and thus preferred by the Navy, is the fully priced one. Here, the two sides agree on the scope of the work to be done, the cost of the work, and the impact on the ship delivery schedule. The change is incorporated into the contract without further negotiations.

Maximum-priced agreements are the next most specific, setting scope, schedule, and the maximum amount the Navy will pay the contractor as a result of the change.

Minimum-priced agreements set scope, schedule, and the least amount the contract will be reduced if the change is one that will reduce the price of an item.

A partially priced agreement is one which does not include the total change in scope, delivery, or contract price.

An unpriced agreement incorporates a change in the contract scope and addresses the impact on delivery schedule, but does not incorporate the price impact of the change.

Constructive changes

A constructive change results from action or inaction by the Navy and causes the shipbuilder to do additional or different work than is required by the contract. Costs associated with this additional work are incurred prior to a formal modification to the contract, which may not be the case with formal changes. The action can take numerous forms, such as a Navy inspector requiring the shipbuilder to do work which the shipbuilder considers to be beyond contract requirements. Inaction can also take numerous forms, such as the Navy failing to approve Government-furnished plans needed by the contractor to work on the ship, thereby disrupting the contractor's efficient use of employees.

Constructive changes are initially identified by the shipbuilder and presented to the Navy as a request for additional compensation. If Navy officials agree that a change has occurred and accept responsibility for the change, it becomes a formal change after it is approved in writing. If they disagree that the Navy caused the change or disagree on the dollar impact of the change, it may result in a contractor's claim against the Government for reimbursement of costs incurred or delay in delivery.

Most claims against the Government are based on alleged constructive changes. For many shipbuilding programs, the cost of constructive changes far exceeds the cost of formal ones.

CAUSES OF CHANGES

Some changes are preventable, stemming from such things as poor communication or mismanagement; others are unavoidable. Changes may be proposed by the shipbuilder, the contractor who designed the vessel (design agent), subcontractors, or the Navy itself.

Changes can have numerous causes, such as

- concurrent development of weapon systems and ship construction;
- improvements to systems previously developed;
- errors/omissions in plans, specifications, and drawings; or
- additional requirements established after contract award.

Concurrent development of weapon systems and ship construction

To ensure that ships incorporate the most recent technological advances, weapon systems are sometimes developed while the ship is being constructed. This sometimes results in having a ship with less capability until weapon systems are fully developed and in having to do necessary rebuilding when such systems become available. This has happened on the FFG-7 program; the ships will go to sea incomplete until developing systems, such as the Close In Weapon System and the TACTAS sonar system, are available for installation.

Improvements to existing systems

The Navy's decision to improve existing systems can also cause changes. For example, the Navy may improve a sonar system requiring alterations to the hull.

Errors/omissions in plans, specifications, and drawings

Ship design is a continuous process, producing many plans, drawings, and specifications. Plans and drawings are the blueprints, numbering in the thousands, which show in detail how the ship should be built. Various military and Federal specifications are the guidelines that require that material, equipment, and manufacturing processes used in constructing the ship meet established health, safety, reliability, and maintainability standards.

A large number of complex specifications, plans, and drawings are required for ship construction. Most of the numerous Navy-controlled military and Federal specifications that apply have been developed at different times and by different organizations, within and outside the Navy. As might be expected, inconsistencies may occur among some of these specifications. The Naval Ship Procurement Process Study stated that more than 40 percent of the 10,000 documents the Navy controls "have known major defects."

An inherent feature of designing a ship is that many working plans and drawings must be frequently revised to correct errors, clarify directions to shipyard workers, change manufacturing processes, as well as make actual changes in design.

Additional requirements established after contract award

Over the years since World War II, the Congress has passed much socioeconomic legislation affecting procurement. Industry involved in Government contracts incur increased costs to carry out the legislation.

Federal law passed after a contract is awarded may require a change to the contract. Such a change could also require work to be done differently, such as hiring a larger percentage of women and minorities at the shipyard or adopting stricter health and safety rules.

Higher level Navy commands may also impose additional requirements after a contract is awarded. For example,

because engines were sabotaged on an aircraft carrier, naval headquarters required that additional security be installed to prevent sabotage on other ships. This requirement was made at the time 30 DD-963 Class destroyers were under contract. As a result of that requirement, special locks will be installed at a substantial cost on equipment maintenance access doors of all 30 destroyers.

Other changes might be caused by having to

- provide for safety of personnel or equipment,
- settle insurance claims,
- repair Government-furnished equipment, and
- refurbish test equipment later installed on ships.

PRICING OF CHANGES

Even if the Navy and contractor agree that a change occurred, they may disagree over the equitable compensation. Pricing a change is a time-consuming process. Many changes first receive detailed engineering analysis and pass through several review layers before a "fair" price can be agreed to. These steps add time to an already difficult pricing process.

Costs related to a change are sometimes difficult to determine, in turn making equitable adjustment of the contract price difficult. In determining the ultimate price of a change, several cost elements are of concern. These elements include (1) "hard-core" cost of a change, (2) costs of delay and disruption, and (3) "cross-contract impact" costs.

Hard-core costs are the net costs of labor and materials for added new work, rip-out and rework, and deleted work, as well as overhead and labor premiums on these costs. The Navy and contractor historically have found that agreement on this element of cost is easier than on the others.

Delay costs occur when a change delays other work, forcing people to stay on the job longer. Disruption costs occur when efficient work procedures are interrupted because of a change. Delay and disruption costs can be difficult to identify; and, therefore, determining who is responsible and must pay for them is also difficult.

Cross-contract impact costs are incurred when changes under one contract increase or decrease the cost of doing work on other contracts in the shipyard. Since such costs are not directly related to specific changes, they are difficult to prove and have been frequently denied by the Navy.

While the Navy generally does not have serious problems in pricing formal changes, the amount of dollar difference and controversy between the Navy and the contractor concerning the pricing of constructive changes can be astounding. For example, the price of all changes from the initial contract ceiling price through December 31, 1978, excluding escalation, has increased the DD-963 contract \$407 million, or 19 percent, and the SSN-688 contracts \$706 million, or 27 percent. Of these increases, the DD-963 and SSN-688 programs have had constructive changes of \$165 million and \$630 million, respectively, which resulted from claims the contractors submitted against the Navy. Of these constructive changes, all \$165 million under the DD-963 program and \$359 million of the \$630 million under the SSN-688 program were paid after the Navy received special congressional approval under Public Law 85-804 to settle the claims. Some Navy officials believe that the payments under Public Law 85-804 should not be considered constructive changes because the Navy claim analysis did not show that those cost increases were caused by Navy action or inaction.

The price of formal changes (excluding \$236 million of central procurement costs) for the first 26 FFG-7 Class frigates has increased those contracts by \$103 million, or 7 percent, through December 31, 1978. As of August 31, 1979, there have been no claims submitted against the Navy for the FFG-7 program resulting from constructive changes.

Although some changes reduce the price of a contract, they are relatively insignificant. For example, of the \$706 million net contract price increase, excluding escalation, to the SSN-688 contracts, only \$21 million were in price decreases.

CHAPTER 3

NAVY MANAGEMENT OF FORMAL CHANGES IS SATISFACTORY

Formal changes can greatly increase a ship's price. Navy officials, in trying to control such changes, have written procedures for review and approval of proposed changes to be followed when such changes are contemplated. This review and approval has been effective in controlling formal changes to three ship class programs--DD-963, FFG-7, and SSN-688. However, some examples suggest that more stringent Navy management is still required.

