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The Navy has been emphasizing intermediate level maintenance on its ships as a way to improve operational readiness and increase the time between major overhauls. Findings/Conclusions: The Navy's intermediate maintenance program has evolved without sufficient consideration of such basic issues as: defining and quantifying work requirements; identifying ways to assess and improve productivity; analyzing operating costs and possible economic alternatives; and evaluating the impact of changing maintenance concepts. Recommendations: The Secretary of the Navy should use scientific engineering analyses to define maintenance work that should be performed at each maintenance level during peacetime and wartime and quantify total requirements; assess the requirements of new maintenance concepts on intermediate level capabilities; reassess the need for new mobile intermediate maintenance activities and deactivate those not essential for wartime emergencies; reassess the need for new shore activities in light of peace and war requirements; reduce redundant maintenance functions and work centers; and improve productivity. (Author/SC)

REPORT TO THE CONGRESS

BY THE COMPTROLLER GENERAL OF THE UNITED STATES

The Navy's Intermediate Ship Maintenance Program Can Be Improved

The Navy has been emphasizing intermediate level maintenance on its ships as a way to improve operational readiness and increase the time between major overhauls.

However, the Navy's intermediate maintenance program has evolved without sufficient consideration of such basic issues as

--defining and quantifying work requirements,

--identifying ways to assess and improve productivity,

--analyzing operating costs and possible economic alternatives, and

--evaluating the impact of changing maintenance concepts.

LCD-77-412

SEPTEMBER 23, 1977

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

B-133170

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

This report discusses the basic issues the Navy needs to consider in determining the optimum level of intermediate maintenance support for its ships. Once the optimum level is known, the most appropriate numbers, capabilities, capacities, and geographic location can be determined. The report also presents several alternatives to increase productivity and reduce maintenance costs at this level of support.

This is our first review of the Navy's intermediate maintenance program and is part of our continuing effort to determine how the military can improve its maintenance program.

We made our review pursuant to the Budget and Accounting Act, 1921 (31 U.S.C. 53), the Accounting and Auditing Act of 1950 (31 U.S.C. 67), and 10 U.S.C. 2313(b).

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

Comptroller General
of the United States

COMPTROLLER GENERAL'S REPORT TO THE CONGRESS

THE NAVY'S INTERMEDIATE SHIP MAINTENANCE PROGRAM CAN BE IMPROVED

D I G E S T

In recent years, the Navy has emphasized intermediate level maintenance on its ships as a way to improve operational readiness and increase the time between overhauls. (See p. 4.)

This maintenance is performed by over 29,000 Navy personnel onboard 25 tenders and repair ships and at shore activities. Personnel and operating costs for these activities in fiscal year 1976 were about $497 million. (See p. 4.)

Tenders are large ships with crews ranging from about 670 to 1,270 personnel. Often compared to floating cities, tenders provide a variety of repair services to other ships as well as the facilities and services required to support their own crews. Modern tenders usually contain over 50 repair shops, including electronics, calibration, electrical, machine, foundry, welding, pipe, optical, printing, photography, sheet metal, weapons repair shops, and chronometer repair. (See p. 2.)

The peacetime roles of mobile (tenders) and shore activities are identical--they perform regularly scheduled repairs on ships which are normally in their home ports. In wartime, however, the roles differ. (See p. 2.)

War plans call for the deployment of most tenders to forward areas. This enables ships to obtain battle damage and other repairs near the scene of action. (See p. 10.)

According to the Navy, the wartime need for forward support dictates that at

least part of the Navy's maintenance capability be mobile. (See p. 2.)

The current wartime and peacetime intermediate maintenance activity levels have developed without systematic consideration having been given to many basic issues.

CONCLUSIONS

Scientific engineering studies are needed to measure the Navy's intermediate maintenance workload under peacetime and wartime conditions. These studies would enable the Navy to estimate its total maintenance requirements more accurately and determine what portion of these requirements needs to be mobile.

The efficiency and economy of peacetime intermediate maintenance operations can be improved. Some improvements can be made within the existing organizations. To achieve these improvements, the Navy should:

--Perform only necessary work.

--Improve workload screening and scheduling to assure that the optimum trade-off is achieved between maintaining skill proficiency, keeping personnel productive, and repairing material economically.

--Improve productivity. Such improvements have been impeded by the ineffective management information system and by a lack of well-trained personnel assigned to repair shops.

--Improve budgeting procedures so they can more accurately project future requirements; current manpower requirements are overstated.

In addition, there is potential for dramatic improvements in intermediate maintenance

operations. To realize this potential the Navy should:

--Define and measure work required to support the intermediate maintenance roles, emphasizing the wartime workload, and matching this with the peacetime workload.

--Determine the most effective way to provide this support; that is, with mobile or shore activities located overseas or in the United States or a combination of means.

--Identify ways to assess and improve productivity.

--Analyze operating costs and possible economic alternatives.

--Evaluate the impact of changing maintenance concepts. (See pp. 7 to 14.)

For example, the Navy has not analyzed how much maintenance would be required under the conditions of modern warfare--the number of ships that would be lost, the types of casualties that would occur, and how much of this work could be done by the tenders and repair ships. (See pp. 16 and 17.)

Past studies which attempted to measure mobile repair facility requirements used repairs performed in peacetime as a basis for determining wartime requirements. (See p. 17.)

No determinations were made concerning whether repairs actually made should have been made, what would happen if they were deferred, or whether they would be necessary in the forward areas of conflict. (See p. 17.)

Once wartime requirements have been defined and the most appropriate level of effort established--the numbers of activities, their capabilities and capacities, and whether they should be mobile or ashore--then the peacetime maintenance can be made more effective and economical. (See pp. 17 and 18.)

As much as possible, intermediate maintenance capability ashore should be favored, since in all respects--facility costs, operating costs, and personnel utilization--shore maintenance is economically superior to the tender.

For some of the alternatives available to promote efficient, economical peacetime operation--assuming that the wartime capability/capacity is greater--see pages 14 and 58.

RECOMMENDATIONS

The Secretary of the Navy should:

--Use scientific, engineering analyses to define maintenance work that should be performed at each maintenance level during peacetime and wartime and quantify total requirements. With such analyses, an optimum intermediate maintenance activity effort can be determined and minimum necessary mobile capacity can be defined.

--Assess the requirements of new maintenance concepts on intermediate level capabilities.

--Reassess the need for new mobile intermediate maintenance activities and deactivate those not essential for wartime emergencies. Reassess the need for new shore activities in light of peace and war requirements. Also, where feasible, reduce redundant maintenance functions and work centers.

--Improve productivity. (See pp. 58 and 59.)

AGENCY COMMENTS AND GAO'S EVALUATION

The Navy agreed with most of GAO's evaluations, conclusions, and recommendations. It added that the Navy has many programs

for correcting the majority of problems GAO identified and will add new programs where needed. (See app. V for the Navy's complete comments.)

The Navy agreed only in part with GAO's conclusion that current operations had evolved without systematic consideration of many basic issues. It stated that since 1975, these activities have received substantial consideration, leading to numerous projects aimed at developing a capability which will satisfy both wartime and peacetime requirements.

GAO agrees that the Navy has undertaken numerous projects aimed at determining the most appropriate maintenance levels for war and peace, but they will only benefit the future. Current conditions continue without benefit of these analyses.

It is essential that these analyses refine the requirements and address the issues GAO raised. GAO reported that no wartime requirements had been established for the shore activities. The Navy responded that it had completed a study of the wartime workload for shore activities. Although GAO's analysis of this classified study was brief, GAO has the same concerns expressed over past Navy studies. (See p. 21.)

GAO commends the Navy for its efforts in trying to define intermediate maintenance requirements. The difficult analyses may take years to complete. GAO will continue to monitor the implementation of its recommendations to determine the effectiveness of corrective actions.

Contents

ABBREVIATIONS

FMAG	Fleet Maintenance Assistance Group
GAO	General Accounting Office
IMA	Intermediate Maintenance Activity

CHAPTER 1

INTRODUCTION

Keeping naval vessels up to date and combat ready requires large expenditures of funds and a tremendous maintenance effort that ranges from simple servicing to major overhauls. In fiscal year 1976, the Navy spent $1.5 billion to maintain its 476 ships and an estimated $2 billion will be spent in fiscal year 1977.

The Navy has adopted a multilevel approach to ship maintenance which, depending on the type and complexity of work, places responsibilities at three different levels. Organizational level maintenance is normally the responsibility of ships' crewmembers. Tasks performed at this level include inspecting, servicing, and lubricating equipment. Intermediate level maintenance is done by designated intermediate maintenance activities (IMAs) for direct support of the fleet. (See app. I.) Assigned work includes calibrating, repairing, or replacing damaged or unserviceable parts, components, or assemblies; modifying material; and providing technical assistance to ship maintenance personnel. Depot level maintenance is done by shipyards and other designated industrial-type activities. These activities are generally responsible for making major ship overhauls, conversions, modifications, and repairs to end-items and components.

