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BY THE COMPTROLLER GENERAL  
**Report To The Chairman, Subcommittee  
On Defense, House Committee  
On Appropriations  
OF THE UNITED STATES**

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RELEASED

**Actions Needed To Reduce  
Schedule Slippages And Cost Growth  
On Contracts For Navy Ship Overhauls**

Growing concern over the cost and effectiveness of the Navy's contracting for ship overhauls prompted the Subcommittee to ask GAO to examine Navy overhaul contracting practices. GAO found that the Navy needs to concentrate maintenance expertise and overhaul responsibility to improve overhaul contracting.



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

B-133170

The Honorable Joseph P. Addabbo  
Chairman, Subcommittee on Defense  
Committee on Appropriations  
House of Representatives

Dear Mr. Chairman:

As requested in your September 22, 1980, letter, we have evaluated the Navy's system for developing contract work specifications packages and its ship overhaul improvements programs.

This report discusses Navy actions to improve the cost effectiveness and timeliness of contract ship overhauls.

As arranged with your Office, unless you announce its contents earlier, we plan no further distribution of this report until 14 days from the date of the report.

Sincerely yours,

A handwritten signature in cursive script that reads "Charles A. Bowsher".

Comptroller General  
of the United States



D I G E S T

The Navy spends about \$800 million a year contracting for private sector overhauls of auxiliary, amphibious, and less intricate surface combatant ships. With growing public concern over the readiness of our naval fleet, the Congress has increasingly scrutinized ship overhaul activities. The Congress is concerned that the Navy is wasting fiscal resources by not effectively definitizing overhaul work to be contracted.

The Subcommittee on Defense, House Committee on Appropriations, requested that GAO examine (1) the effectiveness of the Navy's procedures for developing contract overhaul work packages and (2) the potential for Navy initiatives to improve overhaul contracting.

Overhaul improvement programs and management initiatives already started by the Navy are having some effect on reducing schedule delays and cost growth. The Navy is further stressing its improvement programs by placing a flag review board over these initiatives. (See p. 11.)

However, missed completion dates and cost growth continue to plague the Navy in getting ships overhauled under contract with private shipyards. On the basis of an analysis of overhauls started for the 3 years ending January 1980, GAO found that overhauls were delayed an average of 64 days (see p. 5) and that contract cost growth over the award price was averaging about 62 percent for frigates, 55 percent for auxiliary ships, and 29 percent for amphibious ships (see p. 7).

Contract cost growth is of special concern because contract additives are priced based on sole-source negotiation with the enterprise awarded the basic contract. Under these conditions, the Navy is at a great disadvantage in trying to assure that the best price is being negotiated with the contractor. (See p. 7.) Furthermore, contract changes often contribute to overhaul delays.

GAO's analysis of contract cost growth suggests that the bulk of the Navy's problem is with developing work packages for repairs, maintenance, and minor modifications (see p. 3). GAO believes that key reasons for this problem are:

- The Navy's work package development and contract administration systems are complex and managerial responsibility and expertise are diffused.
- The Navy is using contracting techniques which are not well suited to achieving quality overhauls on time and at minimum cost.

#### NEED FOR CONCENTRATED OVERHAUL MANAGEMENT

The Navy's planning and management system for private sector overhauls is fragmented, with many organizations involved in the coordination and decisionmaking processes. No single entity seems to have the expertise or the managerial responsibility for ensuring that private sector overhauls are effective (see ch. 3). As such, there follow such questions as:

- Who can ensure that work specifications packages are accurate and complete?
- Who is in a position to make timely and informed decisions on proposed changes to contracts?
- Who can ensure that work is of a required quality?
- Who has sufficient visibility to provide reliable feedback on a ship's overhaul?
- Who has the knowledge to put maintenance requirements into the perspective of a ship's total maintenance program and control costs by including in the work specifications package only work that must be done by a shipyard?

These are some of the key issues the Navy must deal with if it is to consistently achieve effective overhauls.

In contrast, the Military Sealift Command and commercial carriers essentially use a single individual--a port engineer--to manage and coordinate the planning and accomplishment of ship overhauls.

The Navy recognizes that a key difference between its overhaul management methods and other shippers' methods is in the centralization of authority and responsibility in a port engineer. As a result, it is testing the use of port engineers. The Navy believes that significant benefits to its overhaul management program could result from these tests. However, the port engineer concept will not be fully implemented or evaluated for some time. (See ch. 3 and app. I.)

Despite the Navy's apparent positive opinion of the port engineer's concept and the commercial carriers' and Military Sealift Command's success with the concept, the Navy seems to be proceeding with the concept slowly.

--The concept is being tested only with combat stores ships.

--The port engineer's duties in the test are being assigned in an evolutionary process.

--The concept is being tested as one element in a test of various commercial concepts.

As a result, the timing and the ultimate scope of port engineer application are uncertain. (See ch. 3 and app. I.) GAO believes that the port engineer concept provides for significant improvements in overhaul effectiveness by concentrating expertise and overhaul responsibility. Accordingly, GAO believes that the Navy should aggressively pursue application of the concept throughout the surface fleet.

#### RECOMMENDATION

GAO, therefore, recommends that the Secretary of Defense direct the Navy to intensify ship maintenance management by concentrating maintenance expertise and overhaul responsibilities in managers similar to port engineers. Port engineers' responsibilities should include:

--Developing and sustaining technical expertise and knowledge of a ship's characteristics, design, and ongoing material condition.

- Making decisions on the scope and need for overhaul contract changes to sustain overhaul cost effectiveness.
- Managing the planning and development of cost-effective work packages.
- Providing feedback on problems encountered during overhauls and lessons learned for future consideration.

#### NEED FOR ALTERNATIVE CONTRACTING TECHNIQUES

The traditional Navy formal advertising contracting methodology used with ship overhauls tends to inhibit overhaul effectiveness. This is because it

- does not sufficiently foster developing and sustaining contractor expertise;
- causes unstable workloads which, in turn, creates work force turbulence;
- has an inherent conflict between awarding the contract early and ensuring work packages are as complete as possible;
- provides insufficient Navy visibility over costs; and
- fosters an adverse relationship between the Navy and contractors. (See p. 33.)

To improve overhaul effectiveness, the Navy has instigated numerous tests of alternatives. Among these is a request for proposal approach which may enable the Navy to improve the selection of contractors. The award would be based on an analysis of how the contractor plans to accomplish the overhaul as well as a price. (See p. 37.)

Success of the Navy's advertising methodology is contingent on how well the Navy defines the work to be done. GAO believes that workload definition can be significantly improved through the use of overhaul management techniques as discussed in this report. Even so, contracting may be further improved by using such approaches as alternative bids and multiship awards. (See ch. 4.)



AGENCY COMMENTS

In early December 1981, GAO met with representatives of the Navy to discuss the report's contents. The Navy considered it a fair representation of the facts and concurred with the basic conclusions and recommendations.



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ABBREVIATIONS

GAO	General Accounting Office
MSC	Military Sealift Command
NAVSEA	Naval Sea Systems Command
PERA	Planning and Engineering for Repairs and Alterations
SUPSHIP	Supervisor of Shipbuilding, Conversion, and Repair
TYCOM	Type Commander (Commander, Naval Surface Forces, Atlantic and Pacific Fleets)

## CHAPTER 1

### INTRODUCTION

The Navy has an active fleet of about 445 ships which periodically require overhaul. In fiscal year 1980, the Navy spent \$3 billion for overhauls, which were comprised of ship repairs and alterations. About 73 percent of these funds, or \$2.2 billion, went for overhaul at naval or public shipyards, while 27 percent, or \$0.8 billion, went for contract overhauls at private shipyards.

The Navy uses its public shipyards to overhaul the more complex ships which include submarines, aircraft carriers, cruisers, guided missile destroyers, and frigates. The public yards have been overhauling about 35 ships annually. In contrast, the Navy has contracted about 44 overhauls a year with private industry. These overhauls generally involve the less complex ships, such as auxiliary and amphibious ships, and some of the less intricate surface warships. The private sector, however, is now being tasked to overhaul more complex surface warships than previously because (1) there are relatively more of these ships and (2) public shipyard resources constrain the shipyards' ability to meet the total requirement.

With growing public concern over the readiness of the naval fleet, the Congress has increasingly scrutinized ship overhaul activities. The Subcommittee on Defense, House Committee on Appropriations, is concerned that the Navy is wasting fiscal resources by not effectively definitizing overhaul work to be contracted. It pointed out that, on the basis of 1978 data, negotiated contract cost increases for work changes amounted to as much as 148 percent of the basic contract. For example, a 1976 contract overhaul of the U.S.S. Spiegel Grove, an amphibious ship, increased in cost from an initial contract of \$8 million to almost \$20 million before the overhaul was completed. Such work changes are not priced on the basis of competition, and therefore, the Navy may not be getting the best price.

Also, the Subcommittees on Seapower and Strategic and Critical Materials and on Readiness, House Committee on Armed Services, have expressed alarm over private sector overhaul quality and timeliness. In April 1981, they held hearings with private industry and the Navy to identify problem areas.

In 1959, we reported that increased ship overhaul costs resulted from laxity of controls over supplemental work. <sup>1/</sup> Since that time the Navy has repeatedly testified that initiatives are

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<sup>1/</sup>"Review of Ship Overhaul Contracting Activities Administered by Industrial Managers; Bureau of Ships, Department of the Navy" B-133170, June 1959.

underway which are intended to improve overhauls. Yet, the problems with overhauls continue today.

On September 22, 1980, the Chairman, Subcommittee on Defense, House Committee on Appropriations, asked us to examine (1) the effectiveness of the Navy's procedures for developing contract overhaul work packages and (2) the potential for Navy initiatives to improve overhaul contracting.

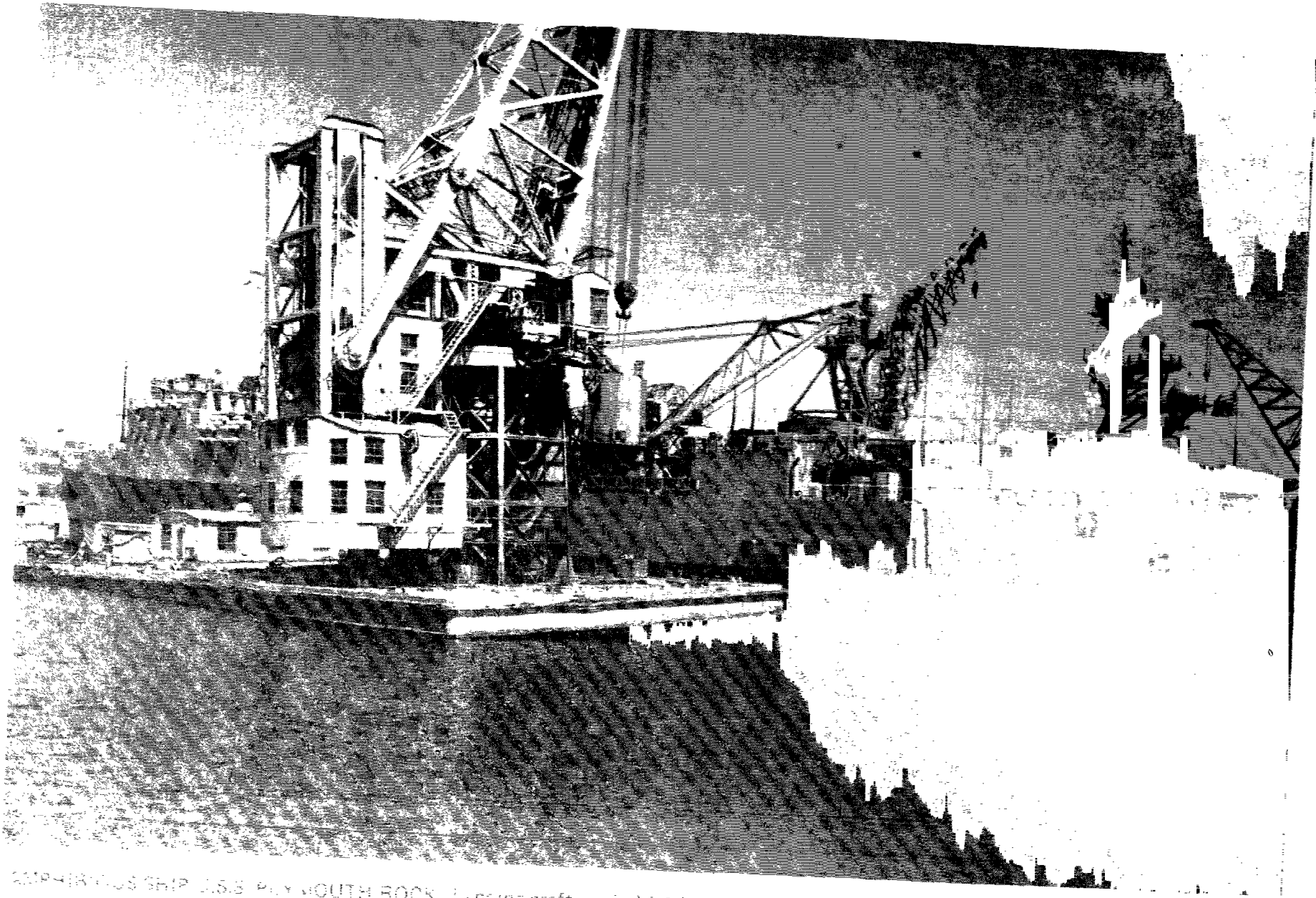
#### OBJECTIVES, SCOPE, AND METHODOLOGY

Our objectives were to

- identify the factors which contribute to cost-effective overhauls;
- assess the extent these factors exist in the total contract overhaul system, both inside and outside the Navy;
- examine alternatives which could enable the Navy to achieve more effective overhauls;
- evaluate the Navy's system for developing contract work packages; and
- assess the Navy's ship overhaul improvement programs.