NAVY REVIEW AND APPROVAL OF FORMAL CHANGES

Navy procedures require that a formal change be approved only for one of four compelling reasons. These are to

- correct deficiencies or errors in design,
- meet operational requirements,
- provide for the safety of personnel and equipment, or
- save the taxpayer's dollar.

Proposed formal changes are reviewed to determine if they conform with one of these compelling reasons. The Ship Acquisition Project Manager (SHAPM) is responsible for assuring that this review is carried out. In addition, the SHAPM is responsible for coordinating the evaluation, processing, approval or disapproval, and implementation of proposed changes under a project.

The approval level for a formal change varies with the effect the change will have on ship technology, cost, or schedule. Proposed changes are approved by either SUPSHIP, which is the naval office located at the shipyard; SHAPM, which is the headquarters office under NAVSEA; the Commander of NAVSEA; or the Chief of Naval Operations.

SUPSHIP approval authority is delegated by NAVSEA. Even if approval authority is given to SUPSHIP, NAVSEA can restrict the role SUPSHIP will have in approving proposed changes. In the case of the SSN-688 program, SUPSHIP may approve a proposed change up to a set dollar limit provided the proposal is not applicable to the entire class of ships. The SHAPM has retained approval authority for any proposed change affecting

all the ships. In the DD-963 program, SUPSHIP may approve proposed changes primarily relating to repairs to Government-furnished equipment, insurance claims, headquarters request for field action, change proposal preparation costs, and escalation.

Depending on the restrictions placed on the SUPSHIP's approval authority, SHAPM approves the other formal changes, with certain exceptions. If an objection has been filed by an organizational member of SHAPM on a change action taken by SHAPM or if a proposed change affects more ships than in that project, the change must be approved by the Commander of NAVSEA. Further, approval must come from the Chief of Naval Operations if a proposed change (1) affects the military characteristics of the ship, (2) increases the end cost of the ship project in a particular fiscal program year above the end cost shown in the latest approved Ship Cost Adjustment Report, or (3) delays delivery of a ship beyond the delivery date set in the contract.

When SHAPM is to approve or disapprove a proposed change, the change is reviewed by the Configuration (Change) Control Board (CCB) within the project office. CCB is an advisory group to the CCB chairman or SHAPM, and approval or disapproval authority rests with either the CCB chairman or SHAPM, depending on the project. Members of CCB come mainly from within the project office, but outside experts are consulted when necessary.

NAVY PROCEDURES TO MANAGE FORMAL CHANGES ARE EFFECTIVE

The Navy's review and approval procedures for selected formal changes made to the DD-963, FFG-7, and SSN-688 contracts were being followed and were effective in managing formal changes. We reviewed changes approved at the SHAPM level, focusing on the (1) justification and need for the change, (2) review of cost estimates, and (3) consideration given to anticipated schedule impact. We also reviewed the workings of the three CCBs, to determine if the Navy was actually analyzing the need for the change as well as its impact. We found that the CCBs were performing adequate analyses of the proposed changes.

DD-963 program formal changes

As of October 31, 1978, the DD-963 contract had formal changes that resulted in a net increase of \$242 million, or 11 percent of initial contract price. In addition, the formal changes represented nearly 60 percent of the \$407 million

net contract cost growth. We reviewed in depth 19 formal changes. These changes were selected primarily because of their large dollar value. As of October 31, 1978, they increased the contract by about \$92 million, or 23 percent of the total contract cost growth.

Two of the changes reviewed dealt with outfitting materials and amounted to \$60 million. Outfitting materials include:

- Onboard spares and repair parts.
- Equipage (noninstalled items of a durable nature, such as handtools and binoculars, which must be onboard for the ship to perform its mission).
- Consumables (bulk material, such as special lubricants and gaskets, required for maintenance or overhaul).
- Peculiar support equipment (tools, handling, and test equipment which only have application to the DD-963 Class destroyer).
- Common support equipment (tools, handling, and test equipment currently used to support other Department of Defense systems required to maintain the DD-963 Class destroyer).

The reasons for the large increase in the cost for these items, according to a Navy official were (1) understated initial contract costs, (2) no provision in initial contract costs for anticipated escalation, (3) unknowns when the contract was awarded, and (4) cost growth. Analysis of these two outfitting changes showed that they were justified and needed. For example:

- The original contract included \$1.4 million per ship, although a Navy official stated that a better estimate would have been \$2.8 million per ship. The \$1.4 million was included in the original contract as "seed money." Navy officials knew more money would be needed. By including only \$1.4 million, the Navy's philosophy was for the contractor to hold down costs and justify any increases.

--The \$1.4 million in the original contract and the \$2.8 million estimate contained no provision for anticipated escalation and were in terms of 1970 dollars. Escalation is an important factor, because ships are built over long periods of time and outfitting materials go on board shortly before delivery. About \$20 million of the increase can be attributed to escalation for outfitting materials.

--Some outfitting materials cannot be identified when a contract is awarded, because later changes to the contract can change the requirements for outfitting materials. Neither the Navy nor we know how much of the increase is attributed to unknowns.

Of the 17 remaining changes reviewed, most appeared to be necessary and little more could have been done to minimize the effects of the changes on ship construction. However, we do question a couple of the changes reviewed. For example, we believe the cost of adding special locks to increase security could have been reduced by at least \$708,000. In another instance, the need for a change adjudicated at \$1.7 million was questionable.

Example 1

As a result of sabotage to engine reduction gears on an aircraft carrier, naval headquarters required additional security precautions. Because of that requirement, special locks will be installed on engine room doors of the 30 DD-963 destroyers under contract.

The locks specified for use in conjunction with the gas turbine module access doors, though the Navy standard for this type of protection, had never been used in this way. Once installed, the locks started jamming, due to temperature changes and twisting motions peculiar to the gas turbine area. Because of this, the requirement for the specific locks was dropped and another lock substituted. This created additional work, because previously installed locks had to be replaced by the newly approved locks. The cost associated with this additional work amounted to \$708,000 for 17 ships. The remaining 13 ships will get the new locks under a separate contract after ship delivery, and no final cost has yet been established.

The impact of this change could have been minimized if Navy officials had tested the locks after installation on only one ship. This approach seems reasonable because of the new application for the lock.

Example 2

The change we considered questionable was negotiated by Navy officials in December 1975 for \$1.7 million to rearrange the galley in the last 20 ships under the contract. The first 10 ships have not been changed, but may be later.

At a CCB meeting held in February 1975, the project financial manager disagreed with the need for the change, stating that it was primarily "nice to have" rather than essential. However, the change was approved by CCB and justified as improving accessibility, sanitation, and personnel traffic flow problems. Although we cannot say with certainty that the change was not beneficial, we agree with the financial manager that the change was not essential and feel that the necessity for it was highly questionable.

FFG-7 program formal changes

As of December 31, 1978, the FFG-7 program had formal changes totaling a net increase of \$339 million, or 23 percent of initial contract prices for the first 26 ships. Of this total, \$236 million is for central procurement items--diesel generator sets, gas turbine engines, and main reduction gears. Central procurement changes do not change ship-building specifications or drawings, as do the SHAPM- and SUPSHIP-approved changes, but represent a way to procure standard equipment which is provided as Government-furnished equipment for follow ships.

Bath Iron Works Corporation (Bath) has been designated the central procurement contractor for this project. Bath is to procure selected standard FFG-7 equipment for the Government's use in the FFG-7 Class follow ships. Since the central procurement items do not represent change in the context we have been using, we did not analyze the review and approval process for these items.