In practice, the distinction between the three maintenance levels is not always clear. However, Navy policy provides for performing ship maintenance at the lowest practical level.

The IMA purpose in war and peace is the same--provide intermediate level maintenance to customer ships. Its roles, however, are different because the scenarios under which their customers operate are different.

INTERMEDIATE LEVEL MAINTENANCE

Although all IMAs have similar repair capabilities, each is configured to service particular types of ships. Mobile IMAs include (1) destroyer tenders and repair ships which service surface vessels and (2) submarine tenders which are configured to service either attack submarines or missile submarines.

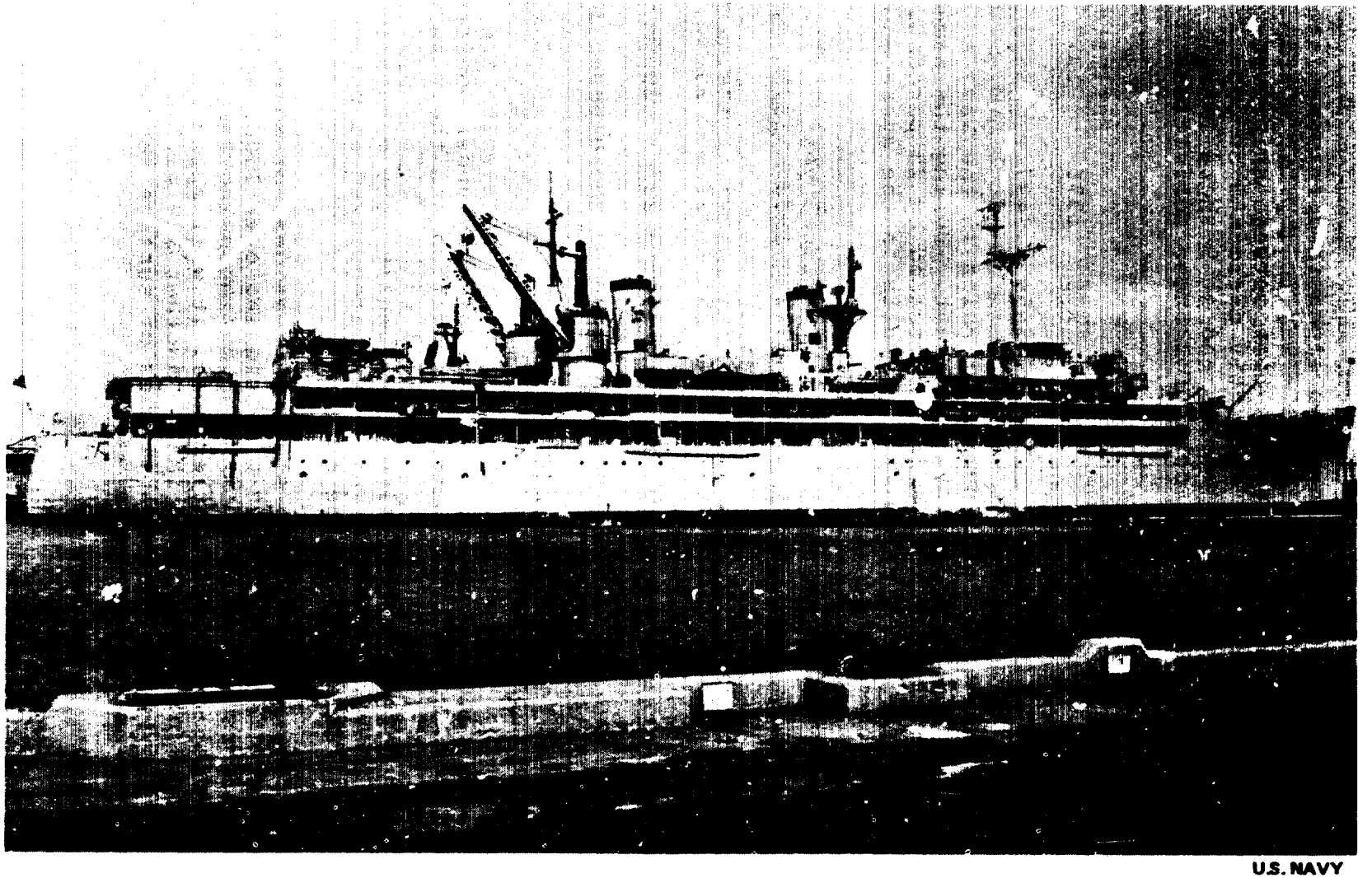
Although referred to as mobile, the Navy does not use these IMAs for repair work while they are moving either in peacetime or wartime because it is not feasible or safe to do so. The mobility refers to the capability of the vessels to move from one anchorage to another to place them reasonably close to the vessels they are to service. The IMAs servicing operations are done at their anchorages. In peacetime, except for training exercises and selective deployments overseas, most tenders remain anchored at their home port.

Tenders are large ships with assigned crews ranging from about 670 to 1,270 personnel. (See picture on the following page.) Often compared to floating cities, tenders provide all the facilities and services required to support their crews in addition to providing a variety of repair services to other ships. Modern tenders usually contain over 50 repair shops, including electronics, calibration, electrical, machine, foundry, welding, pipe, optical, printing, photography, sheet metal, and weapons repair shops. Appendix IV is a representative list of repair shops/centers on a tender.

Shore-based IMAs include (1) support groups, fleet maintenance assistance groups (FMAG), and the Development and Training Command, all three of which primarily service surface vessels and (2) submarine support facilities which service submarines. Most shore IMAs were established in 1972 as part of a program to provide meaningful shore billets for personnel who spend a disproportionate amount of time at sea. These personnel have skills which, for the most part, are needed only onboard ships. The shore IMAs allow these persons to work in their skill area while on shore duty.

Initially designed to assist ships in organizational level maintenance, these facilities quickly evolved into IMAs and today many have essentially the same repair capabilities as tenders.

In peacetime, the roles of mobile and shore IMAs are identical. Both perform regularly scheduled repairs for ships which are normally in home ports. According to the Navy, it is the wartime need for IMA support in forward anchorages that dictates that at least a portion of this capability be mobile.



U.S. NAVY

In recent years, the Navy has emphasized intermediate level maintenance on its ships as a way to improve operational readiness and increase the time between ship overhauls. This maintenance is currently performed by over 29,000 Navy personnel on 25 mobile and at 9 shore IMAs. The table below shows total costs for these activities over several years.

	1974	1975	1976	Estimated 1977
Total IMA costs (millions)	$397	$454	$497	$558

Since 1969, the total number of ships in the Navy's active fleet has decreased by 49 percent. During the same period, the number of mobile IMAs decreased by 29 percent. As shown in the table below, this results in the average tender servicing fewer ships.

	Fiscal year				
	1969	1971	1973	1975	1976
Total Navy ships	926	702	584	496	476
Total mobile IMAs	35	29	27	25	25
Number of ships per mobile IMA	26	24	22	20	19

This table does not include new and expanded shore-based IMAs established since 1972.

By 1981, the Navy plans to buy nine new tenders at a cost of over $2 billion to replace nine tenders which are 30 years or older. Four of these are already under construction. Depending on their material condition and their service capability, these old tenders will either be scrapped or placed in the mothball fleet. Currently, the mothball fleet has only two tenders which are categorized as potentially available for wartime duty.

The Navy also plans to spend a great deal of money to improve its IMA capabilities by assigning over 1,000 additional sailors to existing IMAs and by improving facilities and personnel training. For example, it will spend $180 million to modernize six shore IMAs. Another $29 million will be spent to upgrade the capabilities of surface tenders and repair ships.

Mobile IMAs are large and costly vessels and millions of dollars are being programed to buy new and upgrade existing ship and shore IMAs.

This report explores the problems associated with identifying the most economical ways of managing peacetime resources while assuring that there will be maximum responsiveness to wartime needs.

SCOPE OF REVIEW

Our review included Navy policies, procedures, and practices in providing intermediate level maintenance support to the fleet. We also examined maintenance records and verified, on a test basis, the accuracy of various records. Additionally, we observed maintenance practices aboard seven tenders and at three shore IMAs.

We directed our review primarily at those aspects of the intermediate maintenance program which appeared to warrant particular attention. Our fieldwork included visits to the following:

Naval headquarters commands:
- Chief of Naval Operations, Washington, D.C.
- Bureau of Naval Personnel, Washington, D.C.