Our review included the key Navy organizations in the contract overhaul process, the Chief of Naval Operations, the Naval Sea Systems Command (NAVSEA), and the Pacific and Atlantic Fleets. We also contacted representatives from the U.S. Coast Guard, Military Sealift Command (MSC), commercial shipping companies, private shipyards, and industry.

Our review was performed in accordance with our current standards for Audit of Governmental Organizations, Programs, Activities, and Functions." We examined the Navy's processes and internal controls over the development, approval, and administration of the contract work packages. This involved interviewing responsible agency and industry officials, analyzing the Navy's contract overhaul system, and examining and testing Navy data on 113 contract overhauls completed since fiscal year 1977. A key part of our review was our detailed examination of overhaul contracts and related documents for auxiliary and amphibious ships. The Navy's predominate experience with contracting overhauls, until recently, has been with these types of ships which account for about 45 percent of the surface fleet.



AMPHIBIOUS SHIP (Landing craft carrier) USS PLYMOUTH ROCK UNDERGOING SHIPYARD MAINTENANCE

SOURCE: U.S. NAVY

## CHAPTER 2

### NEED FOR A SYSTEM-WIDE FOCUS

#### ON OVERHAUL IMPROVEMENT INITIATIVES

Missed completion dates and cost growth continue to plague the Navy in getting ships overhauled under contract with private shipyards. These conditions waste fiscal resources and degrade fleet readiness by not providing fully serviceable ships when needed.

The Navy has recognized there are problems with overhauls in the private sector, and it has instituted overhaul improvement programs to manage initiatives for dealing with these problems. While there are indications of improvements, the improvement initiatives have lacked the cohesiveness and commitment necessary to bring about the significant improvements possible. If the initiatives are to be more effective, they must have high-level support and direction toward systemwide improvement objectives. Recently, the Navy established a high-level initiatives review board to foster more effectiveness in initiatives. This is a step in the right direction.

#### ACHIEVING AN EFFECTIVE OVERHAUL

To the Navy, a satisfactory ship overhaul is one that is completed on schedule, returns a ship to a condition which allows it to reliably perform its assigned missions until the next scheduled repair period, and is performed within projected cost. Staying within the projected cost, however, does not assure that the overhaul will be cost-effective. This is because Navy cost projections include historical contract growth which has tended to reduce contract efficiency. The Navy recognizes that a more desirable objective is to achieve ontime, satisfactory overhauls at minimum cost.

The following steps are necessary to ensure an effective overhaul.

- First, the Navy must identify essential repairs, maintenance, or alterations that must be done at and by a shipyard.
- Then, the Navy must translate the identified work into clear and accurate specifications in a work package which will be the basis for the overhaul contract.
- Then, the Navy must award the contract to a private shipyard which can economically perform a quality overhaul on schedule.



--During the overhaul, as unforeseeable work requirements arise, the Navy must quickly decide the appropriate action to minimize costs, delays, and disruption claims by the contractor. It must also examine the work completed to ensure that contract specifications have been met.

--After the overhaul, the Navy should summarize the overhaul and identify key lessons learned for recognition in planning future overhauls.

THE NAVY IS HAVING DIFFICULTY  
ACHIEVING EFFECTIVE OVERHAULS

Analysis of Navy data on 113 ships overhauled under contract, with completions from October 1977 through February 1981, revealed that the Navy continues to have problems with timeliness, work package development, and cost growth. There are, however, indications of improvement with some ship classes.

Overhauls are completed  
2 months late

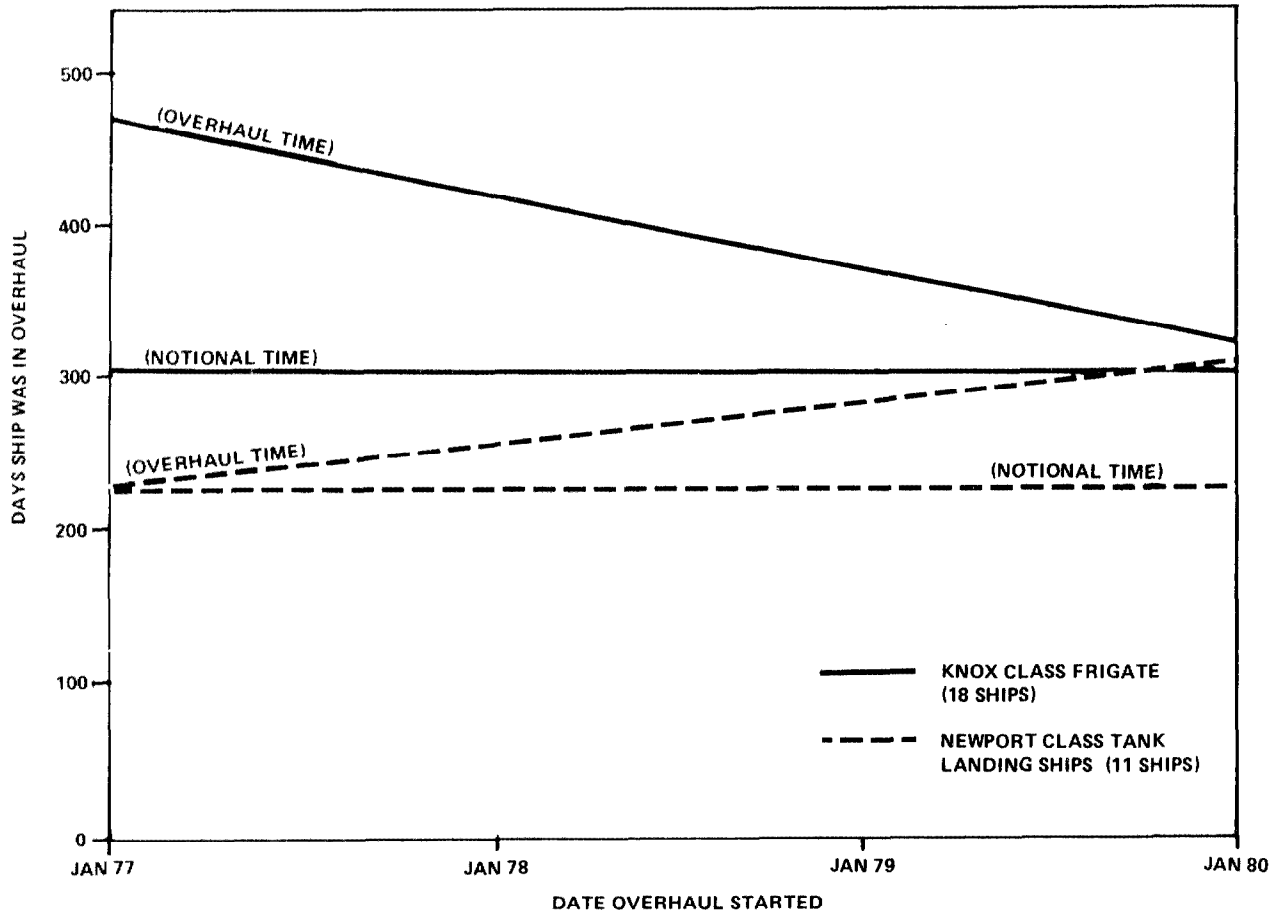
During April 1981 House Committee on Armed Services hearings, the Navy testified that during the 2 years ending March 1981, the average delay for overhauls in private shipyards was about 61 days. Our analysis revealed an average delay of about 1.9 months, or 57 days, for the 113 ships. Without counting the less time intensive minesweeper vessel overhauls, however, the average delay was 2.1 months, or 64 days, as shown below.

<u>Types of ships and no. of overhauls examined</u>	<u>Notional overhaul duration (note a)</u>	<u>Average overhaul period</u>	<u>Delay</u>
	----- (months) -----		
Amphibious (28)	8.9	10.9	2.0
Auxiliary (22)	8.3	8.4	0.1
Frigates (24)	10.0	13.5	3.5
Destroyers (11)	b/7.4	10.9	3.5
Averages	8.9	11.0	2.1
Minesweepers (28)	3.0	4.2	1.2
Averages	7.4	9.3	1.9

a/Navy estimate of overhaul duration based on historical workload data and fleet operating requirements developed by class (these are weighted averages for various ship classes calculated for this report).

b/Based on the average contractual period.

For most classes of ships, particularly auxiliary types, there was insufficient data to reach conclusions on trends in timeliness. In some cases, the more recent overhauls showed improvements, in other cases, they did not. The following illustration depicts the trends for two ship classes having the most data available, frigates and tank landing ships. For frigates, there is an improving trend. On the other hand, overhauls of tank landing ships seem to take longer.



In neither case, has the Navy been able to achieve its estimate (notional) as to the time the overhauls should take.

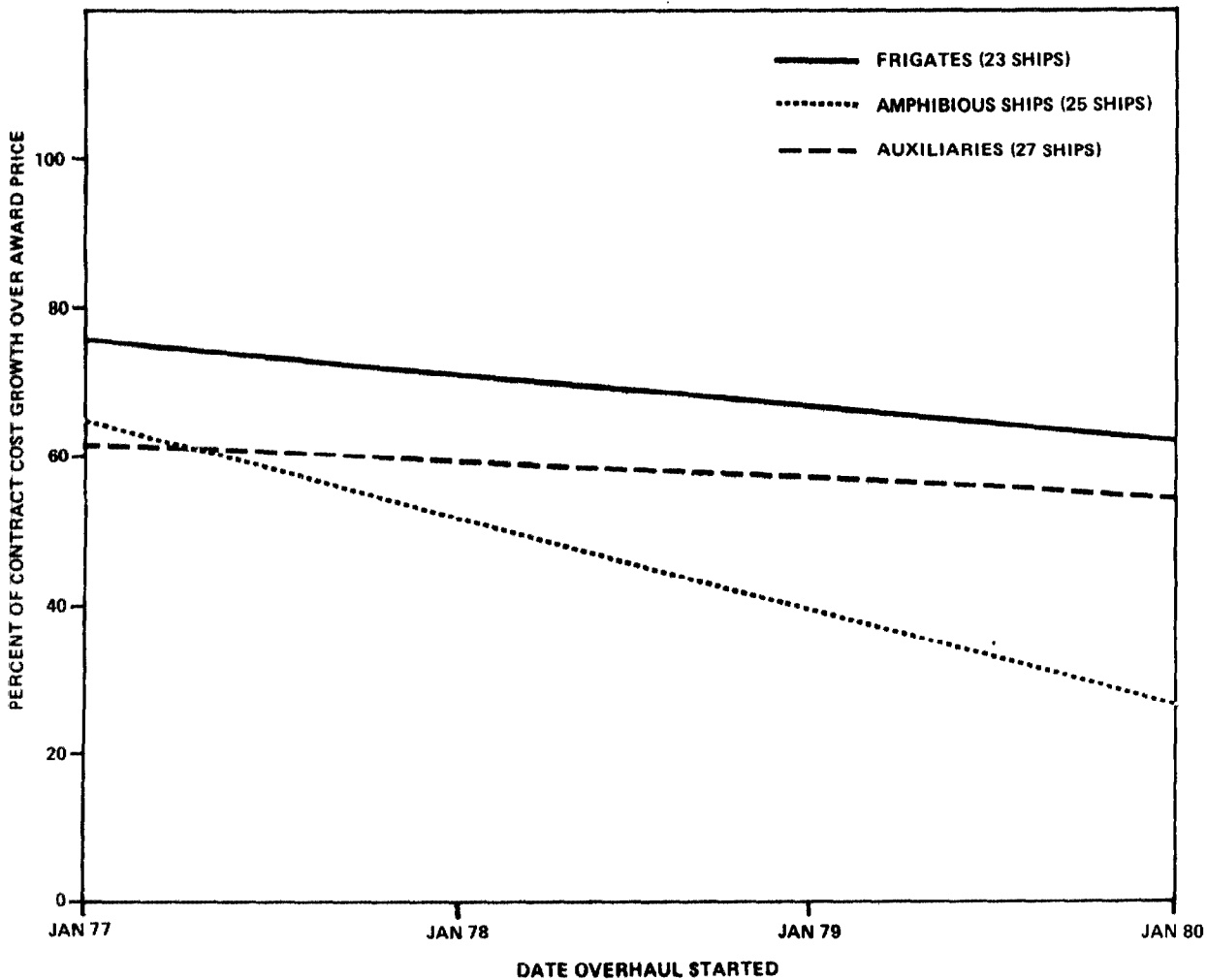
Contract cost growth: some improvement, but still a problem

In the 1970s, the Navy faced a serious overhaul contract cost growth problem. As a result of post-award changes to the basic contract, growth over 100 percent of the basic contract was not uncommon. Generally, the problem resulted from the Navy's difficulties in (1) stabilizing the content of ship overhaul work packages, (2) accurately identifying the work included in the work packages, and (3) dealing with the contractors. The Navy, recognizing a cost growth problem, has tried to reduce the growth, and since 1977 there has been a reducing trend.