Of the remaining \$103 million net increase for the formal changes, \$54 million are to the lead-ship contract and \$49 million are to the 6 follow-ship contracts for 25 ships awarded through the end of 1978. We reviewed 15 large dollar value formal changes totaling \$9.5 million, or 18 percent of the net contract cost growth for the lead ship. These changes also increased follow-ship costs, but some were included as part of the base contract costs for these ships and, therefore, not visible as increases due to changes. These 15 formal changes appear necessary, and we have no reason to conclude that their effects could have been less.

SSN-688 program formal changes

As of December 31, 1978, the SSN-688 program had formal changes totaling a net increase of over \$65 million, or about 3 percent of the initial contract price, and over 9 percent of the net contract cost growth, excluding escalation.

Fifty-nine of the large dollar value formal changes were selected for detailed review and accounted for \$44 million in formal changes. Although some of the changes appeared to be questionable at first, Navy officials provided logical explanations for each questioned change. The outcome of the analysis was that none of the 59 formal changes was considered to be either unnecessary or questionable.

COST OF FORMAL CHANGES

Analysis of the three ship programs shows that, in some cases, formal changes may account for much of a program's cost growth and, in other cases, they may not. The following table illustrates this point.

<u>Ship class</u>	<u>Net cost growth, excluding escalation</u>	<u>Net cost of formal changes</u>	<u>Percent</u>
------(millions)-----			
DD-963	\$407	\$242	59
FFG-7	339	<u>a/339</u>	100
SSN-688	706	65	9

a/Includes central procurement costs of \$236 million.

It must be emphasized that formal changes to a lead-ship contract or earlier contracts of a ship class would not always be shown as an increase in cost to later contracts. This occurs because the cost of some changes is included in the original negotiated price of the follow-ship contracts--not as a change to the contract price. For example, in March 1974, the FFG-7 program added a fourth diesel generator to the ship configuration at a cost of \$3.9 million for the lead ship. The cost to implement this change to the follow ships was estimated at \$1.1 million per ship or \$27.5 million (fiscal year 1973 dollars) for the 25 Navy follow ships under contract at the end of 1978. However, this cost is included as part of the follow-ship contracts' base costs and is not shown as an increase due to a formal change.

In addition, escalation payments are another cost attributable to changes which may or may not be recognized as a cost of formal changes. For contracts awarded before 1975, the shipbuilding contracts contained a clause which made it necessary to "forward price" formal changes, that is, the adjudicated cost of the change included anticipated escalation. For those contracts awarded in 1975 and thereafter, the contract escalation clause no longer provides for forward pricing of formal changes. Instead, a formal change is adjudicated at base month dollars and any applicable escalation is paid, but is not charged as a cost to the contract. Thus, in order to determine the true cost of the change, the base month cost must be added to all escalation attributable to the change while the change is being accomplished.

Because of the method used to make escalation payments (see ch. 5), we could not determine the amount of actual escalation payments attributable to formal changes under the three programs. However, we did learn that the amount could be sizeable. For example, under the FFG-7 program the Navy and contractor negotiated a contract modification to install a protective system on certain parts of the ship. The modification was for \$15.6 million, but the contractors estimated they will receive \$19.6 million because of a \$4 million payment of escalation attributable to the change.

All of the FFG-7 follow-ship contracts and the last three SSN-688 contracts are covered by the new escalation clause. Thus, the adjudicated cost of formal changes to these contracts does not represent the complete cost of these changes. We believe it is important for the Navy to acknowledge these costs whenever discussing the costs of formal changes.

CONCLUSION

The Navy has recognized the importance of managing formal changes and has written procedures designed to minimize the excessive use of them. The procedures require compelling justification. The Navy has set policies for approval levels of the formal changes, with an advisory body in each project office to assist in reviewing formal changes and to recommend their approval or disapproval based on the compelling reasons.

Navy procedures were being implemented, and, in most cases, the approved changes appeared necessary. In two cases, we questioned whether either the change itself or the effect of the change might have been minimized if handled differently. However, on the whole, we believe that the Navy is managing formal changes adequately.

Formal changes do affect a contract's cost growth, although the actual growth may not be readily known. For example, formal changes to an earlier contract of a ship class would not always be shown as an increase in costs to later contracts because the cost of changes to the later ships would be included in the base costs of the later contracts. In addition, for contracts signed since 1975, formal changes do not include the cost of escalation attributable to the changes. Thus, the cost impact of these changes is not fully known because escalation payments related to these changes are not included as part of the contract price and are not identified as a cost of the change. We believe it is important for the Navy to acknowledge these costs whenever discussing the costs of formal changes.

CHAPTER 4

NAVY MANAGEMENT OF CONSTRUCTIVE CHANGES AND

ACTION TO AVOID FUTURE CLAIMS

Outstanding major shipbuilding claims were less than \$300 million in 1971. Shortly thereafter, however, claims began increasing each year, until 7 years later, claims reached \$2.7 billion. These claims ranged from a low of \$1 million to a high of over \$1 billion. Most were filed by shipbuilders who incurred losses from (1) underestimated costs at the time of contract negotiations, (2) inefficiency during construction, (3) constructive changes made by the Navy, or (4) actions or events caused by neither the shipbuilder nor the Navy.

The Navy will not normally accept responsibility under a claim for costs caused by the shipbuilder. It did, however, in two notable exceptions. In 1976, the Electric Boat Division of General Dynamics Corporation (Electric Boat) filed two claims against the Navy for \$544 million under two SSN-688 construction contracts on which it estimated an \$843 million loss. The Navy Claims Settlement Board analyzed the claim and concluded that the Navy was responsible for constructive changes of only \$125 million and that, in effect, the other \$718 million of costs was caused, in part, by the contractor's underestimate or inefficiency. In spite of the Board's decision, the Navy got congressional approval in 1978 to pay the contractor an estimated \$359 million, in addition to the \$125 million. A similar situation occurred in 1978 on the Ingalls Shipbuilding Division of Litton Systems, Inc., \$1,088 million claim which the Navy valued at \$312 million, but for which the shipbuilder will be paid an estimated \$447 million.

Because the Navy will pay for Navy-caused constructive changes and, in some cases, may pay for contractor-caused cost increases, the Navy must

- prevent Navy-caused constructive changes which form the basis for claims and
- defend itself against or possibly prevent a claim which may be filed because of contractor-caused action.

Although Navy officials have taken some actions to avoid constructive changes, these are not adequate. In addition,

Navy officials have taken some positive actions to avoid or defend against claims, but other Navy actions, as discussed on pages 23 to 25, may avoid future claims without reducing costs to the Government.

CONSTRUCTIVE CHANGES
SHOULD BE PREVENTED

If the Navy does not formalize a constructive change, it will probably form the basis of a contractor's claim for reimbursement of costs incurred or delayed ship delivery. In the SSN-688 program, alleged constructive changes formed the basis of five contractor claims for reimbursement of costs incurred or delayed ship delivery. In the settlement of these claims, Navy officials accepted contractual responsibility for substantial sums caused by constructive changes--mostly due to late or defective Government design data.

Navy officials have taken some action and said they plan to take additional action to control constructive changes. We question, however, the effectiveness of some of those efforts and believe that additional action is needed.

Constructive changes can add costs--
the SSN-688 Class submarine example

One Navy-caused constructive change which could have been avoided cost the Navy about \$5.8 million in settlement with the contractor. In February 1976, during testing of an emergency hydraulic control valve used on all SSN-688 Class submarines, the lead yard found defects in the subcontractor-supplied valves. By April 1976, it was evident that the subcontractor would have to rework all emergency hydraulic control valves produced to date. At that time, those aware of the problem included Navy officials, the lead yard, and the subcontractor. The follow yard, which had also received some of the defective valves, subsequently installed them in one submarine. On the basis of our review of the files at SUPSHIP and the project office, it appears that not until November 1976 did the follow yard realize the need to return the valves to the subcontractor for modification. Project officials told us that the follow yard was verbally notified of the defective valves before November 1976, but they were unable to construct for us a chronology of such notification.