Naval operating commands:
- Commander in Chief, Atlantic Fleet, Norfolk, Virginia
- Commander in Chief, Pacific Fleet, Pearl Harbor, Hawaii
- Commander, Submarine Force, Atlantic Fleet, Norfolk, Virginia
- Commander, Submarine Force, Pacific Fleet, Pearl Harbor, Hawaii
- Commander, Naval Surface Force, Atlantic Fleet, Norfolk, Virginia
- Commander, Naval Surface Force, Pacific Fleet, San Diego, California
- Commander, Naval Logistic Force, Pacific, Pearl Harbor, Hawaii

Mobile IMAs:
- U.S.S. Dixon (AS-37), San Diego, California
- U.S.S. Hunley (AS-31), Charleston, South Carolina
- U.S.S. L. Y. Spear (AS-36), Norfolk, Virginia
- U.S.S. Orion (AS-18), Charleston, South Carolina
- U.S.S. Samuel Gompers (AD-37), San Diego, California
- U.S.S. Shenandoah (AD-26), Norfolk, Virginia
- U.S.S. Sierra (AD-18), Charleston, South Carolina

Shore IMAs:

Development and Training Center/Fleet Maintenance Assistance Group Pacific, San Diego, California

Fleet Maintenance Assistance Group, Norfolk, Virginia

Surface Force Atlantic Support Group, Charleston, South Carolina

CHAPTER 2

ISSUES TO BE CONSIDERED IN DETERMINING INTERMEDIATE MAINTENANCE EFFORT

Having adopted a multilevel ship maintenance strategy, the Navy should determine peacetime and wartime capabilities, capacities, and manning requirements for each maintenance level. Because of the large sums of money involved and the potential impact on the combat readiness of Navy ships, these determinations require an integrated approach and careful consideration of many key issues.

At the intermediate maintenance level, the Navy has begun many programs intended to correct the majority of the problems identified in this report and is developing new programs to deal with problems not covered by existing programs. But based on our analyses of these programs and a recently completed study of wartime requirements for shore IMAs, further consideration and analyses of the issues is required to determine how productive the activities are and how well the information systems report productive time. Accurate productive time can then be used to project peace and war requirements and to determine whether new activities should be built or existing ones modernized.

DETERMINING LEVEL OF EFFORT FOR INTERMEDIATE MAINTENANCE

Defining the proper level of intermediate maintenance effort--i.e., the number of IMAs, organization, manning, and capabilities in both peace and war--requires considering several issues. Of primary importance is the delineation of work required at the IMA level, emphasizing the wartime workload and matching this with that required in peace.

Through war-gaming, modeling, and analyses of past, present, and future work at each maintenance echelon, total IMA requirements can be measured and overall parameters of IMA effort can be established. Other issues, such as productivity, costs of operations, and changing maintenance concepts, also require careful consideration, particularly in assessing the IMAs peacetime role.

Quantifying the workload

A primary issue in determining the IMA level of effort is the quantification of the wartime workload--what maintenance is essential, who will do it, and how and where it will be performed. Some factors which should be considered are:

--How much battle damage can be expected and what portion of it can be repaired by deployed tenders?

--How much capability exists in friendly ports?

--What impact will the increased tempo of operations have on maintenance requirements?

--How much of this increase is offset by wartime losses of ships?

--What portion of the current peacetime requirements can be deferred, for how long, and can some be eliminated?

Indepth analyses and investigations are needed to answer such questions. Having established total wartime intermediate repair needs, the next step is to consider geographic location requirements for IMAs and the potential for using overseas and U.S. coastal facilities in support of war plans. This is discussed further under mobility issues below.

We are not, however, suggesting that wartime needs can be established with any precision. There have been no major naval engagements since World War II, and the technology of warfare at sea has changed radically as have the nature and composition of the naval forces of our potential adversaries. Therefore, past experiences is probably a poor guide from which to predict wartime requirements.

Nevertheless, the military services have developed sophisticated war-gaming and modeling techniques from which to predict battle damage and losses to their forces. Thus, despite the potential imprecision in such predictions, there is a basis for estimating the wartime requirements. However, as will be seen in chapter 3, the Navy has made only the most elementary efforts to establish its wartime requirements. Although the Navy did not

concur with this conclusion, we believe it is accurate. This is discussed further in chapter 3.

Once the wartime needs have been estimated, determining the present and future peacetime workload is the next issue to be addressed. Detailed, engineered analyses should be made to answer such questions as what work should be performed at this maintenance level rather than at the organizational or depot levels. Current work should be evaluated to determine whether it is essential or merely "busy work" and whether, in fact, essential work is being accomplished.

By matching war and peace maintenance needs, it may be possible to adjust IMA peacetime requirements to promote more efficient and economical IMA operations. This can be achieved as long as plans are made to have trained personnel and facilities available for a timely transition to a wartime level.

For example, an analysis of wartime needs might show that because of casualties, including battle damage, an IMA requirement exists for manufacturing certain items, such as piping elbows or valve parts.

To accomplish this, a pattern shop to make wood molds and a foundry shop to cast these items might be considered essential. Further analysis would then be needed to determine whether all IMAs need this capability and whether it should be mobile. Finally, this wartime requirement should be matched with peacetime needs.

Since there is no battle damage in peacetime and since it may be more economical to buy than to make these types of parts, the peacetime requirement for such repairs may be minimal. Also, the amount of peacetime scheduled maintenance may not be sufficient to productively employ the personnel in these shops. If not, make-work projects to keep people busy may become commonplace--as we believe it has in certain shops. Through these workload analyses, alternatives can be selected which promote maximum economical and efficient benefits in the IMA peacetime organization and provide for wartime surge capability.

In light of modern warfare, the destructive capability of weaponry, and the advances in the means for providing logistic support, other matters to consider are whether carpenter, pattern, foundry, photo, printing, typewriter

repair, etc., shops are absolutely necessary in war and whether they should be on mobile platforms close to the hostilities. A sample listing of repair workshops/centers for a mobile IMA is shown in appendix IV.

Mobility requirements

Once total wartime requirements have been quantified, additional analyses are needed to determine whether some IMA capability should be mobile or if all requirements can be filled at shore facilities. According to the Navy, the wartime IMA role dictates that at least some of this support be mobile. Navy war plans call for deploying most mobile IMAs to areas near the scene of hostilities to repair battle damage and perform other casualty repairs and maintenance. The Navy says that this reduces the time required for customer ships to go to and from their operating areas for maintenance, which in turn reduces the number of combat ships required to cover the assigned area.

As indicated earlier, mobility in this context means that the IMA capability is in the form of a ship which can move from one location to another if necessary, not that the ships perform maintenance while moving. For the most part, maintenance is not done while the IMA is moving because it is either not feasible or not safe. The locations must be protected from hostilities and sheltered from rough sea conditions. The capability to move exists, but once the ships arrive at their planned stations, they must remain at anchorage to accomplish their mission. Further movements of the vessel would depend on hostilities in the area or changes in planned scenarios.

How essential is the mobility requirement?

There are no shore-based IMAs overseas. The Navy says that the reasons for this are (1) a shore-based IMA cannot move when hostilities or changed plans warrant it and (2) any facility on foreign soil is in danger of being lost through changes in the political environment and are subject to negotiation and renegotiation for their use.

While the Navy positions against shore-based facilities sound plausible, the same could be said of the problems faced by the other two services.

The major contingency scenario is in the European area. We have large air forces and ground forces deployed in Europe which must provide for various levels of maintenance requirements in land (shore) based facilities. All services must plan for facilities in different locations when scenarios warrant it. And Air Force and Army facilities on foreign soil are subject to the same political vagaries of the international scene as the Navy's.

Since we rely on our North Atlantic Treaty Organization allies to authorize appropriate support facilities for the Army and Air Force, the reasons cited by the Navy for not considering shore-based IMAs in Europe do not appear to be valid, at least for the European theater.

The Navy did not concur with our observation. They said that: (1) Navy forces must be as self-sufficient as possible; (2) naval forces must be able to conduct sustained operations anywhere in the world; (3) retaining a minimum mobile repair force is just as important as mobile logistics support or having adequate personnel; (4) the mission of the Navy differs from that of the Army and Air Force because ships are designed to be independent from shore support for long periods.

It may be essential to maintain a minimum mobile repair force to satisfy contingencies which might occur anywhere in the world. We believe, however, that the most predictable and demanding war scenarios should have the most weight in determining whether 25 tenders represent the minimum mobile repair force level.

In other words, because the European war scenario is considered the most predictable and demanding one, a major portion of naval forces will presumably be committed to it. If the Navy's role is to provide sea control and power projection in the European vicinity as well as controlling the resupply sea lanes between Europe and the United States, then the United States and allied countries' shore maintenance capabilities might be an effective means for supporting much of the Navy's wartime maintenance requirement.

This would presumably reduce the mobile IMA requirement and yet, if necessary, allow for some mobile IMAs to satisfy maintenance needs in less demanding scenarios wherever they may occur in the world, and for which no shore capability exists or is feasible. See chapter 3 for further discussion.

Although there are no shore IMAs in the Pacific area, there are four repair facilities which do depot level type work and are capable of performing IMA work. They are located in Hawaii, Guam, the Philippines, and Japan. Most often the mobile IMAs in the Pacific are in the same ports where these facilities are located. This colocation was also true during the Navy's most intensive action since the Korean war, the Vietnam conflict. Mobility does not appear to have been a key factor in ship maintenance in the Pacific in recent history.