Contract cost growth often results in less efficient application of fiscal resources. Therefore, the Navy may pay more for changes or additions to the contract after the initial award because:

- The work is priced based on a sole-source negotiation and, accordingly, does not benefit from price restraining competitive bidding which, for the most part, has been used for awarding the basic contract.
- Changes to work content require various levels of approval which can delay work. During such delays, the contractor continues to incur costs which must be recouped in the price negotiation.

Using Navy data and regression analysis, we identified trends in contract cost growth for the 3 years ending January 1980 for frigates, auxiliary, and amphibious ships. The analysis compared cost growth among contracts, based on the starting date of completed overhauls. We found that the trends are toward reducing contract growth, as shown below.



The complexity of a ship overhaul is such that some cost growth is to be expected. There will always be requirements that cannot be quantified until a ship's overhaul is underway, and some new requirements will be generated after the overhaul contract is awarded. By effectively identifying detectable requirements and eliminating work specification errors, the Navy can minimize contract cost growth.

In 1981 the Commander, NAVSEA, articulated a goal of 10 percent cost growth over the contract award price. In comparison, MSC 1/ tries to limit overhaul cost growth to about 15 percent. Thus, while the Navy has made significant progress in reducing cost growth, it still must achieve further cost growth reductions to reach desired levels.

An approach to reducing contract cost growth is to include virtually every possible overhaul requirement in the work package. Hence, undetectable preoverhaul requirements would not have to be included as a change to the contract if they ultimately do occur. The problem is that unnecessary work may be done or may be negotiated out of the contract at a fraction of the savings. Thus, while the Navy has been reducing cost growth, what has happened to the total contract cost?

This is a difficult question to answer because each overhaul has unique requirements. For example, a September 1980 Navy study of destroyers pointed out that only about 50 percent of the workload recurs from ship to ship. We examined total contract costs since January 1977 for overhauls of various classes of ships, but the results were inconclusive.

#### Work packages need better definition

The Navy categorizes cost growth as being either new work or work relating to work specifications. New work pertains to requirements not included in the original work package. For example, a requirement

- may have developed during the 3- to 6-month leadtime between the work package being finalized and the contract being awarded,
- may have surfaced which was missed or undetectable during ship inspections,
- may be reinstated after previous deferral when additional funds become available, or

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1/MSC operates support ships with civilian crews for the Department of Defense.

--may be added during the overhaul as a new alteration which should not wait until the next overhaul.

Cost growth relating to work specifications pertains to technical shortfalls in the work package. For example, there may be errors in the work specifications or the specifications may lack sufficient specificity. The result often is a contract change, with negotiation of a new price for the work.

We analyzed contract cost growth data to the extent it was available on the ships included in our review and found that 77 percent of the growth was due to work package specification shortfalls, as indicated below.

Summary of Contract Cost Growth

Ship types	No. of ships	Contract award (millions)	Contract growth		Growth due to:			
			Dollars (millions)	Percent	Specification changes (millions)		New work (millions)	
					Dollars	Percent	Dollars	Percent
Amphibious	31	\$271.6	\$125.2	46	\$ 99.6	80	\$25.6	20
Auxiliaries	49	275.4	126.9	46	92.2	73	34.7	27
Frigates	25	230.0	127.7	56	98.1	77	29.6	23
Destroyers	14	76.0	45.2	59	38.9	86	6.2	14
Total	119	\$853.0	\$425.0	50	\$328.8	77	\$96.1	23

Contract cost growth can also be classified based on the Navy organization responsible for funding the work. NAVSEA manages and funds major alterations to ships. The fleets, on the other hand, fund primarily repairs and maintenance, plus some less significant alterations. Both entities serve the Chief of Naval Operations (see app. II).

We analyzed cost growth due to work package shortfalls and found that 82 percent of the cost was fleet funded. Therefore, regarding cost growth, the most significant problem appears to be developing work packages covering repairs and maintenance.

NAVY OVERHAUL IMPROVEMENT PROGRAMS

To address problems with achieving effective overhauls in the private sector, the Navy has developed the maintenance system development program and the depot operations improvement program. The programs have resulted in numerous promising initiatives for dealing with important problem areas in contracting for overhauls. We believe that if the programs are to be more effective, however, there needs to be a high-level orchestration of initiatives toward achieving systemwide improvement objectives.

## Maintenance system development program

The maintenance system development program, which is part of the Navy's Ship Support Improvement Project, <sup>1/</sup> was initiated in 1976 as a 5-year, \$35 million effort to develop an integrated ship maintenance system to improve the material condition of surface ships. It was to

- describe the existing ship maintenance universe;
- examine maintenance strategies outside the Navy;
- examine and compare alternatives of maintenance effectiveness and feedback systems to determine performance and material conditions;
- postulate effective maintenance strategies, compare them, and make recommendations; and
- participate in ship maintenance concept development and planning.

The name of the program appears to be somewhat of a misnomer because the program has not resulted in an overall maintenance system that will ensure effective overhauls. However, the program has brought to the forefront the reliability centered maintenance and the phased maintenance concepts. And, as a result, these concepts are being tested currently with combat stores ships (see app. I.)

## Depot operations improvement program

The antecedents of the depot operations improvement program can be traced to May 1978 when the Navy established a steering task group to examine ship overhaul problems in the private sector. In 1980 the program became formalized as the surface ship overhaul improvement program and, more recently, it became the depot operations improvement program. Major responsibilities are to:

- Develop and maintain methods for measuring and evaluating the effectiveness of the various initiatives undertaken and recommend changes to ensure that the intended objectives are met.

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<sup>1/</sup>In 1974 the Chief of Naval Operations initiated the Ship Support Improvement Project to improve the material condition of Navy ships. The project also covered (1) the FFG-7 class support program, (2) the engineered operating cycle program, and (3) the intermediate maintenance upgrade program. In our report, "The Navy's Ship Support Improvement Project" (LCD-78-433, Sept. 12, 1978), we provided our assessment of the project.

--Make special investigations relative to the manner in which surface ship overhauls are planned and accomplished to identify and develop new initiatives for improving surface ship overhaul performance.

--Examine proposed alternative strategies for improving surface ship overhauls and recommend which initiatives should be selected for further evaluation or implementation.

In practice, the program has been comprised entirely of initiatives directed generally at specific ship overhaul problems. Some of the 29 initiatives in the program included

--using a multiyear, multiship contracting method as an alternative to the maligned advertised bid,

--developing standard cost estimating procedures to improve fiscal management, and

--prepositioning of equipment to improve material support of overhauls.

Actually, many of the initiatives existed before the program, and the program was established to pull the initiatives together. Because of this, we believe the program has lacked cohesiveness and coordination. As a result, the Navy can waste resources on initiatives that:

--Address local problems or symptoms, rather than deal with systemwide issues.

--Merely raise more questions and generate more initiatives.

--Lack organizational commitment or ability to be successful.

Furthermore, important initiatives may be overlooked, inappropriately scoped, or inordinately delayed. For example:

--As far back as 1959, we questioned the Navy's traditional use of competitive bidding as the contracting methodology for ship overhauls (see p. 33). The Navy has been testing numerous alternative methods, but competitive bidding is still the primary method.

--The Navy has known that there are benefits to be gained from implementing commercial maintenance practices. It has implemented, for instance, the commercial reliability centered maintenance concept with aircraft. In 1978 we recommended that the Navy apply commercial practices to certain types of Navy ships. Yet, it took a congressional mandate to get the Navy to test the phased maintenance concept with combat stores ships. (See app. I.)

--In 1980 the Navy testified during House Committee on Appropriations hearings that it had begun requiring post-overhaul analyses to determine the causes for contract cost growth and provide lessons-learned information to improve private sector overhauls. We found, however, that within the Navy's overhaul system such analyses were considered to contain incomplete and unreliable information. Because of this and the resulting limited use, the analyses had a low priority. Consequently, there is a move within the Navy to do away with such analyses.

--During House Committee on Armed Services hearings in April 1981, representatives from the ship repair industry testified that their suggestions to the Navy for improving overhauls were ignored.

By January 1981, the Navy recognized the program had problems. A Navy review confirmed that many of the projects lacked sufficient specificity, resources, plans, or other elements necessary to ensure success. As a result, the Navy has placed the program under a flag review board which reviews and directs the program, making sure that initiatives are appropriately coordinated and that there are sufficiently detailed plans and resources to effectively carry out the initiatives.

Both ship overhauls and the multiorganizational overhaul system are complex. Solutions to problems, therefore, must be system oriented to ensure their implementation is to be effective.

#### CONCLUSIONS

The Navy has instigated numerous initiatives to improve contracting for surface ship overhauls. However, progress in meeting overhaul schedules and in reducing contract cost growth has been slow, partly because of a lack of total system coordination and commitment to the initiatives. The flag review board is a step in the right direction and it can be successful if it effectively

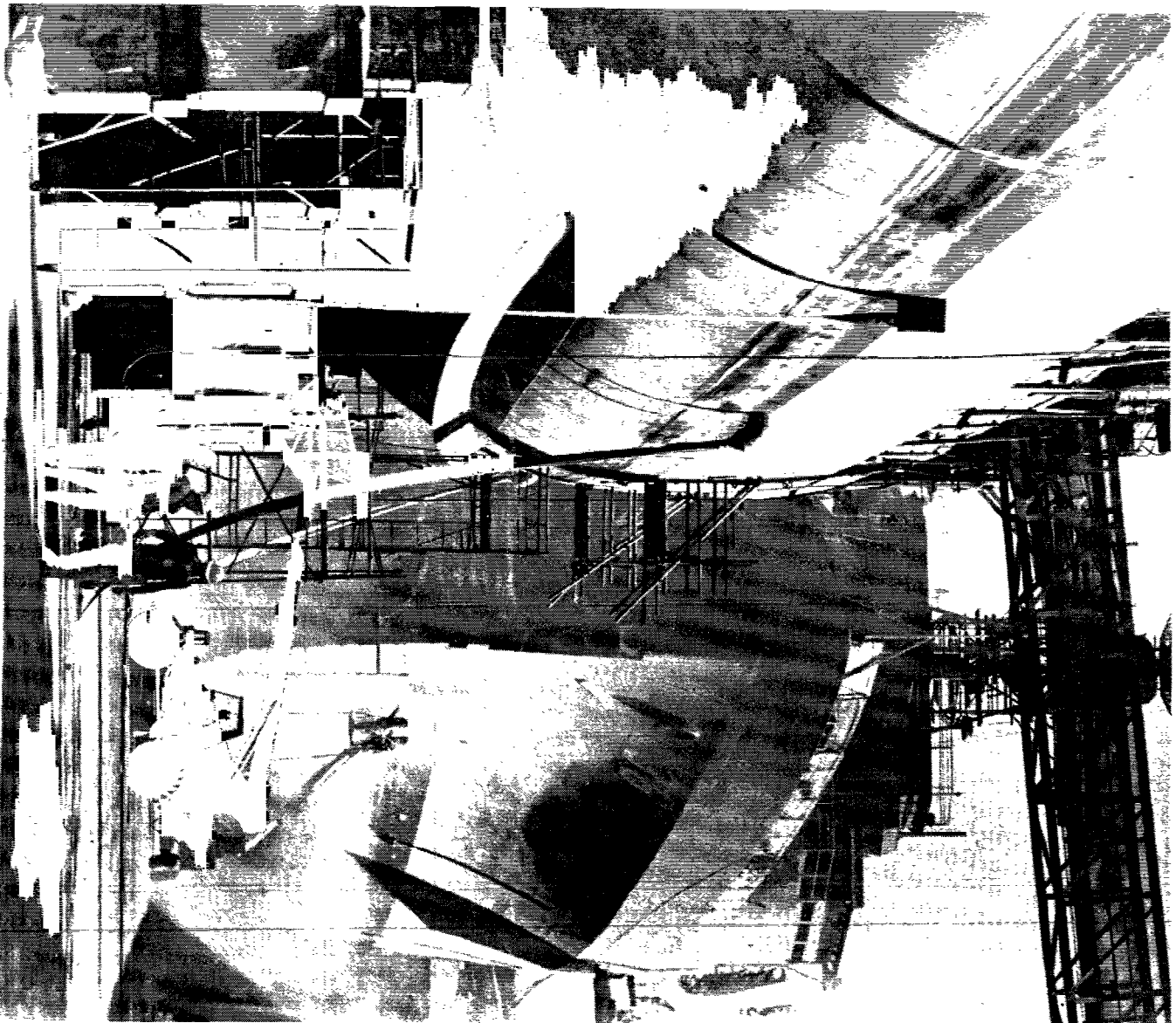
- provides for generating initiatives which are oriented to systemwide improvement objectives,
- commits the total overhaul system to supporting the initiatives, and
- assesses the results of initiatives and instigates actions, as appropriate, based on the findings.