In its analysis of the follow yard's claim, the Navy Claims Settlement Board recognized the valve problem as the major cause of 25 days delay to the shipbuilder. We calculated that the follow yard received approximately \$5.8 million under the claim as a result.

Prior Navy controls over constructive changes have not been effective

Historically, the Navy has not effectively controlled constructive changes. Although it had promised to take corrective action to avoid certain constructive changes on the SSN-688 program, such action was not taken and a major claim ensued. These same problems could arise on future programs resulting in claims.

One constructive change that follow yards used as a basis for claims filed in the late 1960s was the late receipt or purchase of defective plans from the lead yard. Since the Navy intended that such plans be purchased and used, the Navy shared responsibility for problems created by late delivery or defects in these plans.

Navy officials were, of course, aware of the problem when the Navy awarded a contract to the follow yard in January 1971 for SSN-688 Class submarines, with plans to be provided by the lead yard. Soon after that contract was awarded, we discussed our concerns with Navy officials and recommended in our February 1972 report on shipbuilding claims 1/ that enough time be provided to correct the lead-yard plans before they were used by the follow yard. Navy officials said that they would take action to minimize these problems. In 1975 and 1976, however, the follow yard filed claims totaling \$764 million (later settling them for \$581 million). A major cause for the first claim--valued at \$220 million--was attributed by the shipbuilder to the lead yard supplying defective and late design data. The shipbuilder attributed the second claim--valued at \$544 million--to numerous drawing revisions, contending that these disrupted work and delayed it so that work had to be done at a later time when labor costs were higher and escalation payments were not covered under the then existing contract. Of the \$764 million claimed, the Navy recognized contractual responsibility totaling \$222 million, primarily because of the design data. The Navy then paid an additional \$359 million in extra-contractual relief to settle the claims.

The unsuitable drawings problem has not been limited to lead-yard/follow-yard situations. A contract was awarded in November 1974 for the AS-39 and AS-40 submarine tenders which support the SSN-688 Class submarines. When

1/"Causes of Shipbuilders Claims for Price Increases"
(B-133170, Feb. 28, 1972).

the submarine tender contract was awarded, the contractor was told that two-thirds of the drawings would be slightly modified or unchanged from the last tender the Navy had built. However, 2 years later, the contractor reported that about three-fourths of the drawings were either new or old drawings that had been changed significantly. Navy officials explained that they failed to review and rework the basic construction plans for the previous tender after it was built. Also the maintenance strategy and new requirements for the SSN-688 Class submarines were not considered. The Navy agreed that many design changes should have been made before awarding the contract for these tenders.

Corrective actions now in existence may not be sufficient

The Navy now points to the current FFG-7 program as a model lead-yard/follow-yard program. In this program a cost-reimbursement contract was awarded for the lead ship in October 1973. To permit the design to stabilize, the Navy waited 2 years before placing fixed-price incentive contracts for follow ships. The lead yard must produce validated drawings which are checked by both the lead yard and the Navy to insure that they show the lead ship "as built." This technique could reduce drawing changes. While it is too early to cite conclusive results from the FFG-7 program, the Navy has stated that the quality of the drawings validated against the lead ship seems to be improved.

Although no claims have been filed on the FFG-7 program and none are anticipated by Navy officials, it should not be assumed that none will be, nor that a 2-year span in all lead-yard/follow-yard programs is appropriate. While a 2-year span for a relatively uncomplex ship such as an FFG-7 Class frigate which takes an average of 31 months to build may be adequate, it does not mean that such a span will be appropriate for a future program of the complexity of an SSN-688 Class submarine which takes more than twice as long to build. Other factors such as the capacity and capabilities of shipbuilders should also be considered before establishing a time-span.

Actions to control constructive changes are not adequate

In order to safeguard against after-the-fact claims based on constructive changes, the Navy established contract clauses in the early 1970s which placed responsibility on the contractor for identifying constructive changes. The clauses require the shipbuilder to promptly notify the Navy of any written or oral communication or any other act or

omission of the Government which the shipbuilder regards as a change. The Navy envisioned that the clause would provide the Navy with early warning of shipbuilder-perceived problems which could be prevented.

Although the Navy reports that these clauses are intended to be a major control over constructive changes, these clauses seem ineffective in getting shipbuilders to promptly notify the Navy, especially if the constructive change is the result of Navy inaction. Also, some shipbuilders question whether these clauses are enforceable on a contractor. However, to date these clauses have not been tested in court or before the Armed Services Board of Contract Appeals.

In addition to relying on the contractor to notify it of a constructive change, we believe that the Navy should take more action to identify and prevent constructive changes.

The Naval Ship Procurement Process Study suggests other ways to minimize constructive changes. These include

- improving communications between the Navy and its shipbuilders during construction,
- providing additional training to the entire SUPSHIP organization to help it identify constructive changes,
- providing readily available legal support to SUPSHIP staff, and
- assuring that SHAPM and SUPSHIP personnel are fully aware of the Navy's contractual obligations and of the need to avoid creating constructive changes by carefully adhering to contract terms.

These actions could minimize constructive changes or possibly defend against claims. Navy officials told us that specific steps have been taken to carry out all of these actions, but we did not evaluate the extent of steps taken or measure their effectiveness.

CAUTION SHOULD BE USED IN THE
NAVY'S EFFORTS TO AVOID CLAIMS

Some recent Navy actions are positive steps which may avoid claims or at least protect the Government if a claim

were filed. However, other actions simply increase the financial risk to the Government and reduce the risk to contractors. There could be fewer claims filed for contractors' inefficiencies or Navy-caused constructive changes, but reimbursement for the costs of these changes still may be allowed under the terms of the contract.

Positive Navy actions

The Navy has sometimes accused contractors of filing claims for losses incurred because of their underestimates during contract negotiations and not necessarily because of Navy-caused constructive changes. A shipbuilder's underestimate could be caused by a number of factors, such as (1) inability to properly estimate the complexity of or the amount of work needed to construct the ship, (2) overoptimism in estimating the efficiencies it expects during construction, (3) purposely underestimating costs in order to beat out its competitors, or (4) the Navy not providing the shipbuilder, at the time of contract negotiations, with the true understanding of the complexity of the ships to be built.

The Navy suspected Electric Boat of underestimating costs in its proposal for the fifth contract for two SSN-688 submarines. Before awarding it the contract in April 1979, the Navy evaluated Electric Boat's cost proposal and concluded that it underestimated by about 2.4 million the labor hours needed to construct the two vessels. Navy officials believed that the increased productivity expected by the contractor would not occur at the rate projected. The contractor based its projection primarily on the use of a new facility. Navy officials felt that Electric Boat did not adequately consider the inefficiencies which occur when opening a new facility.

The Navy made known its concerns in this area, both during negotiations and later in writing. Electric Boat responded that it had carefully considered the Navy's concerns in its deliberations of its "best and final offer" and that it had enough confidence in the labor-hour estimates to leave them unchanged.

Because the Navy calculated that Electric Boat could still make a profit under the contract, even if the Navy estimate proved to be accurate, the Navy's negotiator could not conclude that the pricing was unreasonable. If the Navy's estimate is correct, however, the chance for the contractor to submit a future claim is strong.