As evidenced in congressional testimony, the Navy has been, because of economics, attempting to phase down the Guam repair facility and move the repair work to the Philippines and Japan. According to the Navy, it is less expensive to repair ships in the Philippines because of the labor costs and less expensive for ships to go to and from their normal operating areas.

This does not appear to be consistent with the Navy's previously stated overseas basing concern about political changes. Guam is a U.S. territory, not in jeopardy of being lost politically or subject to negotiation for its use. If we presume that the repair facilities in the Philippines and Japan will be available in war, serious questions can be raised about the need for all the mobile IMAs planned for that theater.

If, in fact, economics is a major concern, then the mobile IMA offers a very poor payoff, since it is by far the most expensive of the various alternatives. (See ch. 4.) For instance, the Navy says the cost per staff-day in Guam is $142.20. In contrast, an estimate of the per staff-day cost at a mobile IMA is $245.28 on the low side and $507.04 on the high side.

The Navy's response to our position in the Pacific was similar to their Atlantic position; that is, they are required to be ready to deploy U.S. naval forces to a trouble spot anywhere in the huge Western Pacific-Indian Ocean area. They added that the repair facilities do not fulfill the repair support requirements necessary for sustained operation in remote areas of the world in wartime.

Again, we believe that it is essential to weigh U.S and Allied countries capabilities in relation to the most

predictable and demanding contingency scenarios and adjust all maintenance requirements--intermediate and depot level--accordingly.

The Navy also said that the mobile IMAs were often moored off the coast and in the rivers of Vietnam, and without these ships the riverine warfare could not have been conducted. When we asked the Navy to elaborate on this subject, we were told that the ships moored in the rivers were small repair ships, designed for repairing small landing craft and that these ships are no longer in the Navy's inventory. Additional comments on this subject are contained in chapter 3.

Other issues to be considered

Other issues, such as productivity, costs of operations, and changing maintenance concepts, also require consideration in determining the optimum intermediate maintenance level of effort.

Management needs to be able to assess productivity of existing facilities to make responsible decisions to improve it. Information systems should be devised to tell managers how many staff-hours were used repairing an item, how much time was not productive and why, how many units were repaired, how many units should have been repaired, and how long it should have taken to repair the units.

Another essential issue is the cost of existing IMA operations. Cost comparisons should be drawn between work performed by IMAs and the other maintenance levels--operating ships and shipyards. Economic comparisons between mobile and shore IMAs should also be made. Analyses of individual repairs are needed to determine if they are necessary and whether they can be performed more economically through other means, such as by contract. Potential for consolidating redundant capabilities in certain geographic areas should be analyzed periodically. At times there are as many as four IMAs--three mobile and one shore-based--located within a few hundred yards of each other.

The impact of changing maintenance concepts is another important consideration. New programs and modern technology will significantly affect the future maintenance requirements of naval vessels. Careful assessment of these changes is needed to determine their potential effect at each maintenance level.

ANALYZING THE ISSUES

The Navy assumes and we would presume that the wartime requirement is greater than that in peacetime. But we found that the peacetime maintenance requirments were determining IMA needs and that the Navy had not determined the wartime need based on projected maintenance work required in war.

The basic management problems, therefore, revolve around (1) establishing wartime requirements--what are the repair needs and how they can best be satisfied, by mobile IMAs, shore IMAs, or both, (2) matching these requirements with refined peacetime requirements, (3) determining how best to maintain IMA readiness and the skills needed to man them in war while effectively utilizing or retaining their availability in peacetime.

Improvements in existing organizations can be made to achieve increased productivity, but dramatic improvements, such as the consolidation or elimination of some activities and functions cannot be made until a correlation between peacetime and wartime needs is drawn. Through these efforts peacetime resources can then be most effectively managed while responsiveness to wartime needs is assured.

In the chapters that follow we will examine into the Navy's overall planning efforts for wartime and peacetime needs, and we will test the adequacy of their peacetime workloading, efficiency of operations, and productivity.

CHAPTER 3

DETERMINING WARTIME MAINTENANCE REQUIREMENTS

Accurate predictions of intermediate maintenance requirments during wartime are needed to determine the appropriate level of IMA wartime effort--required capabilities, capacities, and number of mobile and shore IMAs.

Detailed analyses of the wartime ship repair needs should be the starting point. Once needs are estimated, how can they best be satisfied? This would include determining the requirements for geographic dispersion, the necessity of movement once dispersed, and the alternatives available, including the availability and use of shore-based maintenance facilities.

The Navy's current wartime mobile IMA requirements are not based on such analyses. In addition, no wartime role had been established for most of the Navy's shore-based IMAs.

During our review the Navy began to reassess its IMA wartime needs. They also recently completed a study of wartime requirements for shore IMAs. Some of the analyses will take many years to complete. The completed study on shore IMAs does not address those issues required to determine the optimum level of support.

The Navy should continue with their analyses. Particular attention should be directed toward quantifying the minimum number of mobile IMAs required under modern naval war scenarios. These assessments should include an evaluation of more economical and efficient shore-based facilities in fulfilling wartime maintenance requirements.

MEASURING TOTAL REPAIR NEEDS

Determining wartime repair needs is the first step in developing IMA wartime requirements. Detailed analyses of probable workload under modern warfare and logistics support should form the basis for decisions about the number and types of IMA repair shops needed and the necessary manning levels. At the time of our review, we were told that no such analyses had been made.

Nevertheless, the Navy believes that wartime repair needs would be greater than peacetime needs because:

--Ships will incur battle damage.

--Equipment failures will occur more frequently because of the increased tempo of operations.

--The ship's crew will be too busy searching for and engaging the enemy to perform some preventative and other maintenance while at sea.

--Crew members will need rest and recreation from the vigors of wartime operations when their ships come in for maintenance. Therefore, they will provide less than normal assistance to maintenance activities.

Although these factors should be considered when determining requirements, without specific studies and analyses, they do not provide quantitative information on expected wartime workloads. For example, there is no recent experience which supports the need for repairs because of battle damage. In addition, it has not been determined whether and to what extent wartime operations would affect IMA workload above peacetime levels. The Vietnam conflict, for instance, exemplified a period of increased tempo without significant changes in IMA workload. Navy representatives said this period of conflict was not representative for IMA experience because of the extensive support provided by shore repair facilities in the Pacific. For the most part, the mobile IMAs had a supporting role in ports where these facilities were located, such as Subic Bay, Philippines.

In their official response, the Navy did not concur that the Vietnam effort exemplified a period of increased tempo without significant changes in IMA workload. They said that, although the demand placed upon the IMAs did not significantly change, the poor material condition of the Navy's ships at the end of the war indicates that much required maintenance had not been accomplished.

The Navy position addresses one of the issues that we believe should be included in their studies on wartime requirements; that is, how much work can be deferred in wartime? If much essential work can be performed by other than mobile IMAs and other work can be deferred, then a potential may exist for reducing the requirements for mobile IMAs.

An offset to wartime requirements based on the above Navy factors is the amount of wartime losses through

attrition--losses which would reduce the war and peace requirements. In recent congressional testimony the Navy said that naval-force losses during the first 30 days of a war would be high (actual figures were classified).

In addition to attrition factors, analyses should be made using modern wartime scenario and weaponry data to determine the amount of battle damage which could and should be repaired at IMAs. Considering the high probability of serious damage being inflicted by modern antiship and antisubmarine weapon systems, it is difficult to imagine the types of ship or submarine damage which would be repairable at IMAs. We did not find any Navy analyses in which this type of data has been or is being developed for conversion into maintenance requirements.

Past Navy studies which attempted to quantify mobile repair facility requirements assumed that historical data of repairs performed on surface ships in peacetime reflected the wartime repair demand. That is, the repairs performed in peacetime would be necessary in time of war and repairs made at the IMA level are a measure of those needed at that maintenance level. Peacetime historical data, however, provides no information concerning (1) whether the repairs were necessary or make-work projects, (2) whether the repairs should have been performed at the IMA level of maintenance, (3) the consequences of deferring the work, or (4) the necessity, in a war, of performing the repairs at the forward areas of conflict.

The Navy has recently begun new studies to determine IMA wartime and peacetime requirements. But in the initial analyses the peacetime historical data is again being used as the basis for determining these requirements (see p. 21). As indicated above, peacetime historical data is not the best basis for determining wartime repair needs. In addition, as discussed in chapter 5, peacetime historical data as currently reported is not even reflective of actual peacetime repair needs.

SATISFYING WARTIME REPAIR NEEDS

Once total wartime maintenance requirements have been better defined for the intermediate maintenance level, additional analyses will be required to determine how and where these requirements will be satisfied. In other words, should wartime intermediate maintenance be performed at shore facilities, at forward areas using mobile facilities, or both?

If mobile facilities are required, where will they be needed under various war scenarios and what is the minimum number required?