Whether it will be successful remains to be seen.



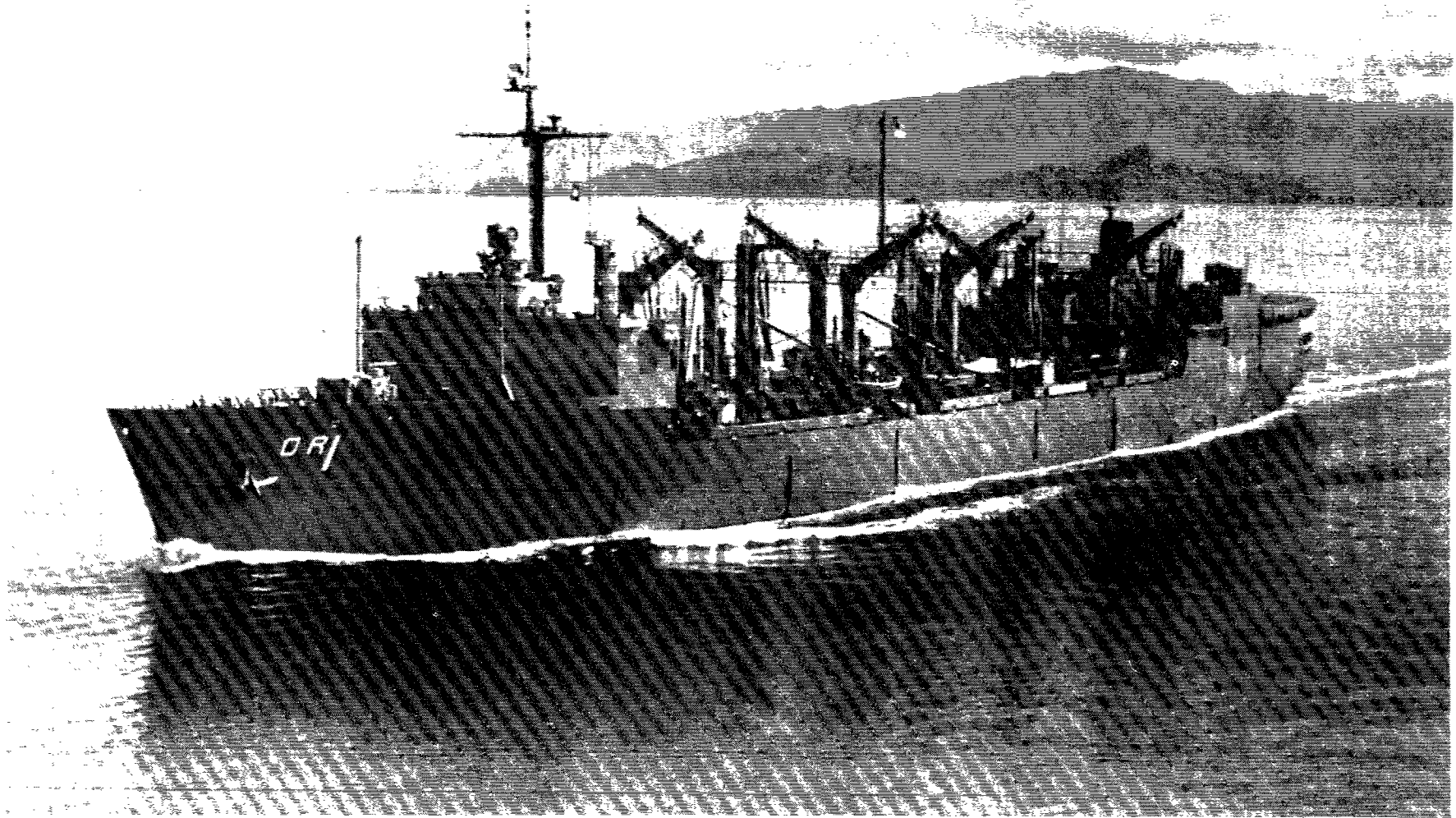
AGENCY COMMENTS

In early December 1981, we met with representatives of the Navy to discuss the report's contents. The Navy concurred with the above conclusion.



AMPHIBIOUS SHIP U.S.S. PENSACOLA IN DRYDOCK UNDERGOING SHIPYARD  
MAINTENANCE

SOURCE: U.S. NAVY



(PHOTO COURTESY OF THE U. S. NAVY)

THE REPLENISHMENT OILER U.S.S. WITCHITA, AOR-1.

## CHAPTER 3

### MORE CONCENTRATED MANAGEMENT

#### OF PRIVATE SECTOR OVERHAULS NEEDED

The Navy's planning and management system for contract overhauls is complex and fragmented, with responsibilities being distributed among various Navy organizations. Expertise regarding the material needs of a ship is dissipated, and no single entity appears to be responsible for managing maintenance resources toward sustaining a ship's material condition in accordance with design and mission requirements. This situation, we believe, seriously degrades the Navy's ability to achieve effective overhauls in the private sector.

In contrast to the Navy's overhaul system, MSC and commercial carriers generally rely on port and ship engineers to manage the planning and accomplishment of their ship maintenance and overhauls. We believe that if the Navy would similarly concentrate the management of ship material maintenance, it could significantly enhance its ability to achieve effective overhauls.

#### KEY MANAGEMENT ELEMENTS FOR EFFECTIVE OVERHAULS

If the Navy is to consistently achieve effective overhauls in the private sector, its overhaul planning and management system must have the following:

- An ongoing knowledge of each ship's design, characteristics, mission, and material condition.
- Knowledgeable planning and development of work packages.
- Timely decisionmaking regarding potential changes to the contract while the overhaul is underway.
- Knowledgeable inspection of the quality of the work.
- Effective cost control based on knowledge of the mission and the resources available to meet the material maintenance requirements.

#### EACH OVERHAUL HAS UNIQUE PROBLEMS

We reviewed overhaul contracts, cost growth contract changes, and reasons for delay and found that:

- The reasons for overhaul problems were diverse and generally unique for a given overhaul.
- An analysis of cost growth occurrences was inconclusive.

We did note, however, that the Navy's overhaul system seemed to lack the concentrated expertise and management responsibility necessary to ensure the key management ingredients.

#### THE NAVY'S SHIP OVERHAUL PROCESS IS COMPLEX AND FRAGMENTED

Managing a private sector overhaul involves identifying needed repairs and alterations, translating them into accurate and complete bid specifications, and monitoring the work to ensure a timely and cost-effective overhaul. The Navy's process is long (2-3 years) and complex, and it requires the interaction of numerous Navy organizations. These organizations include

- the Chief of Naval Operations;
- Commanders in Chief, Atlantic and Pacific Fleets;
- Commanders, Naval Surface Force, Atlantic and Pacific Fleets (Type Commander or TYCOM);
- NAVSEA;
- Supervisor of Shipbuilding, Conversion and Repair (SUPSHIP);
- Planning and Engineering for Repairs and Alterations (PERA);
- planning shipyards;
- the ship's crew; and
- other specialist organizations, including the Naval Electronics Command and the Naval Ship Weapon Systems Engineering Station.

Each organization has some authority and responsibility for assuring the adequacy of at least part of the ship overhaul process. (See app. II.)

#### COMPARISON OF NAVY AND NON-NAVY MAINTENANCE MANAGEMENT

MSC and commercial carriers use maintenance management approaches that are different from the Navy's traditional system. Commercial carriers and MSC concentrate maintenance responsibilities at the production level, making port and ship engineers responsible for the material condition of a specific ship(s) throughout the maintenance cycle.

## Differences in maintenance policies

Some of the different procedural approaches used by the Navy result from the difference in mission. Navy ships must be prepared to operate in a combat environment, requiring certain armaments, large crews, and equipment redundancy. To maintain combat readiness, the Navy has adopted an overall maintenance policy that requires periodic, extensive upgrading of ships and equipment--even those operating satisfactorily--to like-new condition.

During the lengthy overhauls, the Navy performs all outstanding repairs and major modifications that will ensure reasonably reliable material readiness during the succeeding operational cycle. In addition, it maintains and repairs ships, as needed, between overhauls.

In contrast, MSC and commercial carriers generally do not do major modifications, and they try to perform only those repairs needed to sustain operations, thus limiting ships' downtime. They generally use maintenance strategies that minimize the time ships spend in shipyards for maintenance and repairs. For example, their professional crews often make repairs while a ship is underway, or their contractors repair a ship at dockside during ship turnarounds. During their biennial overhauls, MSC and commercial carriers make

- repairs which cannot be accomplished as voyage repairs,
- inspections and repairs to meet U.S. Coast Guard and American Bureau of Shipping seaworthiness and safety standards,
- repairs and ship modifications to meet their safety and/or operating requirements.

## Planning for overhauls

The Navy spends an extensive amount of time, at considerable cost, in planning its overhauls. This planning process begins about 12 to 15 months 1/ before an overhaul starts and essentially ends some 2 to 6 months before an overhaul begins. In contrast, MSC and commercial carriers spend comparatively little time in planning their overhauls. Commercial carriers begin planning their work specifications packages, which include a small amount of repairs and a minor number of ship alterations, between 2 and 5 months before an overhaul starts. MSC begins planning its work specifications package about 2 months before work begins, and it requests bids on the package just 2 weeks before the work is scheduled to start.

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1/This is planning for repairs. Planning for modifications starts 18 to 22 months before the overhaul.

In addition to the port engineers, MSC and commercial carriers rely greatly on their ships' chief engineers to identify repairs. (See app. III for a detailed comparison of Navy, MSC, and commercial planning procedures.) Chief engineers generally have more experience than Navy ship engineers. Often, chief engineers have been assigned to the same ship or to a similar ship for 5 to 10 years, whereas Navy ship engineers may have been at their jobs for only a year or so.

MSC and commercial carriers have few individuals involved in the planning process and, apparently, plan their overhauls quickly. On the other hand, planning a Navy overhaul involves many organizations and includes a lengthy process of inspection coordination and review.

#### Overhaul management

Similar to its planning procedures, the Navy, when managing overhauls in process, involves many organizations or groups within the organizations. In contrast, MSC and commercial carriers essentially concentrate their overhaul management responsibility in a single individual--the port engineer. Consequently, they can accomplish overhauls in a more timely manner without experiencing as many delays and disruptions caused by untimely decisions.

A comparison of the management responsibilities for the Navy, MSC, and commercial carriers during the overhaul process is shown in the following chart.

Delegation of Overhaul Management Responsibilities

<u>Function</u>	<u>Navy</u>	<u>MSC</u>	<u>Commercial carriers</u>
Quality control	SUPSHIP Quality Control Dept.	Port engineer	Port engineer
Approval of contract growth or new work	SUPSHIP <u>a</u> /TYCOM NAVSEA	<u>b</u> /Port engineer	<u>b</u> /Port engineer
Negotiation of contract change order price	SUPSHIP Contracts Dept.	Port engineer/ MSC Contracts Dept.	Port engineer
Issuance of contractual change order document	SUPSHIP Overhaul Supervisor or Con- tracts Dept.	Port engineer	Port engineer

a/Some decisions must be made by yet higher commands.

b/May require verbal approval from management if the estimated cost exceeds a specified amount.

MSC and commercial port engineers can obtain approval, if required, from higher levels of management within hours so as not to delay the progress of a contractor. However, Navy officials said it may take weeks to obtain approval from a higher echelon to have the contractor perform additional work. Depending on the circumstances, Navy procedures could result in contractor claims for delay and disruption.

THE NAVY NEEDS MORE EXPERIENCED  
MAINTENANCE MANAGEMENT

An analysis of the Navy's overhaul system and a comparison of the system with the systems used elsewhere revealed serious voids in the Navy's system. These voids can significantly inhibit the Navy from achieving the management ingredients essential for fostering effective overhauls. Basically, the Navy has a shortfall in ongoing technical expertise for each ship and lacks central managerial responsibility for each overhaul.