Navy officials did request acknowledgement of their concerns and received a response in writing. This, the officials feel, will provide a basis for a defense if Electric Boat submits a claim. A project official stated that the project office plans to closely monitor this contract.

In addition to the above action, the Navy recently assigned 15 personnel at SUPSHIP Groton and at 4 other SUPSHIPS to help monitor changes. We believe that this is also a positive action which could help avoid claims and defend the Government in the event a claim is filed.

Other Navy action may avoid future claims but not reduce costs

In our 1975 report on shipbuilding claims, 1/ we recommended that the Navy guard against overemphasizing the use of cost-reimbursement type contracts to avoid claims, rather than solving existing problems which may cause them. Although the Navy has not recently overemphasized the use of cost-reimbursement type contracts, we believe that some of its recent actions could have about the same effect. It could reduce contractors' financial risk to the point where the fixed-price incentive contracts would be nothing more than cost-reimbursement type contracts with the label of a fixed-price type.

Two broad categories of contracts are used in shipbuilding--cost reimbursement and fixed-price incentive. Under a cost-reimbursement contract, the contractor is reimbursed for all allowable costs without limitation and the Government absorbs all the risk of contract performance. Under a fixed-price incentive contract, the contractor is also reimbursed for allowable costs, but to a limit called the ceiling price. The contractor and Government agree to share the risks of contract performance.

At the outset of the fixed-price incentive contract, several figures, such as a target cost, target price, and ceiling price, are negotiated. The target cost is the estimate of costs the contractor will incur. The target price is the target cost plus negotiated profit. The ceiling price is the Navy's maximum liability under the contract. The

1/"Status of Shipbuilders' Claims for Price Increases: --Settlement Progress--Navy Claim Prevention Actions--Need For Caution" (PSAD-76-24, Nov. 5, 1975).

ceiling price is expressed as a percentage of target cost-- such as 120 percent, 130 percent, and so forth--and that percentage is known as the "ceiling price spread." The more the spread, the greater the Navy's liability for costs and the less risk to the contractor. For example, if the ceiling price is 120 percent of target cost, the contractor would not be reimbursed for any costs that exceed 20 percent of the target cost, and risk would be high. If, on the other hand, the ceiling price is 150 percent of target cost, the shipbuilder would be reimbursed for costs that exceeded up to 50 percent of target cost, and its risk would be lower.

Determining the cost-to-ceiling spread is judgmental and is based on many factors. It is, however, important to both the Government and the contractor, because it limits the liability of the Government and provides a stronger incentive for the contractor to control costs than does a cost-reimbursement type contract. A ceiling spread which is too narrow will not cover potential problems arising during shipbuilding. On the other hand, a spread which is too wide--relative to the risks involved--can approach a cost-reimbursement type contract which by its very nature reduces contractor incentives to control costs.

The Navy negotiated a ceiling price spread for the first two SSN-688 follow-ship contracts of 111 percent and 116 percent with Newport News Shipbuilding and Dry Dock Company and Electric Boat, respectively. These were extremely low spreads as compared to the spreads of the last two SSN-688 contracts which were negotiated at 135 percent.

The Navy chose the wider spreads because of the long timespans (about 6 years) of the contracts and to increase the contractor's risk protection under the contracts, in view of the large cost overruns and resulting claims on the early contracts. However, the degree of risk in the last contract, especially, was not a major factor since nine ships had already been delivered and a lot of actual cost data was available. In addition, the number of changes anticipated at that time was very low.

The Navy recognizes the need for a realistic cost-to-ceiling spread in fixed-price incentive contracts. Determining a realistic spread is based on many factors, such as the uncertainties in the program (for example, the complexity of the ship, whether the shipbuilder has previously built that class of ship, or whether detailed drawings are available to show how to build the ship) and the amount of costs the Government will accept before the shipbuilder begins to incur a loss. It is a judgmental determination, and neither the Navy

nor we have criteria for establishing a fixed percentage that could be designated as realistic. However, we believe that the Navy should guard against increasing spreads, particularly for contracts where shipbuilders have increased experience from similar contracts and where the spread, therefore, would normally be narrower. We are concerned that without these safeguards, the spread could widen to the point where the contractor has practically no risk and a fixed-price incentive contract would be nothing more than a cost-reimbursement type contract with the label of a fixed-price contract.

The Navy is using other means of reducing contractors' risks

In addition to a wider cost-to-ceiling price spread, the Navy is reducing contractors' risks in fixed-price type contracts with special escalation contract clauses. These are discussed in chapter 5.

CONCLUSIONS

Although Navy officials have taken some action to control constructive changes, we believe they have not been adequate and that additional action is needed. Positive actions already taken include notifying a contractor that his cost estimate may be understated and assigning personnel at major shipyards to identify constructive changes. These steps should contribute to possibly avoiding or defending against future claims.

Other actions, although adequate at present, may not be in the future. We believe that a 2-year interval between the award of a lead-yard contract and follow-yard contracts, as used on the Navy's FFG-7 program, may not be adequate for future programs involving more complex ships or different shipyards of different capacities and capabilities. The timespan needed for new programs should be determined for each program before follow-yard contracts are awarded, thus assuring that defective lead-yard plans will not be the basis for constructive changes.

Some actions, we believe, are actions in name only. Navy actions to avoid claims by placing greater risks on the Government for escalation and increasing its burden for increased ceiling prices under the contract are policies which will avoid claims but not necessarily reduce costs. In fact, they could cost the Navy more than claims have cost in the past because contractors also shared part of the increased costs; whereas now, they may simply pass on all costs to the Government by being reimbursed directly under the contract.

We believe that the Navy should not rely primarily on contractors to identify constructive changes. Furthermore, some contractors have questioned the enforceability of those contract change notification provisions. Even if a contractor does identify constructive changes, it might be too late to avoid the costs of those changes, as was the case of the valve problem at Electric Boat explained earlier in this chapter. We believe that the Navy is responsible for seeing that its employees are properly managing their shipbuilding programs by assuring that constructive changes are kept to a minimum. Therefore, Navy officials should continue efforts to minimize constructive changes, as suggested in the July 1978 Naval Ship Procurement Process Study.

RECOMMENDATIONS

We recommend that the Secretary of the Navy:

- Ensure that the ship acquisition strategy include a plan which provides enough time to correct lead-yard plans before they are used by follow yards under any future lead-yard/follow-yard program.
- Establish guidelines for use in fixed-price incentive shipbuilding contracts to spread the risk between the contractor and the Navy. These guidelines should provide for consideration of the uncertainties of the program and the target-to-ceiling price spread that is proper under the circumstances. By these actions, there will be less chance of the Navy absorbing too much risk by providing a spread so wide that it virtually assures a contractor reimbursement of even those costs caused by contractor inefficiencies or Navy-caused constructive changes.

MATTERS FOR CONSIDERATION BY THE CONGRESS

Before authorizing purchase of a new class of ships under the lead-yard/follow-yard concept, the Congress should seek assurance from the Navy that its acquisition strategy allows an appropriate amount of time for lead-yard plans to be prepared and corrected before they are used by follow yards. In this way, constructive changes can be minimized.

The Congress should recognize that the Navy will not necessarily have corrected its constructive change problem if fewer claims are filed by contractors. It may be the result of the Navy absorbing all the risk, thereby allowing

contractors to recover contractor-caused and Navy-caused cost increases under the programs without having to resort to filing claims.