Although current studies do not adequately address such basic issues, the Navy contends that mobile IMAs are the fundamental maintenance base for wartime scenarios. Based on information available to us, we believe indepth analyses are needed to support the number of mobile IMAs required. A recent cursory analysis within the Navy of wartime deployment schedules raised a serious question as to the need for two of the mobile IMAs. This precipitated further analyses within the Navy.

Mobile facilities

According to Navy officials, analyses have been performed which attempt to quantify the number of mobile IMAs that can be economically justified. One such analysis was the Mobile Repair Facility Requirements Study for surface ships dated May 13, 1972. This study was an economic analysis to determine how many mobile IMAs should be built if the amount of money available to build and operate surface ships and mobile IMAs were held constant. The study determined the number of ships that would be required in each geographic area as prescribed by the postulated threat and war scenarios. The incremental expenditures for IMAs were then traded-off against the changes in the cost of the total number of surface ships required to maintain a fixed number of ships on station. If there were no IMAs, the ship would have to go to the nearest shore facility, a necessity which would increase the time away from the station and require more ships. Adding mobile IMAs reduces transit time and the inventory required to keep a specified number of ships on station.

The study showed that for optimum economies in funds expended, fewer mobile IMAs than in the current inventory could support more ships than are currently in the fleet. The study also recognized the need for further analysis to develop wartime repair needs to use in lieu of historical peacetime activity and to isolate those wartime needs essential for mobile IMA support. It concluded that

> "* * * the capabilities and capacities of mobile repair facilities as well as the economic numbers to have in the fleet depend upon the repair needs of the fleet. If shore facilities are available for repairs, then the capabilities, capacities

and numbers of mobile repair facilities depend, not upon the total repair needs of the Fleet but upon those repair needs which must be and can be satisfied at locations away from available shore facilities. No data were discovered which would support an estimate of these repair needs."

Another recent internal Navy study of current deployment plans for the existing surface mobile IMA inventory showed, according to one official, that only seven of the nine destroyer tenders were needed. Basically, this study considered the availability of shore facilities on the U.S. coasts to support ships operating in these geographic locations. The Navy had previously considered that the same percentage of mobile IMAs would deploy as the ships they were to support. The fact that some of the ships would not deploy far from coastal shores was not reflected in the requirements. This study has precipitated additional analyses of these requirements.

According to the Navy there are no completed analyses which support the current size of the surface tender inventory. Studies have been completed for other logistic support ships, such as oilers and supply ships.

Aircraft sortie rates, ship steaming hours, manning levels, geographic locations, repair parts demand rates, times for resupply and other such information form the basis for determining petroleum, oils, lubricants, foods, and repair parts requirements in wartime and, in turn, the numbers of mobile support ships needed to resupply the fleet with this material. But this type of analysis has not been done for tenders, and the current procurement program is based on a one-for-one replacement of the older, less capable tenders.

The reasoning used in the 1972 study mentioned above is also used to justify the need for attack submarine tenders. Basically, it was assumed that if an IMA were not located at a particular station, additional submarines would be needed to cover that geographic location when some were going to and from shore maintenance activities. An indepth analysis of repair needs has not been made, and under this philosophy an IMA may be required whether there are 5 or 20 submarines operating within a particular area.

Ballistic missile submarine tenders have been justified as support for missile-firing submarines. Generally, these submarines operate under wartime conditions as part of our strategic forces. Currently, limited by the range of their missiles, they are usually stationed in forward areas such as Holy Loch, Scotland, where they also receive IMA maintenance. By the early 1980s, however, there will be no requirement to support these submarines from mobile IMAs because the increased range of the new Trident missile will permit them to operate from U.S. ports. (See ch. 4.)

Other analyses of the need for mobile IMAs have been performed for the Joint Chiefs of Staff Operation Plans. But, these studies do not reflect realistic needs because the inventory upon which they were based is dramatically higher than any current or proposed fleet size and because other data used, such as repair needs, was incomplete, outdated, and based, for the most part, on peacetime repairs.

Shore facilities

At the time of our analysis, no wartime role had been established for most of the Navy's shore-based IMAs. There are no shore-based IMAs overseas. In satisfying wartime repair needs, we believe that the use of U.S. coastal shore facilities should be emphasized for the economic and efficiency reasons discussed in chapter 4. In addition, further consideration should be given to using overseas shore activities--those existing Navy maintenance activities as well as the potential for support from our allies.

Since 1972 new shore IMAs have been established and some existing ones expanded as part of a program to provide meaningful shore billets for personnel who spend a disproportionate amount of time at sea. These personnel have skills which, for the most part, are needed only onboard ships. The shore IMAs allow these persons to work in their skill area while on shore duty. Additional shore billets also improve the sea-to-shore rotation ratio, which reduces family separation time, improves morale and, it is hoped, improves the retention of these skilled persons.

Although established for commendable reasons, the need for these shore activities was not based on firm peacetime maintenance requirements and, at the time of our review, did not support any wartime requirement.

Once these activities were established and work was programed into them, the maintenance hours expended then became the justification for both the existence and the need for constructing new facilities and modernizing others.

These facilities did not exist when the above-mentioned 1972 study was made. But they did exist and were considered as available in the cursory analysis of deployment schedules which resulted in a conclusion that only seven, not nine, destroyer tenders were needed; that is, only seven destroyer tender IMAs were required to be mobile.

In their response to our report, the Navy said that since we completed our work, a study had been completed which establishes a wartime role for shore-based IMAs.

We briefly reviewed this study and had major problems with it for the same reasons discussed above regarding previous Navy studies. First of all, peacetime workload is once again used as the foundation to which other factors for increased tempo of operations, battle damage, etc., are added.

Peacetime workload may be a good starting point in any analysis, but it should be refined. As discussed in chapter 4, the current workload hours reported expended are overstated because they include much time spent on nonrepair activities such as watchstanding, mess cooking, leave etc. Also included is time spent on unnecessary work.

In addition, much of the work normally scheduled in peacetime may be deferred in wartime--both intermediate and organization level work. For example, we noted in this study that much of the planned workload requirements after the first 2 months of the war would be for organizational maintenance. The Navy believes that this work could not be performed by the ships' crew during the rigors of combat. Determinations about whether this preventative type maintenance has to be done at all or can be deferred over time were not made in this study.

Other factors were not considered, such as the attrition rates or whether some ships would move from one ocean to another. It was presumed that all ships would remain in their respective ocean operating areas and although some would suffer battle damage, none would be lost. The study also presumed that all ships would return to the United States on a scheduled basis for normal repairs--this also does not appear realistic in time of war.

We believe that the capabilities of shore IMAs should be analyzed when determining how the Navy can best satisfy its wartime maintenance requirements. If all the work could be performed there most effectively in wartime, it should be planned for there, because in peacetime it is more economical to use these activities than the mobile IMAs.

However, before the decisions are made on the numbers, size, location, and whether new IMAs will be built or older ones modernized, accurate, realistic data should be developed to determine these needs. Also, the impact that this will have on the need for mobile IMAs should be simultaneously analyzed.

Regarding overseas shore-based IMAs, the Navy says that the reasons for not having them are that IMAs must be mobile and that any facility on foreign soil is in jeopardy of being lost and subject to negotiation and renegotiation for its use.

In peacetime, mobility is not essential, nor is the need for large numbers of IMAs overseas. Except for some training exercises and selective deployment overseas, the tenders remain affixed to a pier in their home port, and few are deployed. Of the 25 tenders in the inventory, only 8 are deployed at a time. Of these eight, three are supporting ballistic missile submarines. By the early 1980s these IMAs will no longer be required overseas or in a mobile form because of the range of the Trident missile system.

In the Pacific each of the four tenders, including the ballistic submarine tender, are located, most often, in the ports where substantial maintenance capability exists: in Hawaii, the Philippines, Guam, and Japan. Because of the extensive shore-based maintenance capability in the Pacific area, the need for any deployed IMA capability in peacetime could be questioned. The Navy's position and our comments on this and the question on the next page pertaining to the role of mobile IMAs during the Vietnam era are discussed on page 12. We believe our questions are valid and should be considered in determining future IMA needs.

In the eastern Atlantic and Mediterranean Sea areas, there are no U.S. Navy shore-based maintenance facilities. There are currently four mobile IMAs in these areas, two of which support ballistic submarines. As in the Pacific all remain stationary in the sheltered waters of the friendly countries of Scotland, Spain, and Italy. If these IMAs were not available, the only other alternative

at this time for providing these maintenance services in the European area would be through foreign nation resources. In view of the availability of existing IMA assets and the minimal peacetime requirements for overseas IMAs, it would not now appear practical to establish overseas facilities or to rely on foreign resources for support of peacetime repair requirements. However, we believe the potential for using Allied nation resources should be continually analyzed especially in light of the discussion on wartime requirements to follow.