Shortfall in technical expertise

As discussed on page 17, MSC and commercial carriers concentrate expertise in a port engineer and a ship engineer that have worked with their ships for many years. In contrast, the Navy's



ship engineer is military and is assigned for a limited tour of duty. Further, the Navy does not use a port engineer as a standard practice. Then, the question: Where does the level of ship expertise provided by port and ship engineers in MSC and commercial enterprise lie in the Navy?

Granted there are differences in the types of ships. In comparison to MSC and commercial carrier ships, Navy ships are more complex, the missions are more involved, and the maintenance system is more diverse. Therefore, there appears to be a need for even more intensive expertise with Navy ships.

Who has technical expertise and knowledge of a Navy ship's design, mission requirements, and ongoing material condition? Key involved activities are the ship's crew, PERA, TYCOM, SUPSHIP, and the design planning yard.

MSC and commercial carriers use port and ship engineers, in addition to generally experienced crews, to keep the ships in satisfactory operating condition. Navy crews, however, are less experienced with their ships because of rotation and retention and because they face more complex and demanding maintenance. Therefore, Navy crews are not likely to fill the expertise requirement.

The Navy recognized this problem when it established PERAs in 1967 to manage the planning and engineering requirements for overhauls. PERAs, however, are not in a position to provide the expertise either because they are generally overhaul oriented. At the beginning of an overhaul cycle, the applicable PERA assesses a ship's material condition, and this assessment becomes the basis for the overhaul work package. Besides the deficiencies identified in a PERA preoverhaul test and inspection, the crew inputs repair notices, and other organizations input alteration requirements. The PERA's involvement with a given ship is generally not continuous and is often not direct. For example, PERA often uses contractors or a SUSPHIP organization to perform inspections. Accordingly, it is not in a position to know whether the inspection uncovered all discoverable requirements or whether the input from other activities is complete.

TYCOM generally is concerned with matching a work package with available fiscal resources. It screens the PERA's preliminary work package and either approves the requirements, assigns them to other Navy maintenance activities, or defers them. TYCOM generally cannot provide the ongoing expertise for a given ship because the responsible official (1) is military and is assigned on a rotational basis, (2) manages a class of ships rather than an individual ship, and (3) relies on input from the crew and PERA.

SUPSHIPS also have limited visibility over the ongoing material condition of a ship. A planning SUPSHIP prepares work specifications for the items included in the PERA's work package,

and an administering SUPSHIP, which may be a different entity, administers the contract. Neither has an ongoing relationship with a given ship and therefore cannot provide the expertise.

The design planning yard is concerned with designing alterations for a given ship. It may lack access to a given ship, and designs may be based on a similar available ship. Thus, its expertise with a given ship is limited.

On the basis of the above, none of the organizations appear to have the ongoing expertise of a given ship.

#### Who's in charge?

Since different organizations are responsible for various overhaul management functions, the questions arise:--Who's in charge?--Who has the knowledge, visibility, and the authority to manage the overhaul process for a given ship to ensure that the overhaul is effective?

A 1973 report 1/ prepared for the Navy addressed this issue and made the following comments:

"In the Navy there are many organizations with significant roles in the planning of overhauls \* \* \*. The roles are nominally advisory, in many cases, but the fact appears to be that there is a tendency for each participant to recommend that something be done, whereas there is an obvious reluctance to override advice which indicates that repairs should be carried out. The decision-makers involved have no incentive to save money if the money is available, but have strong incentives not to take even the negligible risks that may be associated with failure to make a recommended repair. Unlike commercial and MSC port engineers, there is little opportunity for Navy personnel to develop the knowledge of, and familiarity with, the particular ships for which they make overhaul decisions."

\* \* \* \* \*

"It is recommended that the Navy's overhaul planning process be redesigned, utilizing an organization, rules and procedures similar to those which characterize MSC and commercial operations. The redesigned system would be very much simpler than the current Navy system, and would use less resources--time and people--for planning overhauls."

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1/"A Demonstration of an Approach to Improvement of Ship Overhaul and Maintenance," Cooper and Company, July 3, 1973.

Apparently little action was taken on the 1973 recommendation because the Department of the Navy issued a June 1980 report entitled "Logistic Support of U.S. Navy Ships in the Northeastern Region of the United States," which addressed the same types of problems in the Navy's overhaul planning and management system. With respect to the management process itself, the report cited the following observations:

"\* \* \* The current overhaul management process is fragmented. There is no single organization below the Chief of Naval Operations staff which bears the total responsibility for, and authority over, the entire overhaul process. No single individual is responsible for implementation of overhaul policies which cut across organizational boundaries. No single individual is responsible for the total funding, planning and execution of a given overhaul. Consequently, independent decisions are sometimes made without a full appreciation for their impact on the conduct of the overhaul as a whole. Accordingly, overhaul management coordination should be improved."

The report recommended that the Chief of Naval Operations, in conjunction with other commands responsible for the ship overhaul management process, assess ways and means of improving overhaul management coordination which will achieve the benefits of centralized overhaul control.

The Pacific Fleet TYCOM later advised NAVSEA that "The fragmentation of pre-overhaul responsibilities is not conducive to a successful overhaul \* \* \*," and that the best procedures for transferring completed work from one organization to another would not compensate for the disadvantages caused by the fragmentation. Pacific TYCOM believed that a concentration of responsibilities, combined with the use of multiship, multiyear contracts, would reduce the time needed for ship repairs and alterations during the 1980s.

#### Illustrations of shortfalls in expertise and management

The following overhaul occurrences illustrate problems that result from shortfalls in ship expertise and from fragmented management.

--Extensive rework was required on a communications equipment alteration on the U.S.S. Coronado because (1) NAVSEA provided inadequate information for the alteration design, (2) the private design firm did not make appropriate ship visits to check its drawings, and (3) the Navy's planning shipyard did not adequately review and supervise the design firm's work. As a result, the cost of this alteration was expected to increase by about \$2 million and the overhaul was extended 5 months.

- During the 1978 overhaul of the U.S.S. Haleakala, three alterations to upgrade the underway replenishment capability were accomplished. Prior to the Haleakala overhaul, these alterations had been programed for accomplishment during the 1977 overhaul of a similar ship. Although these alterations were in existence and had been programed for other ships of the class, only one of these alterations was included in the advanced planning for the Haleakala overhaul. The late addition of the other alterations increased the contract price by about \$251,000.
- The U.S.S. Wabash's crew, apparently dissatisfied with the overhaul work package, submitted 68 new work requests to TYCOM at the start of the overhaul. The crew had failed to express this dissatisfaction at a work definition conference held onboard the ship or at any other time prior to the overhaul. During the overhaul, the crew submitted 29 additional work requests. TYCOM approved 64 of the 97 work requests. The estimated cost of accomplishing these new work items was at least \$435,000. Furthermore, this additional work delayed the overhaul 58 days.
- In planning the 1978 overhaul of the U.S.S. Haleakala, NAVSEA failed to cancel a radar alteration with TYCOM. Since the ship's radar was considered outdated, TYCOM reinstated the alteration. Meanwhile, SUPSHIP was planning an alteration involving the radar's antenna. Due to ineffective coordination between the organizations, the radar antenna was placed in the wrong position. The resulting operational deficiency was corrected, subsequent to overhaul completion, at a cost of about \$14,500.
- In planning the U.S.S. Hector's overhaul, drawings for shop arrangement alterations did not adequately define the work. Examples of the errors included (1) machinery being placed where operation would be impossible and (2) equipment being installed in spaces too small to accommodate them. The planning shipyard denied any responsibility. A subsequent meeting of all concerned organizations also proved insufficient. These design problems contributed to about \$548,000 of growth and new work on shop alterations.
- Ineffective coordination of design problems for a contaminated waste holding system alteration created problems on several ship overhauls. Design deficiencies corrected during the overhaul of the U.S.S. Flint were not coordinated in planning the alteration for the U.S.S. Kiska, overhauled 5 months later. These design deficiencies resulted in structural damage to the Kiska. Additional repairs and alteration modifications increased costs about \$165,000 and extended the overhaul 29 days.

--In a related situation, the 1979 overhaul of three amphibious ships, started within 5 months of each other, had cost growth totaling \$325,000 due to design changes in the contaminated waste holding system alteration. Following completion of these overhauls, PERA stated:

"The lessons learned from this overhaul should be incorporated into the corporate knowledge of those organizations involved with the overhaul process so that these costly lessons will not have to be relearned."

#### Problems obtaining timely decisions

Diffused management of the planning and accomplishment of ship overhauls can result in untimely decisions, thereby increasing the length and cost of overhauls. Although PERA and SUPSHIP are responsible for planning and managing the overhaul, their decisionmaking authority is limited. As a result, decisions cannot be made immediately at a worksite, and generally must be sought from higher command levels, a process which sometimes takes several weeks.

Representatives from private shipyards said that the Navy is organized in such a way that timely decisions by knowledgeable individuals are not possible. Some changes to a contract take 3 to 4 weeks to get approved; however, a much quicker decision is necessary to avoid delay.

During a hearing of the House Committee on Armed Services in April 1981, representatives from the private sector also said:

"\* \* \*quite often the work on the original item, or items stops completely until an answer is given to a condition report or letter in the form of a formal change. When answers to the problems take weeks, it is very difficult to maintain reasonable progress towards a timely completion."

\* \* \* \* \*

"\* \* \*every decision to authorize over \$5,000 for a contract change is considered by four or more individuals in several agencies of the Navy. By the time this decisionmaking process is completed, months have often transpired. Since overhaul availabilities average eight months during which almost one thousand contract changes are written, the delaying effect of this is obvious. In today's environment, the final decision on these \$5,000 changes is usually made by the SURFLANT Surface Ship Atlantic ship Type Commander who sometimes goes for months without visiting the shipyard."

The President of the Shipbuilders Council of America, in commenting on the Navy's overhaul management, also testified that:

"\* \* \*debilitating of all is the cumbersome decisionmaking process. Procurement law prevents the authorization of work to the private shipyards unless funding is specifically assigned and an audit trail justifies that assignment. Additional but necessary work not detailed in the original job order is frequently discovered by the shipyard during the course of an overhaul. Before this necessary work can be done, a report must be filed with the Supervisor of Shipbuilding who in turn must consult with the Type Commander at Fleet Headquarters to determine if funding can be made available. The process can sometimes take weeks, even months. Such action does not permit our shipyards to make the most efficient use of their resources."

Navy officials generally agreed with the above comments, stating that it may take weeks for PERAS or SUPSHIPS to obtain approval for additional work from higher echelons.

Need to concentrate expertise  
and assign management responsibility

Recognizing that the Navy has a shortfall in concentrated on-going expertise for each ship and lacks central managerial responsibility for an overhaul, there follows such questions as:

- Who can ensure that work specifications packages are complete and accurate?
- Who is in a position to make timely and informed decisions on proposed changes to contracts?
- Who can assure that work is of a required quality?
- Who has sufficient visibility to provide reliable feedback on a ship's overhaul?
- Who has the knowledge to put maintenance requirements into the perspective of a ship's total maintenance program and to control costs by including in the work specifications package only work that must be done by a shipyard?

These are some of the key issues the Navy must deal with if it is to consistently achieve effective overhauls.

In our opinion, if the Navy is to effectively deal with these issues, it needs to establish concentrated expertise and assign management responsibility similar to the port engineer and ship engineer structure used in private industry. According to top level Navy officials, such concentrated expertise is a luxury the Navy currently cannot fully implement because of personnel ceilings. However, they concurred that it may significantly enhance the effectiveness of ship overhauls.

In fact, the Navy has implemented a port engineer concept with its Atlantic Fleet's combat stores ships. It instigated the concept as a result of a congressional mandate subsequent to our report, "The Navy Overhaul Policy--A Costly Means Of Insuring Readiness For Support Ships" (LCD-78-434, Dec. 27, 1978). This report described the differences between commercial and Navy overhaul activities and pointed out how commercial enterprise concentrates expertise in ship and port engineers for each ship.

#### TESTING THE PORT ENGINEER CONCEPT

The Navy recognizes that a key difference between commercial/ MSC and Navy overhaul planning and execution lies in the centralization of responsibility and authority in a port engineer. As a result, the Navy is in the process of testing the utilization of port engineers as part of its phased maintenance program (see app. I). If the test program proves successful, it believes the concept could be responsible for significant benefits to its overhaul management program.

#### Program expectations

As part of the phased maintenance program for combat stores ships of the Atlantic Fleet, the Navy is trying to parallel the commercial/ MSC port engineer concept in its planning and management of ship overhauls. Initially, the engineer's duties are expected to fall short of the full range of functions provided by commercial and MSC port engineers. The Navy expects the mix of authority and responsibility to evolve over time so that the proper organizational and jurisdictional interfaces will connect the port engineer, TYCOM, and the other organizations in the overhaul process.