CHAPTER 5

NEW NAVY ESCALATION POLICIES COULD INCREASE

COST AND DELAY SHIP DELIVERY

Provisions which the Navy includes in fixed-price type contracts protect the shipbuilder from inflation by making escalation payments relating to cost increases beyond the control of the shipbuilder or the Navy. This protection is especially needed in shipbuilding contracts because of the long time involved in constructing a ship.

New Navy escalation policies, however, include paying escalation on costs which may not be affected or significantly affected by inflation, and continuing escalation payments beyond the original ship delivery date to actual ship delivery date even when the delay is caused by the contractor. In addition, the July 1978 Navy study on ship acquisition recommended that the Navy reimburse shipbuilders for their actual escalation on labor costs rather than using national averages. We believe these policies can increase cost to the Navy and reward contractors for late ship delivery.

SHARING THE RISK OF INFLATION-- ESCALATION CLAUSES

Navy shipbuilding contracts are usually long term, averaging from 4 to 10 years. As a result, economic changes over the life of the contract greatly affect the contract cost to the contractor and the Government. For example, by the end of 1978, Navy officials reported over \$2 billion paid and estimated to be paid to shipbuilders for escalation in the DD-963, SSN-688, and FFG-7 programs for contracts awarded through that date. When cost-reimbursement type contracts are used, the Navy pays the shipbuilder the actual costs incurred, which automatically accounts for material and labor cost changes due to inflation. Shipbuilding contracts, however, are generally a fixed-price type, with an escalation clause to reimburse shipbuilders for inflation.

Escalation clauses protect both the shipbuilder and the Navy because both share the risk of inflation. The clauses ensure that each pays a fair share by providing for both increases and decreases in contract price if the rate of inflation changes. Without such clauses, the shipbuilder would have to include estimates of inflation in the bid or proposal price. If these estimates were included in the contract price and the rate of inflation exceeded the estimate, the shipbuilder would have a reduced profit or a loss.

If, on the other hand, the rate was less than estimated, the shipbuilder would receive a windfall profit and the Navy would pay unreasonably high prices.

Since 1962, the Navy has developed and used special escalation clauses for its fixed-price type shipbuilding contracts. These clauses compute escalation payments using the shipbuilders' average inflation experience, as shown in indexes of the shipbuilding industry. These indexes, provided by the Bureau of Labor Statistics (BLS), are

--a material index prepared from a composite of 3 BLS wholesale index commodities and

--a labor index (used for both labor and overhead escalation) prepared using earnings reports from 17 private shipyards in 4 regions of the United States.

Before 1975, shipbuilding escalation clauses provided for automatic quarterly escalation payments based on (1) changes in the material and labor indexes and (2) quarterly material, labor, and overhead expenditure rates predetermined when the contract was awarded. These clauses excluded a certain percentage of total contract costs which the Navy considered unaffected by inflation. Also, escalation payments continued to the ship delivery date set in the contract, regardless of whether actual ship delivery was early, late, or on time. These clauses are no longer found in current shipbuilding contracts or included in new contract awards.

The Navy computed the escalation payment by first determining the percentage changes in the indexes, which was done by comparing them with base month indexes specified in the contract. The predetermined material and labor expenditure rates for the quarter were then multiplied by the original target cost to calculate the quarterly predetermined expenditure amounts. These amounts were then multiplied by the index changes which resulted in the quarterly escalation payment to the shipbuilder.

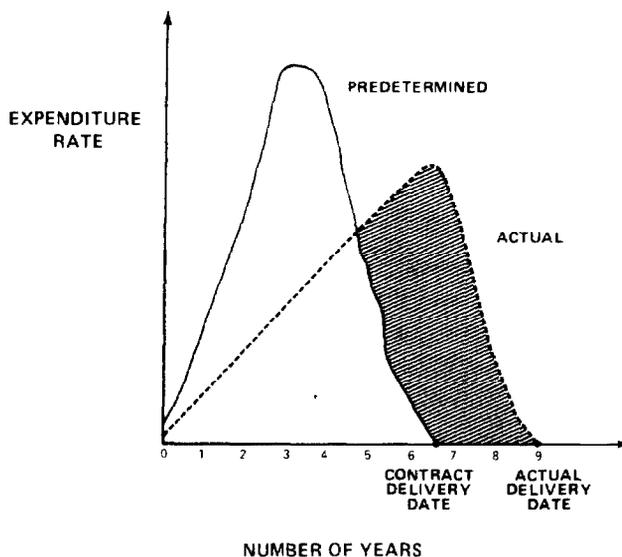
The payment amount was not affected by the shipbuilder's actual expenditures, allowing the shipbuilder little flexibility in purchasing materials or using labor. If actual costs incurred did not approximate the predetermined expenditures for any reason (Navy, shipbuilder, or neither party responsible), the shipbuilder could incur more costs during later times at higher inflation rates. However, the shipbuilder would receive escalation payments as if the costs were incurred at the predetermined level and lower inflation

rates. Also, since the target cost remained unchanged for escalation purposes, the shipbuilder would not receive escalation on costs which exceeded contract target cost. The Naval Ship Procurement Process Study noted that shipbuilders considered these clauses less than adequate during relatively stable economic periods and wholly inadequate for the double digit inflation which started in the early 1970s.

In 1975, the Navy began using new escalation provisions to give shipbuilders a more equitable escalation price adjustment. The Navy continues to base the payment computation on changes to the indexes, but uses the shipbuilders's actual expenditures for a month or a semimonthly period rather than using predetermined expenditures. This means the Navy now pays escalation at the inflation rates in effect when costs are actually incurred. These payments continue until actual ship delivery (past the contract delivery date if necessary) or until contract costs, excluding escalation, reach ceiling price, the Navy's maximum cost liability for the contract. Like the old escalation clauses, the new clauses specify the percentage of contract costs receiving escalation coverage, excluding those considered unaffected by inflation.

The graph shown below compares hypothetical predetermined and actual expenditure rates for material costs to illustrate the difference in coverage that might be provided by the old and new type escalation clauses.

COMPARISON OF PREDETERMINED AND ACTUAL MATERIAL EXPENDITURE RATES FOR A HYPOTHETICAL SHIPBUILDING CONTRACT



This graph illustrates the situation where a shipbuilder's actual material expenditures do not approximate the predetermined expenditure rates of the old escalation clause. To do this, we developed hypothetical expenditure rates to represent the shipbuilder's actual expenditures. The difference between the two expenditures' curves (the shaded area) represents costs incurred at a later time than predetermined in the contract. Under the old clause, the shipbuilder would receive escalation payments based on the predetermined expenditure rates and the BLS index levels at those times, even though some costs are incurred at a later time when the BLS index levels may be higher. Under the new escalation clause, the shipbuilder receives escalation based on the actual expenditures and the BLS index levels at the time costs are incurred, past contract delivery date to actual ship delivery date, if necessary. Examples for labor and overhead expenditures would be similar to this example.

The amount of escalation paid by the Navy under either clause would depend upon economic conditions at the time. For example, in the case shown above, if inflation increased throughout the years as has been the experience during the 1970s, the Navy would pay more escalation under the new clause than the old. If inflation decreases in future years, escalation payments would be less under the new clause than they would be under the old clause.

The amount of escalation payments can vary greatly depending on the type of escalation clause used. For example, escalation paid for the DD-963 contract under the original escalation clause totaled about \$792 million, using its predetermined expenditure rates and providing coverage for 93 percent of contract costs to the contract delivery date. Navy officials estimated that, if the new type clause were used, an additional \$400 million would have been paid as escalation assuming that (1) escalation was calculated using actual costs incurred, (2) coverage was provided for 100 percent of costs, and (3) payment was made through the actual and projected ship delivery dates.