An analysis of wartime needs is more difficult because of the lack of recent wartime IMA usage history. There has been no wartime usage of IMAs in the Atlantic since World War II and not much more in the Pacific. Even during the most extensive Navy involvement in the Vietnam conflict, the IMAs were not used in the role for which they are designed.

During the peak of the Vietnam era, the size of the fleet supporting this effort doubled in size from 80 to 160 ships. The associated expansion of maintenance workload was principally assumed by the overseas shore facilities, especially the one at Subic Bay, the Philippines. Repairs due to battle damage, although minimal, and casualty damage, accidental explosions, etc., were performed by the Subic Bay facility. The IMAs acted in a supporting role in the ports where the repair facilities were located.

Although the size of the fleet doubled during Vietnam, the IMAs' role was not vital in returning the ships to their battle stations and, therefore, their need, especially in a mobile form, was not established.

Will these repair facilities be available in the future? The Navy says the uncertainty of the answer to this question is one reason for mobile IMAs. However, recent Navy statements appear to be contrary to this concern. The Navy told the Congress in 1976 it was considering phasing out the facility in Guam, a U.S. territory and not in jeopardy of being lost, and increasing the maintenance activity on non-U.S. soil in the Philippines and Japan.

The Navy told us that it did not now intend to phase out the Guam repair facility and that the need for this facility and the vulnerability of the one in the Philippines is recognized. But according to fiscal year 1977 appropriation hearings, Navy intended to phase the Guam facility down to a caretaker status or close it. The

proposal was to reduce staffing down to about 200 persons--from the high in 1969 of 2,600.

The Navy said in these hearings that the facilities in the Philippines and Japan are in a better position than Guam to support the fleet because they are closer to the normal operating areas. Again, the issue as we see it, is how do these positions relate to the need for mobile IMAs or the ability of our allies to help support the fleet in their planned operating areas.

In the Atlantic, with no existing U.S. Navy maintenance facilities onshore, could the repairs allocated by the Navy to mobile IMAs operating in friendly, sheltered harbors and ports be satisfied by existing North Atlantic Treaty Organization country shipbuilding and ship repair organizations?

As stated previously, we believe this is an alternative worthy of consideration. As discussed below, we believe that the map on page 25 shows that our European allies have a capability to provide significant amounts of intermediate maintenance support.

The numbers on the map represent our count of shipbuilders listed in the "International Shipping and Shipbuilding Directory" who have the capability of building ocean-going vessels, small ones as well as super oil tankers, cargo ships, and Navy ships including submarines. Many of these also advertised major ship repair capabilities, and many would presumably be capable of less complex intermediate level repairs. The dots represent some of the key locations where these companies have their facilities.

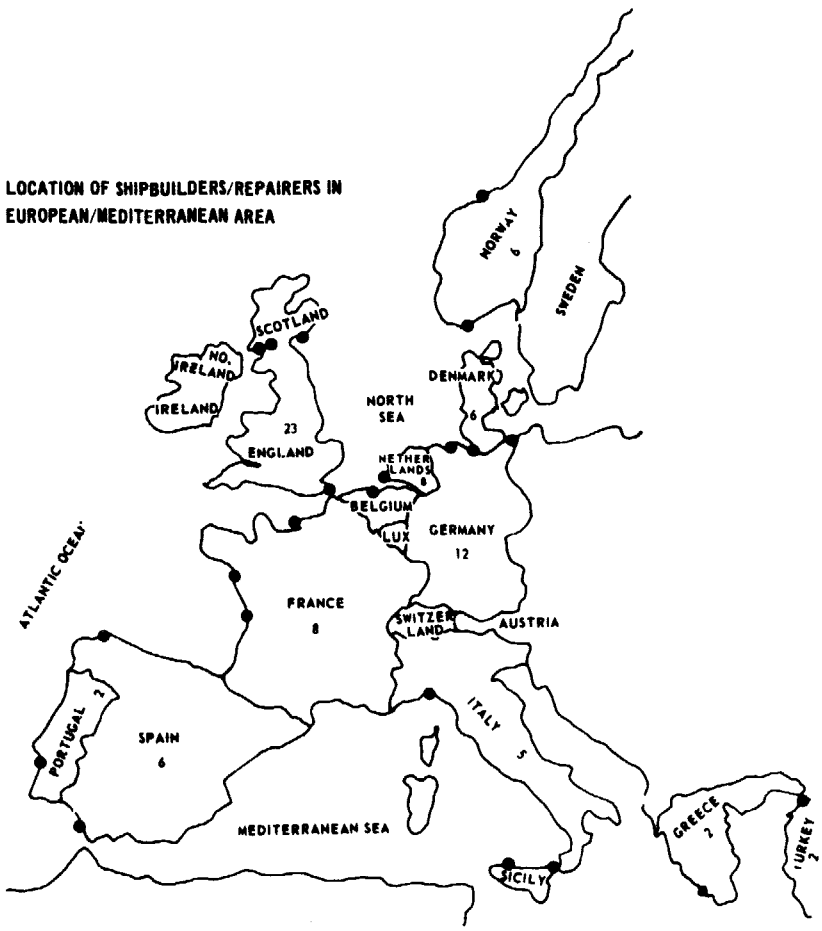
Although our analysis was brief, we believe it demonstrates the feasibility of including allied major and intermediate ship repair capabilities in war planning. As with mobile IMAs, the war planning should also include the protection of these assets.

As previously mentioned, no wartime role had been established for most of the Navy's shore-based IMAs, nor had their availability been considered in any in-depth analyses of wartime needs. When their availability was considered in an analysis of ship wartime deployment schedules, the Navy determined that two of the existing mobile IMAs could be eliminated and the wartime maintenance requirements met. This would indicate that the peacetime maintenance requirements are considered to be higher than those in war. The Navy, however, believes that the reverse should be true.

The Navy needs to analyze the war and peace repair needs and organize its maintenance programs accordingly. They recognize this and have begun numerous studies with this in mind.

The Navy says that in those instances where current studies do not address the issues we have raised, new ones will start to do it.

We commend the Navy for their actions. We recognize that in some instances corrective action will take time and we will continue to monitor their progress. But, we believe that in the interim and before major decisions are made on the sizing of the IMA support level, key data such as the peacetime historic workload should be refined before it is used in Navy analyses.



CHAPTER 4

DETERMINING PEACETIME MAINTENANCE REQUIREMENTS

The Navy's peacetime intermediate maintenance capabilities have developed over time without systematic consideration of many basic issues. After examining these issues and current IMA operations, we believe there are several opportunities to improve IMA efficiency and reduce maintenance costs. To reassess its peacetime maintenance requirements and achieve certain economic benefits, the Navy should:

--Analyze all maintenance requirements to define the types of work that should be performed at each maintenance level--organizational, intermediate, and depot.

--Validate total intermediate maintenance requirements using scientific workload analyses and accurate historical data to arrive at realistic estimates of total manpower needs. The Navy's current requirements estimates are overstated.

--Evaluate the economic differences among the various maintenance levels giving particular attention to the economic advantages of shore IMAs. Also, the feasibility of consolidating redundant capabilities in certain geographic areas should be studied.

--Assess current work tasks to eliminate nonessential and uneconomical work

--Consider the impact of changing maintenance concepts on the total maintenance strategies and requirements.

Each of these issues is discussed in detail below. An additional issue affecting requirements determination is IMA productivity. This is addressed in chapter 5.

The Navy concurred with our conclusion and outlined the progress underway to correct the problems discussed here and in chapter 5. As previously stated, we commend the Navy for their efforts and will continue to monitor their progress. The studies to determine future maintenance needs will take time. It is therefore essential that the repair work currently reported as being done be refined before it is used in any interim study of IMA needs in peace or war.

DETERMINING THE APPROPRIATE LEVEL OF MAINTENANCE

Past and current projections of IMA requirements have been based on historical data and estimates. The Navy has not completed any scientific engineering studies to identify which maintenance tasks should be performed at the intermediate level versus the other maintenance levels. Without such studies, there is no assurance that current IMA capabilities and capacities match the workload that ideally should be performed at this level.

In its fiscal year 1977 Program Objective Memorandum, the Navy for the first time recognized the need for a systematic review of its maintenance strategies, requirements, and resources. To accomplish such a review, the Navy established the Ship Support Improvement Program. This program was further defined in the fiscal year 1978 Program Objective Memorandum, which states:

> "* * * the program is not primarily concerned with solution to immediate problems, but with the longer term development of a maintenance strategy for all ship classes within the Navy. This effort will distribute total ship maintenance functions among depot, intermediate, and organizational levels and fill present support gaps such that adequate fleet material condition is maintained. The program will assure that the various support elements are synchronized and focused upon the common goal, readiness, reliability, and maintainability of the ships systems."

Although this program is a step in the right direction, it will not be complete for many years. In the meantime, additional effort should be directed to analyzing the existing workload to determine whether all tasks should be performed and, if so, at which maintenance level.