As TYCOM's representative, the port engineer is expected to:

- Evaluate (i.e., defer, modify, or approve) work requests from ships and assign the work.
- Supervise the work planning process to ensure that repairs are specified properly.
- Work closely with SUPSHIP during negotiations, contracting, and administration of the contract.
- In conjunction with SUPSHIP's Quality Assurance personnel and the ships' crews, verify that work is done properly.
- Evaluate and resolve (i.e., defer, modify, or accomplish) all change orders.
- Coordinate advance planning of overhaul dates, including acting as TYCOM's sole-contact point for work definition

and authorization. (TYCOM's maintenance staff will continue to coordinate long-range planning and schedule events, ship alteration packages, special reports, etc.)

- Make recommendations to TYCOM, as appropriate, and provide data for budgeting and planning.
- Maintain records of the material condition of assigned ships to facilitate maintenance planning and accomplishment.

#### Anticipated benefits

The Navy expects to gain the following benefits from establishing the port engineer concept:

- Lower overhaul costs through cost-effective repair decisions, with concurrent improvement in maintenance of ship material condition.
- A "central authority" for continuity of management and engineering judgment.
- A single control of repair authorizations and expenditure decisions, which should result in more timely and efficient work performance.

#### Progress to date

The initial program test began in 1980, with the hiring of two port engineers by the Atlantic TYCOM for surface ships. These Norfolk-based engineers have been assigned maintenance responsibility for the combat stores ships under the phased maintenance program. The Navy intends to evaluate the program for the first time in mid-1982.

While the Navy is currently applying this concept to only a few specific ships on the east coast, it plans to hire two additional port engineers in 1983. One of these will be a senior port engineer who will be in charge of the overall program. The Navy anticipates expanding the program to other ship types in both the Atlantic and Pacific Fleets.

Although the concept is not yet in use in the Pacific Fleet, it has been authorized and is being developed. However, the Pacific TYCOM for surface ships envisions that using the port engineer will provide little change from its present management procedures. For the past several years, Pacific TYCOM used onsite representatives as its eyes and ears during the overhaul. Although these representatives have had little authority, they have expedited SUPSHIP, TYCOM, and contractor communications.



### Test limitations

Despite the Navy's test and its generally positive attitude toward the port engineer concept, there are conditions which can delay or forestall the concept's widespread implementation. For example:

- The concept is being tested with only combat stores ships.
- The port engineer's duties in the test are being assigned in an evolutionary process.
- The concept is being tested as one element in a test of various commercial concepts (see app. I).

As a result, the timing and ultimate scope of port engineer application are uncertain.

### CONCLUSIONS

The Navy's system for managing ship overhauls is fragmented. As a result, expertise on each ship is dissipated among the various entities, and no one appears to be orchestrating the conduct of each overhaul. Under this method of operation, it is difficult for the Navy to provide for key management functions which are essential for consistently ensuring effective overhauls.

If the Navy will concentrate expertise and material maintenance management for each ship similar to MSC and commercial enterprise practices, it has an excellent potential for improving the effectiveness of its ship overhauls.

The Navy has implemented such commercial practices with combat stores ships. This, however, is in the form of a test and the extent of ultimate implementation remains to be seen.

We believe that the need to improve Navy ship overhauls demands more timely action. The problem with fragmented overhaul management is evident and, therefore, we believe more immediate action is warranted.

### RECOMMENDATION

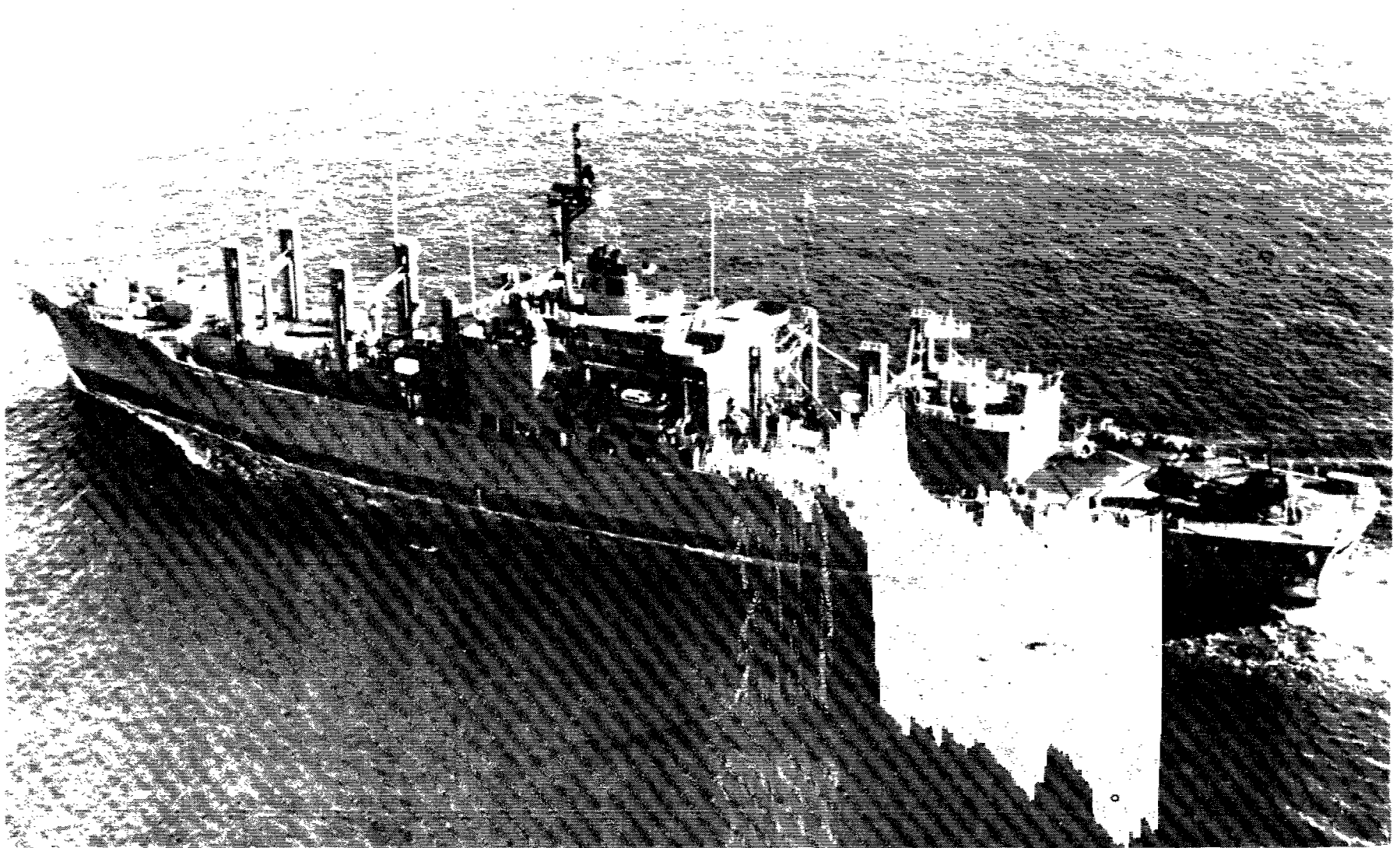
We recommend that the Secretary of Defense direct the Navy to intensify ship maintenance management by concentrating ship maintenance expertise and overhaul responsibilities in managers similar to port engineers. Their responsibilities should include:

- Developing and sustaining technical expertise and knowledge of a ship's characteristics, design, and ongoing material condition.

- Making decisions on the scope and need for overhaul contract changes to sustain overhaul cost effectiveness.
- Managing the planning and development of cost-effective overhaul work packages.
- Providing feedback on problems encountered during overhauls and explaining variances from effective overhauls and lessons learned for future consideration.

#### AGENCY COMMENTS

The Navy agreed in concept with the conclusions and recommendations in this chapter and stipulated that the use of additional civilian managers on the TYCOM staff who work specifically and closely with a limited number of similar ships would provide a level of management, continuity, and expertise which does not now exist. Furthermore, the Navy generally agreed with the technical responsibilities of a port engineer and stated that it is moving as rapidly as practical with implementation of the port engineer concept.



(PHOTO COURTESY OF THE U. S. NAVY)

THE U.S.S. SYLVANIA (AFS-2). THE MISSION OF THIS COMBAT STORES SHIP IS TO CARRY FOOD, REPAIR PARTS, AND OTHER SUPPLIES TO SHIPS OF THE FLEET.

## CHAPTER 4

### IMPROVING THE NAVY'S

#### OVERHAUL PROCUREMENT PROCESSES

Procurement by the Government through the use of formal advertisement is the preferred Government contracting method. To be used effectively, however, formal advertising requires that purchasers accurately define what is being procured.

The Navy has traditionally used formal advertising to obtain competitive bids for a firm fixed price overhaul contract. Award of the contract is made to the lowest qualified bidder. Because it has been unable to effectively identify and define the work to be done, however, its traditional use of formal advertisement to obtain bids may, in fact, inhibit the effectiveness of the overhaul. This is because inadequate work definition results in extensive changes to the contract after the overhaul is underway. These changes are costly under firm fixed price contracts because:

- The contracts are priced based on sole-source negotiation when the Navy is at a negotiating disadvantage. The Navy lacks sufficient contractor cost information and is under time pressure to complete the overhaul.
- Delay and disruption costs accrue to the contractor, while the Navy decides on contract changes. The contractor must recoup such costs in the price of the change.

Additionally, contract changes can delay the completion of the overhaul and this ultimately influences the readiness of the fleet.

The recurrence of extensive contract changes nullifies the benefits of formal advertising for competition and renders the original bids irrelevant. This, in turn, limits the Navy's ability to select the shipyard which can perform the most effective overhaul in terms of timeliness, cost, and quality. Less capable contractors can bid inordinately low to gain the contract knowing that they may recoup losses and make profits from the extensive changes which have become characteristic of Navy overhaul contracting. Ultimately, the Navy may have to pay more for a less quality overhaul than it perhaps would have if it had awarded the contract to a higher bidder.

If the Navy achieves the overhaul management and work package development process improvements discussed in chapter 3, it will have moved significantly closer to attaining the benefits of formal advertising. We believe, however, that this is not enough. Regular use of additional or alternative contracting techniques may further foster improved overhauls. These techniques include using request for proposal, and multiship award contracting.

THE NAVY'S TRADITIONAL USE  
OF FORMAL ADVERTISING

Traditionally, the Navy has solicited bids on overhaul packages from qualified contractors within a competitive area. <sup>1/</sup> A qualified contractor is one that has a master ship repair contract, which is awarded after the Navy has appraised and approved the adequacy of the contractor's management, labor, and facilities for doing Navy work.

Before awarding a contract, the Navy generally performs a preaward survey to determine whether contractors can effectively accomplish a specific overhaul. The extent of the survey is influenced by the previous work done by the contractors for the Navy. The Navy publicly opens sealed bids from the qualified contractors, performs the necessary preaward survey, and awards the contract to the lowest responsible bidder, using a fixed price contract.

Lowest bidder may not  
be effective

Despite a Navy preaward survey to qualify a shipyard for the award, the lowest qualified bidder may not be able to perform an effective overhaul. The Navy finds it difficult under formally advertised procurement to eliminate a marginal shipyard from consideration. A disqualification can result in litigation which can delay the overhaul and disrupt the schedule. Furthermore, even after a significantly less than effective overhaul, the Navy may not be able to eliminate the shipyard from the next award because the Navy may have contributed to the problems with its numerous contract changes.

Another problem is that the more competent shipyards tend to submit more realistic bids. The marginal shipyards may bid low to obtain the contract with the intent of making up any loss with contract changes. As a result, the original contract award price may be meaningless because of the contract changes. Ultimately, the Navy may pay more to the low bidder and get a less effective overhaul.

OUR PAST CRITICISM OF PROCUREMENT  
BY FORMAL ADVERTISING

In 1959, and again in 1970, we questioned the Navy's use of formal advertising to procure ship repair and overhaul services.

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<sup>1/</sup>A competitive area is a geographical area in relation to a ship's home port in which there are sufficient shipyards to provide competition.

Both reports 1/ described the Navy's difficulties in providing complete and accurate work specifications--a prerequisite for formal advertised or bid contracting. The lack of complete and accurate work specifications resulted in a large amount of contract growth, either in the extent of work to be done or increased price. This growth was added to the contract through sole-source negotiated change orders which had a tendency to dilute, if not eliminate, the advantages normally attributed to formal advertising.

Then, in December 1976, we issued a report, "Contracting For Navy Ship Repairs and Overhaul--Need For Changes," (PSAD-77-47). This report pointed out that the Navy relies on formal advertising of contracts to assure that the prices for repair and overhaul of its ships are fair and reasonable, but such reliance may be imprudent. We stated that, because of the Navy's inability to minimize changes to the contracts, it generally loses any benefits that may have been obtained through the initial competition. We also stated that the Navy is at a disadvantage when negotiating prices for modifications.