In recent contracts, the Navy has further reduced shipbuilders' risk for inflation by including separate escalation provisions for certain types of costs which increase at a higher rate than the material and labor indexes. These special provisions cover:

- State and federally legislated employee benefit costs, such as Federal Insurance Contribution Act benefits, workmen's compensation, unemployment compensation, and disability.

--Energy costs, such as coal, coke, electricity, and fuel oil.

Escalation payments on employee benefit costs use a formula based on actual changes in cost. Energy cost escalation uses the wholesale price index for coal and coke costs, but uses actual cost increases for electricity and fuel oil.

Another change in Navy escalation policy to make risk sharing equitable concerns profit on escalation. The Navy previously considered escalation to be "risk free" and, therefore, not a factor in developing contract profit objectives. However, it now believes that escalation should be considered when determining profit, because actual cost expenditures and escalation recoveries can present cash flow problems for the shipbuilder. This means the Navy now negotiates the contract profit amount on contract cost plus the estimated escalation recovery, instead of on contract cost alone and allows some profit on escalation.

THE NAVY PAYS ESCALATION ON COSTS
NOT SUBJECT TO INFLATION

Escalation clauses in some recent shipbuilding contracts provide for escalation payments on costs which do not increase with inflation or which increase at a slower rate than the inflation rate. This can result in the shipbuilder receiving excess escalation payments. Because of this potential for excess payments, we reported the situation in a letter report to the Secretary of Defense (PSAD-79-79, Apr. 19, 1979). The report recommended that the Secretary discontinue this policy and delay pending ship acquisitions until the Navy was confident such contracts would not pay escalation on costs not subject to inflation.

In his July 14, 1979, response to our report, the Secretary told us that the Navy was conducting a study of this issue on a contractor-by-contractor basis. He added that the study would form the basis for establishing Navy policy on escalation payments for future shipbuilding contracts. The results of this study are discussed later in this chapter.

The Navy recognizes some costs
not subject to inflation

Navy contracting officials recognize that, during the life of a contract, not all of a shipbuilder's costs increase with inflation and some increase slower than others. The

Defense Acquisition Regulation (formerly the Armed Services Procurement Regulation) gives examples of costs, such as (1) the fixed cost to the contractor of subcontracted items that are not subject to increases when delivered and (2) certain areas of overhead--such as depreciation charges, prepaid insurance costs, rental costs, leases, and taxes. The Defense Acquisition Regulation states that these types of costs should be examined in detail and that escalation should not be paid on those unaffected by inflation.

The July 1978 Naval Ship Procurement Process Study addressed the need to exclude certain costs from escalation. It recommended that the shipbuilder's overhead accounts be reviewed to identify such costs. It also noted that the percentage of overhead costs not subject to escalation should vary among shipyards and not be a standard percentage for all contracts.

Escalation coverage in prior and recent shipbuilding contracts

In shipbuilding contracts awarded in the early 1970s for the DD-963 and SSN-688 programs, the Navy used a standard percentage of escalation coverage for different shipbuilders, but did exclude some costs from coverage. In more recent contracts the percentages of costs receiving escalation coverage have increased. Some contracts provided escalation coverage on all costs. This was done, for example, in the September 1977 fixed-price incentive contract with Newport News Shipbuilding and Dry Dock Company, for construction of eight SSN-688 Class submarines, and the April 1979 fixed-price incentive contract with Electric Boat for construction of additional SSN-688 Class submarines.

In a June 4, 1976, report addressed to the Deputy Commander for Contracts, Naval Sea Systems Command (NAVSEA), the Defense Contract Audit Agency (DCAA) reported that the percentage of overhead costs subject to inflation for Newport News and Electric Boat were 93 percent and 91 percent, respectively. During our audit, however, the Deputy Commander for Contracts acknowledged that the contract awards to these shipbuilders providing escalation coverage for 100 percent of overhead costs were not based on the DCAA analysis. He also stated that coverage of all contract costs may have established an unfortunate precedent of allowing escalation payments on costs not subject to inflation.

Our April 19, 1979, letter recommended that the Secretary of the Navy delay the pending contract awards for FFG-7 Class frigates until confident that shipbuilders would not

receive excess escalation payments. On April 27, 1979, the Navy awarded fixed-price incentive contracts to 3 contractors for a total of 8 FFG-7 Class frigates with options for as many as 13 additional frigates. These contracts provide escalation coverage for all costs except 5 percent of indirect costs (overhead).

Before awarding these contracts, NAVSEA officials provided us with preliminary DCAA data to support escalation coverage for 95 percent of overhead costs. NAVSEA also requested DCAA to review the overhead accounts of these and other shipyards to determine if some overhead items are not subject to inflation over the 5- to 6-year lives of shipbuilding contracts. After the contracts were awarded, DCAA completed its review. In a June 25, 1979, letter to the Navy, it reported that only 4 percent of one contractor's overhead was not subject to inflation, but that almost 10 percent of the second contractor's and 13 percent of the third contractor's overhead were not subject to inflation.

Furthermore, although the Navy provided escalation coverage of 100 percent of overhead in the two SSN-688 contracts with Electric Boat and Newport News, the DCAA study showed that almost 17 percent of Electric Boat's overhead and almost 7 percent of Newport News' overhead were not subject to inflation.

Excess escalation increases cost to the Navy

Most current fixed-price type shipbuilding contracts contain price incentive provisions allowing the shipbuilder and the Navy to share cost savings and cost increases below or above a target cost. When the contract ceiling price is reached, the Navy no longer shares cost increases with the shipbuilder. As discussed above, ceiling price represents the Navy's maximum cost liability for the contract, excluding reimbursement for escalation. However, under the new escalation clauses, escalation payments also stop when contract costs reach ceiling price.

Escalation payments are not considered part of contract costs. Thus, they are not subject to the contract price incentive provisions, nor are they included in the computation of target cost, target profit, target price, or ceiling price. However, escalation payments are subtracted from actual incurred cost to determine the contract costs subject to these provisions. This means that the more the Navy pays of the shipbuilder's costs as escalation, the less cost is considered contract costs and subject to the contract price

incentives. Therefore, if the Navy pays escalation which should be considered contract costs (excess escalation), as in paying escalation on costs not affected by inflation, this would cause the shipbuilder to reach target cost and ceiling price at a slower rate. Because of the sharing provisions of the fixed-price incentive contract, the shipbuilder would then receive a windfall profit or reimbursement for costs that the Navy should not have to pay.

PAYING ESCALATION BEYOND CONTRACT
DELIVERY INCREASES COST AND
ENCOURAGES LATE DELIVERY

Until 1975, shipbuilding escalation clauses did not allow escalation payments after the ship delivery date set in the contract. The Navy took this position because it did not want to reward late delivery. As a result, the shipbuilder absorbed all inflation costs on original contract work done after the contractual delivery date.

After 1975, the Navy began paying escalation to actual ship delivery and beyond the contract date if necessary. The Navy did so to respond to shipbuilders' complaints that they were not solely responsible for late ship delivery.

Escalation payments, after the contract delivery date, are made during later time periods when inflation rates are generally higher than the rates initially considered by the shipbuilder and the Navy in negotiating the contract price. The Navy's liability for these escalation payments is limited somewhat in that escalation payments stop when contract costs reach ceiling price. In addition to the ceiling price limitations, the Navy has further limited its liability in some contracts by experimenting with the extent of escalation coverage it provides to actual ship delivery. This included

- fixing or "capping" the indexes at the levels reached as of the delivery date set in the contract, as in a contract for AD-41 destroyer tenders, and

- capping the indexes generally 240 days after the delivery date set in the contract as in some SSN-688 contracts.