The results of a recent test program illustrate the critical need for careful maintenance workload analyses. In fiscal year 1976, the Navy established the Equipment Maintenance Related Material program on a test basis for 38 ships. The objective of the program was to increase the productivity of organizational maintenance personnel by removing funding limits for repair parts. Lack of funds for repair parts had been cited as one reason for underutilization of shipboard repair personnel.

Although we did not evaluate the merits of the program, Navy officials said preliminary results showed that ships with unlimited funds for repair parts completed 27 percent more maintenance jobs. Also, the Navy concluded from the program, that improved performance at the organizational maintenance level will probably result in a significant reduction of work deferred to the IMA and depot levels. Letters from two of the ships included in the test stated that as much as 80 percent of the maintenance tasks that would have been deferred to IMAs were completed by shipboard personnel.

The Navy plans to expand the Equipment Maintenance Related Material program in fiscal year 1977 at a cost of $74 million. However, at the time of our review, no analyses had been made to measure the corresponding impact on requirements at the IMA and depot levels. In addition, the Navy had not measured the true success of the program--whether real economies and efficiencies were obtained by completing more maintenance tasks at the organizational level instead of at the other maintenance levels.

The Navy in their response to our report said that, based on the initial results of the test, a $26 million reduction was made in depot level emergent repair funds in the 1978 budget request.

Our followup on that point indicated that the $26 million reduction was not a direct result of the above-mentioned program. The Navy said that this estimation wasn't done scientifically. Basically, they noted that, in the past years, organizational and intermediate staffing has been increasing. And, this must be having an effect on depot-level work, so they reduced it by $26 million. We were also told that both the $74 million and $26 million figures are old figures. New figures are not now available but they are expected to be lower than previous estimates.

VALIDATING THE FUTURE NEED FOR MAINTENANCE RESOURCES

Accurately projecting future workload levels is one of management's key responsibilities. Since projected workloads are used to estimate future economic resource levels, the data compiled and used for forecasting requirements must be accurate. Nevertheless, we found many overstatements in the historical information used by the Navy for projecting its future IMA workload and manpower needs. As a result, Navy's estimated future IMA personnel requirements are also overstated.

Navy's IMA budgeting process

Detailed analyses of workload, of what should and what should not be done at this level, have not been incorporated into the IMA budget process. For the most part, the Navy assumes work performed in the past will be performed in the future. This approach to budgeting depends heavily on the IMA management information system which documents and accumulates IMA direct or productive staff-hours charged for ship maintenance.

To project its future workload, the Navy determines the total productive hours used by the IMAs during the last year. The Navy adjusts this total to allow for expected workload changes and to add time for overhead and nonproductive time such as leave, military duties, and training. Total estimated IMA hours are then converted to an equivalent number of people. Comparing this number of people with the current IMA personnel level determines whether there is a need to increase or decrease total IMA personnel in the future.

Overstated IMA requirements

Using these budgeting procedures, the Navy estimated in its 1978 Program Objective Memorandum that IMA personnel should be increased by 1,247 to meet projected workloads. Since overstated data from the IMA information system was the basis for this determination, we believe the Navy's estimates are also overstated. The Navy's IMA information system lacks adequate controls to insure accurate and reliable input data. Chapter 5 discusses this in more detail and describes a few of the many reporting inaccuracies identified at the IMAs visited.

Although quantifying the overstatement of IMA reported staff-hours is difficult, we obtained some indication of the extent of overstatement by comparing jobs completed and productive staff-hours used for two periods of time. During the third quarter of fiscal year 1975, most IMAs were using a full staff-hour accounting system which reported and categorized both productive and nonproductive hours. During the third quarter of fiscal year 1976, most IMAs had dropped the full staff-hour accounting and reported only direct productive staff-hours expended. Without the full staff-hour accounting, many IMAs reported nonproductive time as productive, an error which resulted in time overstatement.

Our test showed that overall the number of IMA jobs completed, or workload, increased by only 2.6 percent during the test period while productive staff-hours charged increased by 35 percent. Furthermore, assigned repair personnel decreased by 8 percent during the period. Other factors, such as more difficult jobs, could account for some of this difference. But, based on discussions with shop supervisors and our tests of the reporting system, we believe most of the difference is due to an overstatement of productive staff-hours. Below are selected examples showing the results of the comparison.

	Percentage increase or decrease (-) in jobs completed	Percentage increase or decrease (-) in staff-hours used
U.S.S. Simon Lake	-19	64
U.S.S. L.Y. Spear	-12	77
U.S.S. Shenandoah	17	67
U.S.S. Proteus	22	57
U.S.S. Prairie	61	127
U.S.S. Samuel Gompers	7	45

The Navy basically agreed that the above-mentioned information system encouraged overstated productivity reporting. They stated that, as an added measure of productivity, they would record productive man-hours expended per work request completed. This, however, was done under the old system.

The key is not where productive hours are recorded but what is included in a productive hour. The IMAs were recording productive hours to the work requests but included leave, liberty, watchstanding, food preparation, etc., as part of a productive hour or day. We believe a full-staff-hour-accounting system is best to record both productive time to jobs and nonproductive time to other military duties and free time.

Although the Navy agreed that the system encourages overstated productivity reporting, they did not agree that estimated personnel requirements are overstated. The Navy feels that workload at IMA's is understated because customer ships' crews lack sufficient experience and, thus, are unable to identify all work required. As a result, some work that should be done at IMA's is not identified, the condition worsens, and a serious problem occurs which requires work at

a depot rather than an IMA. We agree that customer ships have staffing problems, but our reviews 1/ have shown that the most significant shortages have been in the mid-level ranks and not in the senior experience levels. In a soon to be issued report entitled, "Urgent Need for Continued Improvements in Enlisted Career Force Management," we show that in terms of the Navy's stated career experience profiles, the Navy is meeting its objectives in the senior and lower levels but again fall short in the midrange level personnel with 10 to 15 years' experience. We believe that the senior level persons should be able to identify problems needing IMA attention.

The Navy also disagreed with our conclusion that most of the increase in staff-hours used was due to overstatement of productive staff-hours. To the contrary, the Navy feels that actual productive hours had increased due to special efforts to improve IMA support of the fleet. The Navy said

--new quality assurance procedures were instituted,

--personnel from other departments were shifted to repair work, and

--much overtime was worked.

We recognize that the above factors could have some impact on reported hours, but we don't believe the effect is nearly as appreciable as the overstatement of hours by ship supervisors. In our review, we asked the supervisors at the IMAs visited to list, for a given day, the number of productive hours and nonproductive hours (by type) actually used. And we asked them to provide the number of productive hours reported as used.

For the most part, the supervisors were consistent in reporting much nonproductive time as productive. Some of the logic given was (1) if we report low actual productive hours, we will get much more work to perform and (2) the system does not provide the means to report overtime unless the total available staff-hours are reported as being expended.

1/GAO reports:
"Impaired Combat Readiness of the Navy's Atlantic and Sixth Fleets," B-146964, June 30, 1970.

"Navy Logistic Support of the 7th Fleet in Southeast Asia: Continuing Logistics Issues and Constraints," B-146964, June 25, 1974.

example of the latter situation is this. There are four persons normally assigned to a repair shop, two are available for work on a particular day and two are on leave. The two work 10 hours. Under the current system, the shop supervisor should report 32 hours available, "20 hours productive, 12 hours nonproductive. The supervisors, however, want to show that his people worked overtime so he would report 36 hours of productive time.

Because neither the Navy nor we admittedly can measure the amount of the overstatement over a period of time, it is imperative that the system be revised and monitored to provide a full accounting of how available hours are used.

It is important to note that in budgeting for staff years, factors for nonproductive time--as presented on page 36--are applied to the reported productive time. So in the example above, nonproductive factors to account for the absence of the two persons for such things as leave would be applied to the 36 hours not the 20.

EVALUATING ECONOMIC FACTORS

Management decisions should include an analysis of all relevant costs. For example, when developing ship maintenance strategy, Navy managers need to consider differences in the cost of work at different maintenance levels. In addition, the cost differences of alternative approaches within the same maintenance level need to be scrutinized. Through economic evaluations of such issues, management can identify, and eventually achieve, opportunities for savings. We believe the Navy should increase its economic analyses of maintenance work and place greater reliance on the results of such studies in its decisionmaking process.

Analyzing costs at different maintenance levels

Economic considerations are important when deciding which maintenance level should do a task when more than one level is capable of doing it. In this regard, Navy officials have stated that, in considering work at an IMA versus doing it at a depot, as much maintenance work as possible should be performed at the intermediate level because of economics. They contend that the cost to do a job at an IMA is less than the cost to do the same job at a shipyard.

Because of the previously discussed overstatement of IMA productive staff-hours used, it is extremely difficult to determine the cost of a productive hour of labor. For purposes of estimation only, we used two methods.

In the first method, even though we know they are inflated, we used the hours expended as reported by the IMAs. Uninflated hours, when divided into the IMA operating costs, would result in a higher average cost per hour. These costs as computed here were also used as indicators in our section on uneconomical work on page 42.