#### ELEMENTS OF AN EFFECTIVE OVERHAUL CONTRACTING METHODOLOGY

If the Navy is to assure that its contracting methodology promotes effective overhauls, we believe the methodology should address, to the extent consistent with maximizing competition, the following key issues:

- Developing expertise in the private sector by concentrating classes of ships at fewer shipyards.
- Sustaining workloads at shipyards to minimize work force turbulence.
- Awarding overhaul contracts with sufficient leadtime to enable the contractor to obtain the required resources.
- Providing the Navy visibility over costs to enable it to negotiate prices without being at a disadvantage.
- Involving the contractor in the overhaul planning process to (1) draw on its expertise, (2) foster early agreement on the work, and (3) establish more of a partnership arrangement.

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1/"Review of Ship Overhaul Contracting Activities Administered by Industrial Managers, Bureau of Ships, Department of the Navy" (B-133170, June 8, 1959) and "Weaknesses in Award and Pricing of Ship Overhaul Contracts, Department of the Navy" (B-133170, Mar. 19, 1970).

--Providing the contractor with an incentive for completing an effective overhaul.

### SHORTFALLS IN THE EXISTING METHODOLOGY

Comparing the elements of an effective overhaul contracting methodology with the existing methodology used by the Navy reveals that the current method has shortfalls.

#### Private sector expertise is dissipated

There are 193 U.S. commercial firms that hold master ship repair contracts which enable the firms to compete for shipwork. Of these firms, 58 were performing maintenance work on Navy ships during April 1981 and 43 yards had completed overhauls on Navy ships during the past 2 years.

Also, during the 3-year period ending 1980, private industry performed overhauls on 30 different classes of amphibious and auxiliary ships, destroyers, and frigates. Furthermore, in the future, the Navy anticipates having the private sector to overhaul more complex ships.

Under formal advertising, a given shipyard may obtain contracts on various classes of ships. The first time a contractor overhauls a class of ship, it lacks experience and there may be a resulting loss of overhaul effectiveness. Later, the contractor may be able to apply the expertise to the next ship to improve overhaul effectiveness, but if it is a different class of ship, the educational process must start over. The cost, again, may be loss of effectiveness. Although this learning factor should be revealed in the bids offered, this does not always occur in situations where a contractor submits an unrealistically low bid in an attempt to win the contract.

Because a contractor does well with one class of ship does not ensure similar success with another class of ship. For example, in 1980 a contractor which had an excellent record with tank landing ships was awarded the contract to overhaul a complex dock landing ship. The Navy terminated the contract early and had a public shipyard complete the overhaul because the contractor apparently could not effectively complete the overhaul.

In our opinion, the effectiveness of overhauls can be enhanced by building contractor expertise through specialization on individual classes of ships.

#### Inconsistent workload

Under the traditional competitive bidding method, private shipyards have little opportunity to anticipate, let alone achieve, a steady flow of work. Failure to win a contract could mean labor

cutbacks by an enterprise. Then, when a contract is obtained, labor must be rehired and trained. Such workload fluctuations can decrease a contractor's overhaul efficiency because of the more frequent shut-down and startup costs. These costs must ultimately be passed on to the customer--the Navy, in this case.

According to an industry representative, declines in the level of ship repairs and construction have resulted in more qualified shipyards pursuing fewer contracts. This condition can intensify workload fluctuations for shipyards throughout the industry.

The use of multiship awards may provide more consistent workloads to private shipyards and there is a potential for savings from improved plant efficiency.

Contract award leadtime  
inhibits overhaul effectiveness

Overhaul contracting by the Navy has an inherent conflict between awarding the contract early enough to provide sufficient time for contractor preparation and awarding it as close to the overhaul start as possible to provide the most complete work package. Both the Navy and contractors prefer an early award.

The Navy wants to improve crew morale and retention by awarding the contracts early so that crews can arrange for their time ashore. The Navy would like to make the award 120 to 180 days before an overhaul.

Contractors would like a long leadtime to marshall their resources for the overhaul. For example, a major contractor stated:

"\* \* \* the interval between contract award and arrival of a ship in the shipyard has a great impact on the quality achieved and the ultimate delivery date."

\* \* \* \* \*

"\* \* \* While we would ideally have 180 days, the lead time actually provided (125 days) was adequate to permit the shipyard to acquire necessary technical documents, complete indepth pre-arrival planning and place purchase orders for a bulk of the required material. When these activities can be accomplished in an orderly manner before the ship arrives, the overhaul commences very efficiently and the probability of success is far greater than when the lead time is squeezed and there is simply not sufficient time to make adequate preparations before the ship arrives."

On the other hand, an early award results in more uncertainty in the work package and this in turn contributes to contract cost growth to cover newly emerging requirements.



One method for dealing with this apparent conflict is a multiship award (see p. 40) for a sequence of ships. Under such an award, overhauls following the initial overhaul could benefit from the relatively early award, while the work package could be finalized shortly before the ship enters the overhaul process.

#### Insufficient visibility over costs

A characteristic of a formally advertised firm fixed price contract for Navy ship overhauls is that the bidders are not required to provide cost data. Essentially, each contractor submits a single total price to perform the total overhaul work package. Without knowledge of the costs of the individual work elements within the package, the Navy is at a disadvantage in negotiating the prices for the hundreds of contract changes that can be generated during an overhaul. For example:

- When a work element is removed from the contract, the Navy is uncertain as to how much the contract price should be reduced. It knows neither how much of the total price applies to the element nor what costs the contractor has incurred in preparing to do the work.
- When a work element is partially changed, the Navy is uncertain as to what the new price should be because it does not know the price of the portion that was changed.

#### Adverse relationships with contractors

While there is much to be gained from a cooperative atmosphere between the Navy and contractors, formally advertised contracts may foster an adverse relationship. During the April 1981 Committee on Armed Services hearings, a major ship overhaul contractor testified as follows:

"I can assure you from first-hand experience that no day goes by in my shipyard or any other, without offering at least one contractual basis for delay.

If shipyard management is inclined, for any reason, to take advantage of this situation, the Navy is and always will be ineffective in preventing it."

\* \* \* \* \*

"The use of advertised bid on projects where initial price is of minor importance is short sighted. The loss of an urgently needed ship for 6 months while delayed in overhaul makes the up-front savings pale in significance."

The ship repair industry has become increasingly competitive due to declining workloads. Allegedly, some contractors bid inordinately low, sometimes below cost, to obtain an award knowing that they can recoup losses and make a profit from contract changes. Under such conditions, an atmosphere of distrust between the contracting parties surrounds the overhaul and must negatively affect the overhaul's effectiveness. On the one hand, the contractor can contend that the Navy is ineffective in providing accurate and complete work specifications in the bid package. On the other hand, the Navy can contend that no work specification can be developed that is beyond a smart contractor's ability to generate a contract change.

Regarding the relationship between contractors and the Navy, another major contractor testified:

"This (the relationship) is an area which requires the finesse and balance of a tight rope walker to be sure that all parties understand that it takes all \* \* \* of them acting as a team to keep the overhaul progressing to a smooth completion. Once the balance is broken and any of the players fails to carry his share of the burden then chaos often results."

If the Navy would use contracting methods which foster more of a partnership arrangement with a contractor, it could improve overhaul effectiveness. For example, the Navy could draw from contractor expertise when identifying requirements and planning the work specifications package. And by doing so, an agreement could be reached earlier than usual on the scope and details of the overhaul, and this may preclude contract changes and delays during the overhaul.

As another contractor testified:

"There is no substitute for operating on a cooperative basis with the Navy. Adversarial relationships only contribute to and compound what is already a difficult and complex task."

#### Navy contracts lack incentives

Another characteristic of Navy contracts is the lack of an incentive for a contractor to perform an effective overhaul. There is virtually no reward for good performance and, except in extreme cases, little, if any, penalty exists for marginal or poor performance. As a major contractor testified:

"In today's overhaul contracting environment, shipyards which have reacted to overhaul problems by taking advantage of them rather than resolving them are treated with impunity at the time the next overhaul proposal is being solicited."

In contrast, MSC includes a damages clause in its contracts wherein the contractor must pay for delays, and commercial carriers can take their business elsewhere if they get poor work from a shipyard. A question to ponder is: When shipyards are working on both Navy and non-Navy ships, who would get priority on the use of limited resources?

According to Navy officials, using monetary damages or rewards under the ongoing contracting method for overhauls is difficult and would probably be ineffective because:

- Losses in readiness due to delays are difficult to quantify in terms of dollars.
- Perceived Navy culpability in contributing to delays would significantly limit the Navy's ability to measure penalties or rewards.

Non-Navy shippers, on the other hand, lose revenue when ships are out of service; therefore, they can estimate dollar losses from overhaul delays.

#### NAVY USE OF OTHER CONTRACTING TECHNIQUES

The Navy recognizes that it needs to improve on the traditional contracting method, and it has implemented negotiated procurements using requests for proposals, an alternative to formal advertising. Additionally, the Navy has experimented with numerous other methods.

#### Requests for proposal

The request for the proposal method requires a contractor to submit a proposal for evaluation. This proposal explains how the contractor plans to technically and administratively manage the contract and contains a price offer. After the Navy reviews proposals and, if necessary, discusses any ambiguities with the contractors, awards are made on the basis of a combination of price and other factors.

The Navy believes the request for proposal method will enable it to more effectively eliminate (1) marginal shipyards from selection and (2) shipyards with unacceptable proposals from further consideration, thereby improving the chances for an effective overhaul. There is, however, some resistance from the ship repair industry over use of this method. According to an industry representative, some shipyards are unhappy about the administrative burden of preparing proposals. Furthermore, to be in contention for contracts, the marginal shipyards may hire professionals to write the proposals. When this occurs, the proposal method may result in a significant amount of effort being expended with questionable payoff. The Navy, however, believes that even with professionally written proposals, the proposals will still reveal when shipyards can not effectively perform overhauls.

## Navy experiments with other contracting techniques

The Navy has experimented with various contracting techniques to improve overhaul effectiveness. For example, it has used the following:

- A multiship award grouped several ships of the same class to be overhauled under one contract. This was intended to produce better overhauls at a lower cost by reducing training time, design and planning costs, material acquisition costs, and the extent of Navy supervision.
- A 90-day award interval was instituted to remedy problems of allowing ship crews enough advance warning to make arrangements for their families, and give contractors adequate time to plan overhauls and procure needed materials.
- A milestone incentive clause was used, whereby the contractor was given a bonus for meeting milestones.
- A planning with incentive technique was used, which provided the contractor with a bonus for meeting milestones and also involved the contractor with the planning phase.
- A performance incentive was used, wherein the contractor received bonuses during the overhaul for the quality of work and schedule adherence.
- A planning contract was used, wherein the contractor did the planning for the overhaul, as well as the actual overhaul.
- A modified planning approach was used, wherein the Navy provided the initial work package to the contractor for correction and updating prior to the start of the overhaul.
- A multiship, phased maintenance contract (see app. I).

## PROMISING CONTRACTING TECHNIQUES

Some promising contracting techniques involve alternative bids and multiship awards.

### Alternative bids

It is virtually impossible to formulate a work package that includes every overhaul requirement at the time of the contract award. New requirements arise after the award is made and, in some cases, the extent of the work may not be identifiable until after the overhaul begins. For example, the ship's boilers may not be available for internal inspection until the ship arrives for the overhaul.

One way to meet this problem is the use of alternative bids, wherein there is a basic bid plus incremental amounts for additive anticipated work. For example, boilers contain a multitude of tubes which are subject to periodic replacement. A bid could be for a price to replace a minimum estimated requirement, plus the price to replace each tube or increments of tubes, beyond the basic amount. The advantage of such a technique is that it could place more of the total overhaul under the umbrella of competition.

#### Multiship awards

Multiship contract awards of common classes of ships sequentially into the same shipyard would enable a shipyard to

- accumulate and perpetuate expertise and
- plan workloads and efficiently marshal resources for the overhauls.

In fact the Navy has experimented with this approach. If follow-on ships would be at the option of the Navy, based on previous work, the shipyard would have more of an incentive to provide an effective overhaul.

#### CONCLUSIONS

The Navy's use of formal advertising inhibits the effectiveness of ship overhauls. The Navy has conducted numerous tests of contracting alternatives and appears to be moving in the right direction toward improving its methods.

Formal advertising for ship overhaul contracts has been criticized repeatedly because the Navy has not been able to sufficiently define the work to be done, a prerequisite for formally advertised procurements. A key issue is whether the Navy should discontinue formal advertising in favor of negotiation, or whether it can sufficiently provide accurate and complete work packages to effectively achieve the more favorable pricing of competitive bidding.

We believe that the opportunity exists for the Navy to maximize the benefits of ship overhauls. This requires, however, that the Navy intensify its planning and management of contract ship overhauls, especially by implementing the recommendation in this report. The Navy may further enhance its contracting by continuing to implement contracting techniques which will promote contractor involvement and incentives, and Navy price visibility.