The Navy has also allowed normal payment of escalation through actual ship delivery without capping the indexes, as in the nine follow-ship contracts for FFG-7 Class frigates. However, current Navy policy is to cap the indexes 240 days after the delivery date set in the contract.

Escalation as delivery incentive

Navy contracting officials agree with the shipbuilder that work can extend past the contract delivery date in cases where responsibility for the delay is difficult to assign. However, these officials also recognize that delayed work can be caused by the shipbuilder, yet the Navy still pays escalation to actual ship delivery. As discussed above, these payments are limited only in that they stop when contract costs reach ceiling price or, in some contracts, by capping the indexes.

If delay occurs because of the Navy, or for reasons beyond the control of either party, such as labor strikes, the ship delivery date can be extended by changing the contract. In this case, escalation coverage would then automatically extend to the new ship delivery date. If delay were caused by the shipbuilder, the contract delivery date would not be changed; but under the new Navy escalation clause, the Navy would still pay escalation past the original delivery date.

Paying escalation past the delivery date set in the contract eliminates part of the shipbuilder's cost responsibility for shipbuilder-responsible delays and provides no incentive to deliver the ship on time.

The July 1978 Naval Ship Procurement Process Study states that capping the escalation 240 days after contract delivery provides the shipbuilder incentive to deliver the ship within a reasonable time after that date. The study notes, however, that escalation clauses are not the media for delivery incentives.

While we generally agree that escalation clauses should not be used as delivery incentives, the alternative is not desirable. Paying escalation through actual delivery without capping the indexes at contract delivery date may encourage late delivery. In the past, the Navy has included clauses to reward early delivery and to penalize late delivery. Current Navy policy, however, is to avoid using either positive or negative incentives because of the difficulty in determining their applicability in delay situations.

With no specific delivery incentives or penalties either through specific contract provisions or escalation, the shipbuilder can adjust ship delivery to his cost advantage, as opposed to Navy needs. For example, the shipbuilder could delay Navy ships by decreasing labor used on this work in order to increase labor used on commercial or other Navy contracts which contained delivery incentives or penalties.

PAYING FOR ACTUAL ESCALATION
WILL INCREASE SHIP PRICES

As discussed above, the Navy bases the escalation calculation on changes in BLS indexes of the shipbuilding industry. Since escalation payments are based on average inflation in the shipbuilding industry, as represented by these indexes, the payments to a particular shipbuilder will most likely be different than his experienced inflation. This encourages the shipbuilder to keep costs below the average, as a way of increasing profits because its payments will be based on the average. This, in turn, lowers the industry inflation rate and the resulting indexes.

The Navy's July 1978 Naval Ship Procurement Process Study, however, recommended that the Navy pay a shipbuilder's actual escalation on labor costs to totally remove labor escalation from the shipbuilder's costs. Paying this actual escalation would eliminate the shipbuilder's risk of reduced profit or loss due to unanticipated high inflation of labor costs. As the study noted, the shipbuilder also would no longer have to include allowances for anticipated underrecovery of escalation in the contract price.

The study did not recommend paying actual escalation on material costs, because this might diminish the shipbuilder's incentive to strive for the best price. However, for labor costs, the study observed that the shipbuilder would still have incentives to hold down costs if actual escalation were paid, because (1) the labor costs on ongoing commercial contracts would not receive such coverage and (2) the shipbuilder would desire to remain competitive for future Government shipbuilding. The study, therefore, concluded that the shipbuilders probably would not unduly increase employee wages if paid actual escalation, because upcoming new ship construction is limited and a number of shipbuilding companies are already noncompetitive.

We do not agree with the study's recommendation. We believe that as the study notes for material costs, paying actual escalation reduces the shipbuilder's incentive to obtain the best price for labor as well. In addition, basing escalation payments on indexes allows the Navy to compare price proposals for all competitors, including estimated escalation, because each proposal would be subject to the same index changes. A similar comparison would not be possible if escalation were based on actual experience because different amounts would be recovered by each shipbuilder according to his own labor inflation experience. Shipbuilders anticipating high labor escalation could remove

this amount from the proposal price and possibly show a lower price than a shipbuilder anticipating less escalation. A contract awarded to the lowest proposal price could, therefore, result in a higher cost to the Navy when escalation was eventually paid.

Officials of the NAVSEA Contracts Directorate share our opinion that paying actual escalation will increase ship prices. These officials, in their formal response to the study, indicated that they planned to recommend against this practice.

CONCLUSIONS

Current and proposed Navy escalation policies can increase ship cost to the Navy and encourage late ship delivery. These policies contradict the purpose of escalation payments (reducing risk to the shipbuilder) by providing the shipbuilders with an opportunity to get a windfall profit. They also conflict with contract price incentive provisions and delivery requirements.

Paying for escalation on costs not affected, or not significantly affected, by inflation will result in excess escalation payments. Because these payments are not subject to contract price incentives, the Navy pays more than if the costs were included in the contract price. The shipbuilder also approaches ceiling price at a slower rate, which can increase the Navy's overall cost liability for the contract.

Continuing escalation coverage past the original ship delivery date to actual delivery results in additional escalation payments for periods and at inflation rates not considered by either party in the contract pricing. It also provides less incentive for the shipbuilder to deliver the ship on time. With current Navy policy not to provide delivery incentives or delay penalties in the contract, ship delivery could become increasingly dependent on other shipbuilder business considerations, rather than the delivery terms of the contract.

The Naval Ship Procurement Process Study's recommendation to pay actual labor escalation can only contribute to the price of ships. Adopting this policy will place an additional cost risk on the Navy for inflation and reduce the shipbuilder's incentive to hold down costs.

RECOMMENDATIONS

We recommend that the Secretary of the Navy:

- Direct Navy contracting officers to discontinue negotiating shipbuilding contracts which pay escalation on costs not affected, or affected to a lesser degree, by inflation.
- Discontinue paying escalation on costs incurred after the delivery date set in the contract. Additional escalation coverage should be provided by changing the delivery date, and only for delays for which the shipbuilder is not responsible.
- Continue using BLS indexes of the shipbuilding industry as the basis for escalation and not adopt the Naval Ship Procurement Process Study recommendation to pay the shipbuilder's actual labor escalation.

AGENCY COMMENTS AND OUR EVALUATION

Although we have not received formal written comments from the Secretary of the Navy, we met with Navy officials on October 26, 1979, to discuss our draft report. During that meeting Navy officials told us that future shipbuilding contracts will not provide escalation for 100 percent of overhead costs. Those contracts will provide only 95 percent coverage for competitive solicitations and for sole-source solicitations will exclude from coverage that percentage which is computed after deducting the contractors' depreciation on existing capital assets.

We believe that these actions are a step in the right direction, but do not go far enough. Although the Navy will exclude 5 percent of overhead from escalation coverage in future competitive solicitations, it plans to do so across the board. The DCAA study pointed out that the percentage of shipbuilders overhead not subject to inflation ranged from a low of about 4 percent for one shipbuilder to a high of almost 17 percent for another shipbuilder and that it may be inequitable to exclude the same percent of overhead from escalation coverage for different shipbuilders. We agree with DCAA and recommend that the Navy reconsider its newly adopted policy.

In addition, we believe that the Navy should not only exclude from escalation coverage contractors' depreciation on existing capital assets but recommend that it revise its policy to exclude all overhead costs that are not affected by inflation, and exclude a proportionate share of those overhead costs that are affected to a lesser degree by inflation.

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