We believe that the Navy's use of request for proposals is a move in the right direction. By further implementing such techniques as alternative bids and multiship awards, the Navy can come closer to achieving effective contract ship overhauls.

AGENCY COMMENTS

The Navy concurred in general with the philosophy and the points raised in this chapter.

THE PHASED  
MAINTENANCE PROGRAM

The Navy has started using phased maintenance with its auxiliary combat stores ships. Phased maintenance is a ship overhaul practice that is considerably different from the Navy's normal method of overhauling ships. Although phased maintenance is new to the Navy, it has long been an accepted method of overhauling commercial vessels.

The phased maintenance program applies a number of concepts to ship overhauls that include shorter, more frequent repair intervals, as well as initiatives in material management, work package development, and contracting. The Navy has a system in place to evaluate the overall success of the phased maintenance concept, as well as the individual components.

PROGRAM CONGRESSIONALLY  
DIRECTED

The House Committee on Appropriations directed the Navy in 1979 to conduct a long-term test program using Navy ships in a commercial equivalent, prudent risk maintenance program. The Committee made this decision on the basis of our report which stated that Navy maintenance costs for like-sized amphibious and auxiliary ships greatly exceeded the maintenance costs of equally sized commercial tankers and cargo ships.

The Navy's response to the Committee's directive came on July 6, 1979, when the Navy approved a phased maintenance plan that emulated the Merchant Marine port engineer concept.

ELEMENTS OF  
PHASED MAINTENANCE

The three main elements of the phased maintenance program are the

- phased maintenance cycle,
- work package development, and
- use of a port engineer.

There are also three other facets of the program which are significant. These include

- an innovative contracting method,
- materials management initiatives, and
- program evaluations.

The above elements will be discussed below, except for the use of the port engineer, which is already described in chapter 3.

#### The phased maintenance cycle

The three Atlantic Fleet auxiliary combat stores ships involved in the phased maintenance program are the U.S.S. San Diego, Concord, and Sylvania. A typical operating pattern in the past for these ships consisted of 4 months deployed to the Mediterranean Sea followed by 6 months in the continental United States (4/6). Each ship received a regular overhaul of 7 to 8 months about every 5 years.

In contrast, phased maintenance envisions operating patterns of 6 months deployed and 9 months in the continental United States (6/9) with all shipyard maintenance performed during the 9-month period of an operating cycle. One complete cycle will span 5 years and include four phased maintenance availabilities of 2 to 3 months duration, plus one drydocking.

#### Work package development

Work package development challenges the practice of automatically preauthorizing certain repair work without considering the actual material condition of a ship. The phased maintenance program approach reflects the practices of commercial carriers and MSC by placing much greater emphasis on material condition during work authorization. The work package development element is characterized by two features: (1) a revised and improved class maintenance plan and (2) the application of high-quality, practical engineering judgment to the early planning of the phased maintenance overhaul. (Since the engineering judgment relates to the port engineer concept, as discussed in chapter 3, it is not discussed in this section.)

The class maintenance plan defines projected organizational, intermediate, and shipyard maintenance requirements for the various ship systems and equipment. It will be used for scheduling maintenance, estimating required staff and skill levels, designating required facilities, determining logistical support, and preparing alteration and repair packages for the overhauls. In keeping with the phased maintenance program philosophy of defining repair packages on the basis of actual material condition, no repairs specified in the plan will be accomplished unless the need has been verified by an onsite inspection.

#### Innovative contracting method

By Navy instructions, the contract vehicle for the phased maintenance program departs from the traditional contract mechanism. The Navy wanted a flexible contract that improved



contractor incentives and contained selection criteria so structured that more competent shipyards could favorably compete.

The significant features of the new contract vehicle for the phased maintenance program include: (1) contracting for a set of ship availabilities, rather than for one at a time, (2) using a cost-type contract, (3) using an award fee and options for contract renewal as incentives to the contractor, and (4) assigning the overhaul planning and management tasks and responsibilities to a private shipyard to ensure timely accomplishment. The new contracting approach is designed to overcome problems experienced with the traditional invitation-for-bid process, and to capitalize on the advantage provided by repetitive availabilities.

The Navy decided to try a new contracting vehicle because private sector overhauls had experienced delays, quality difficulties, and legal, financial, and administrative problems. The Navy is convinced that these problems arose from existing ship repair contracting procedures. According to the Navy, the conditions conducive to fixed price contracts seldom exist in its overhaul situation. Regulations state that the firm fixed price contract is suitable for use in procurement when reasonable, definite design or performance specifications are available and whenever fair and reasonable prices can be established at the outset. Yet experience has shown that, in many cases, the full extent of overhaul work cannot be determined in advance of pricing the effort, as definite design or performance specifications frequently are not available. Under these conditions, fair and reasonable prices are difficult, if not impossible, to establish in advance. Consequently, use of a fixed price contract frequently leads competitors to underestimate price to win the awards, and qualitative legal and administrative difficulties arise when the true extent of the work finally becomes known.

#### Material management

Material management under the phased maintenance program follows customary Navy procedures, and it is being carried out by traditional organizations. However, because of abbreviated availability periods and emphasis on actual equipment condition as the main determinant of work packages, the program has adopted a prepositioning initiative with unique characteristics for the management of material.

This material consists of items selected and prepositioned to ensure that specific high-cost repair jobs can be authorized and performed on short notice, if and when material condition warrants. Secondary items needed for repairs will be positioned at the shipyard, while primary equipment will be kept in Navy warehouses.

### Program evaluation

The phased maintenance program evaluation plan is to provide a basis for future decisions to stop, alter, or expand the program or some of its elements. The phased maintenance program is designed to meet a number of goals. It is both a solution to a fleet scheduling problem and a test program for improved maintenance practices. In addition, the program involves changes to almost every aspect of the scheduling, planning, and execution of depot maintenance for auxiliary combat stores ships.

In such a complex setting, the Navy believed it was not enough to simply evaluate the program's overall success. It believed there should be a hierarchy of evaluation at the overall program level and at the level of major program elements. The program evaluation plan reflects this hierarchy of evaluation. The plan contains detailed methods and procedures for (1) measuring pre-and post-AFS program costs and performance, (2) conducting periodic evaluation, (3) identifying causes of differences attributed to the program, and (4) publishing periodic evaluation reports.

### THE CURRENT PROGRAM STATUS

The first ship overhauled under the program was the U.S.S. San Diego, and its overhaul was finished 1 week early. The second ship, the U.S.S. Concord, began its overhaul on schedule in July 1981. The work definition conference on the third auxiliary combat stores ship, the U.S.S. Sylvania, was completed in June 1981 aboard the ship in the Mediterranean Sea. The Sylvania will be the first overhaul where both the work and the work package development will be performed by a contractor. After the Sylvania, the overhaul packages will be totally provided by a contractor. The first major program evaluation is scheduled to take place in March 1982.

### Future program plans

During October 1980, the Chief of Naval Operations asked the Chief of Naval Material to investigate the feasibility of extending the Atlantic Fleet's phased maintenance program as rapidly as possible. The Chief of Naval Operations also wanted priority to be given to the Pacific Fleet's ship oiler class ship. As a result, a program to implement phased maintenance on the Pacific Fleet's ships is underway. The Pacific Fleet believes that the plan will result in increased operating time for the auxiliary combat stores ships.

Initial planning for the Pacific's auxiliary combat stores ships was similar in concept to the Atlantic Fleet's planning, but differed as to specifics:

	<u>Atlantic Fleet</u>	<u>Pacific Fleet</u>
Operating cycle in months (deployment/stateside)	6/9	6/12
Available contractor labor days per month per ship	5,000	7,500
Ship availabilities during 5-year cycle	1-4 months 2-3 months	1-4 months 2-3 months

On June 3, 1981, the Chief of Naval Operations approved the Naval Sea Systems Command's request to add oilers to the phased maintenance program. The Atlantic Fleet has also been authorized to add two more port engineers to the program, in addition to the two it already has. The Pacific TYCOM has not yet hired any port engineers nor has it planned any auxiliary combat stores ships or oiler phased maintenance overhauls.

#### SUMMARY

The phased maintenance concept currently being tested by the Navy is planned to:

- Increase the amount of time ships are available for fleet operations by reducing the overall time that the ships are "down" for maintenance.
- Reduce the size of the work packages by having shorter, more frequent overhauls.
- Reduce the overall cost of ship overhauls by limiting the staff-days of effort expended on the overhauls.

Although this program is still in its infancy, the Navy believes the concept will prove highly beneficial to the ship overhaul process.

PRINCIPAL NAVY ORGANIZATIONS WITH OVERHAUL RESPONSIBILITIES

<u>Organization</u>	<u>Overhaul planning</u>	<u>Overhaul accomplishment</u>
Chief of Naval Operations	--Budgets for overhauls.	--Provides overhaul funds to major commands
	--Establishes overhaul schedules.	--Approves changes to overhaul schedules and fleet modernization program
	--Approves fleet modernization program.	
	--Provides overhaul planning funds to major commands.	
Commanders in Chief, Atlantic and Pacific Fleets	--Budgets for repairs and alterations.	--Provides overhaul funds
	--Determines ship deployment schedules.	
	--Provides planning funds.	
Commanders, Naval Surface Forces, Atlantic and Pacific Fleets, TYCOM	--Responsible for material readiness of assigned ships.	--Approves use of funds for overhaul contracts, cost growth, and new work
	--Budgets for repairs and alterations.	--May suggest funding changes to fleet
	--Approves funds for planning.	

Organization

Commanders, Naval Surface Forces, Atlantic and Pacific Fleets, TYCOM

NAVSEA

Overhaul planning

- Tasks others to identify repair work.
- Determines types of activities to accomplish repairs.
- Authorizes and funds selected alterations.
- Approves work package.
- Responsible for overhauls in the private sector-- tasked to subordinate commands.
- Provides material support.
- Implements Fleet Modernization Program.
- Provides funding and guidance to planning shipyard.

Overhaul accomplishment

- Monitors overhaul progress.
- Approves selected modifications.
- Funds accomplishment of alterations under Fleet Modernization Program.
- Approves technical changes to alterations.

Organization

Overhaul planning

Overhaul accomplishment

Planning shipyard

- Prepares basic alteration class drawings for first-time Fleet Modernization Program alterations.
- Maintains configuration control for specifically assigned ships.

PERA

- Plans, tasks, and coordinates preoverhaul ship inspections.
- Recommends repairs for inclusion in overhaul.
- Prepares preliminary and final work packages.
- Prepares milestones and monitors progress of other organizations.

--Prepares post overhaul analysis report.

Planning SUPSHIP

- Prepares preliminary cost estimates.
- Prepares some basic alteration class drawings.
- Prepares supplementary alteration drawings.
- Prepares work package bid specifications.

OrganizationOverhaul planningOverhaul accomplishment

Administrative SUPSHIP

--Solicits bids and awards contracts. 1/

--Monitors work in progress

--Performs quality assurance functions.

--Notifies NAVSEA or TYCOM when additional work and/or funds are required.

--Negotiates contract change order prices.

--Prepares Departure Reports.

Ship

--Identifies some repair items.

--Performs work assigned by TYCOM.

--Reviews preliminary work package.

--Assists SUPSHIP in quality assurance functions.

Other specialist organizations

--Participate in ship inspections.

--May monitor or perform work within their area of expertise.

--Recommend/plan work within their area of expertise.

1/ This function may be accomplished by the procuring activity of another SUPSHIP.

COMPARISON OF NAVY, MSC, AND COMMERCIAL  
RESPONSIBILITIES FOR PLANNING OVERHAULS

	Navy	MSC	Commercial carriers			
			A	B	C	D
Length of time prior to overhaul that planning begins	18 to 22 mo.	2 mo.	2 mo.	5 mo.	45 days	4 mo.
Orgs./individuals involved in the scheduling and planning of ship alts./mods.	NAVSEA TYCOM Planning yd. PERA SUPSHIP (Pln.) Others	Port engr. 1/ Naval architect Port engr.	Engr. Dept. Naval architect Port engr.	Chf. Planner Port engr.	Marine engr.	Engr. dept.
Orgs./individuals involved in planning ship repairs:						
Specific repairs (broken parts)	Ships Force PERA SUPSHIP (Pln.) TYCOM Others	Ships chief engr.	Chief engr. Port engr.	Chief engr.	Chief engr.	Chief engr.
Standard repairs of regulatory requirements	PERA SUPSHIP (Pln.) TYCOM Other	Port engr.	Port engr.	Port engr.	Port engr.	Port engr.
Estimating cost of overhaul	SUPSHIP (Pln.)	Port engr.	Port engr.	Port engr.	Port engr.	Port engr.
Preparation of work specification package	SUPSHIP (Pln.)	Port engr.	Port engr.	Port engr.	Port engr.	Port engr. Dir., Maint. & Repairs
1/Ship alterations are minor. Major conversion/overhaul accomplished when ship first required by MSC.						





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