We compared the cost of an hour of productive labor at the IMA and shipyard levels. For both levels, costs included direct labor, indirect labor, materials, and other major overhead items. Our analysis showed that the average hour of productive labor at an IMA costs $27.80. This cost is an overall average composed of the shore IMA cost of $21.15 per productive hour and the mobile IMA cost of $30.66 per productive hours. At the shipyard level, an average hour of productive labor cost $23.51.

In the second method we used available productive hours computed using both actual data and Navy estimates. This method of computing available hours is illustrated in detail below. In using available hours and the costs of operating Atlantic Fleet IMAs, we found that (with a shore IMA cost of $34.07 and a mobile IMA cost of $63.38) the average hour of productive labor equaled $48.19.

In their response the Navy said that their calculations show that the cost of a productive hour at a shore IMA is $26.55--no costs were provided for mobile IMAs or the shipyards. As previously stated, it is difficult to determine the cost of a productive hour at the IMAs. At the time of our review, the Navy could not provide us with these costs--so we computed our own. Even if we use the $26.55 figure, the relationships between the above costs do not change much, so we did not analyze where there were differences between our figures and the Navy's.

The Navy also said that a direct comparison between shipyard and IMA productive labor hours is not valid because trade skills differ between civilian and military. So, in general, more civilian than military are required to accomplish the same job.

We recognize that trade skills and union requirements can have an impact on comparisons--the military person can work overtime with no additional cost and can do various skill activities without breaking union rules. However, there are other important considerations which must be addressed in specific, not general, terms. We did not find any Navy analyses which made such comparisons.

The key consideration is that much of a military person's time in peacetime is spent on military duties. As shown on page 36, 42 percent of the repairperson's time on the tenders was spent on military duties, leave, training, etc.--43 percent at shore IMAs.

Similarly, in a recently issued report 1/ on military versus civilian work at shipyards, we showed that 43 percent of the military person's time is required for security watches, housekeeping, supply, food service, medical services, laundry, inspections, and other activities associated with daily shipboard life.

To our knowledge, neither we nor the Navy have compared civilians' productivity while actually working with that of the military.

We attempted to do so but, with the time available, we were only able to obtain indicators of differences. We compared work done by the ship's crew versus estimates of how long it would take shipyard personnel to do it and work done by the IMAs and estimates of cost to do it in the civilian sector.

There was a dramatic difference in both instances; the military work took much longer and cost much more. In the first instance, six jobs done by the ship's crew were compared with shipyard estimates of man-hours to do the same tasks. In total, the ship's crew expended about 3,500 hours, and the shipyard estimate was about 900; a difference of 2,600. Examples of the IMA differences are shown on page 43 and in appendix II.

We recognize that military duties are necessary; however, these needs must also be given significant weight in any comparison of civilian versus military productivity and the costs of their work.

Analyzing costs within the intermediate maintenance level

In providing intermediate maintenance, shore IMA's are more efficient and economical than mobile IMA's. In facility costs alone, there is a vast difference between the estimated

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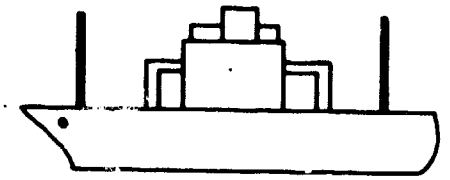
1/"Changes in Navy Ship Overhaul Practices Could Improve Fleet Capability and Crew Effectiveness," FPCD-77-76, April 8, 1977.

$260 million cost for a new tender and the estimated $35.6 million cost for a new shore IMA. Also, in operating costs and personnel utilization, the shore IMA is economically superior to the tender.

As shown in the illustrations on the next two pages, the shore IMAs devote more than twice as much of their total manning to customer maintenance needs than mobile IMAs--28 versus 13 percent. The primary difference is attributed to the mobility factor--many personnel are required to move, operate, and maintain a ship. Also, a considerable amount of time is spent by the repair department in maintaining the ship.

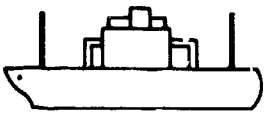
For tenders, the actual percentage of personnel available for customer work to total ship manning ranged from 8 to 18 percent. The range for shore IMAs was from 17 to 39 percent. Percentages of productive hours used on self-maintenance varied on tenders from 10 to 54 percent, with 29 percent as an average. For shore IMAs, this figure ranged from 0 to 14 percent, with 9 percent as an average.

PERCENT OF TOTAL MOBILE IMA REPAIR PERSONNEL HOURS AVAILABLE FOR CUSTOMER MAINTENANCE SUPPORT



Total Average Manning On Mobile IMAs:

930 persons or 1,867,440 available staff-hours per year. 100% of total.



Total Repair Department Personnel:

409 persons or 821,674 available repair department hours per year. 44% of total.

44 percent of the personnel are in the repair department. The remaining 56% are needed basically because this IMA is a ship and is mobile – ship operators, suppliers, engineers, communicators, on deck persons, etc.

Repair Personnel In The Repair Department:

303 persons or 608,038 available productive hours per year. 33% of total.

74 percent of repair department personnel are repairpersons. The remaining 26% are supervisors, suppliers, timekeepers, etc.

Repair Personnel Available – Equivalent Hours:

176 persons or 352,662 equivalent productive hours available per year. 19% of total.

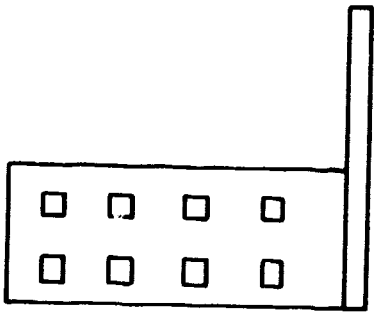
58 percent of the repairpersons' time is spent at work. The remaining 42% of IMA time they are on leave, sick, performing military duties, in training, etc.

Repair Personnel Available For Customer Work:

125 persons or 250,390 equivalent productive hours available per year for customer work. 13% of total.

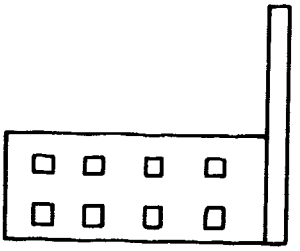
71 percent of the repairpersons' time at work is spent on work for customers. The remaining 29% of the time is for self-maintenance.

PERCENT OF TOTAL SHORE IMA REPAIR PERSONNEL HOURS AVAILABLE FOR CUSTOMER MAINTENANCE SUPPORT



Total Average Manning At Shore IMAs:

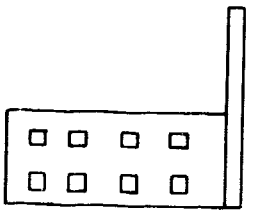
479 persons or 961,832 available hours per year. 100% of total.



Total Repair Department Personnel:

354 persons or 711,756 available repair department hours per year. 74% of total.

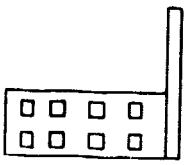
74 percent of the personnel are part of the repair department. The remaining 26% are administrators, planners, estimators, suppliers, schedulers, etc.



Repair Personnel In The Repair Department:

259 persons or 519,582 available productive hours per year. 54% of total.

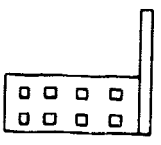
73 percent of repair department personnel are repairpersons. The remaining 27% are supervisors, suppliers, timekeepers, etc.



Repair Personnel Available — Equivalent Hours:

147 persons or 296,162 equivalent productive hours available per year. 31% of total.

57 percent of the repairpersons' time is spent at work. The remaining 43% of the time they are on leave, sick, performing military duties, in training, etc.



Repair Personnel Available For Customer Work:

134 persons or 269,507 equivalent productive hours available per year for customer work. 28% of total.

91 percent of the repairpersons' time at work is spent on work for customers. The remaining 9% of the time is for self-maintenance.

The following table summarizes some of the economic differences between an average tender and an average shore IMA.

	Average tender	Average shore IMA
Estimated replacement cost (millions)	$260	$35.6
Estimated cost per productive staff-hour (note a)	63.38	34.07
Overhead personnel to repair personnel ratio	2.1 to 1	.85 to 1
Percent of productive hours used for self-maintenance	29	9
Percent of total personnel supporting needs of customer ships	13	28

a/Based on available hours as discussed above.

The Navy provided their own figures in their response to our report. We revised our figures where appropriate.

The Navy's biggest concern was that we excluded the repair department's planners, etc., from our calculations of available hours for customer maintenance support; that is, we included only direct labor time as part of customer support and in actuality the support persons also provide indirect support to the customers.

The purpose of our illustrations was to provide indicators of differences at the mobile and shore IMAs between productive time available and costs of operations. To do this, we used repairperson's available time. We believe this is an excellent indicator of the amount of actual repair work which can be expected from these activities.

Regardless of the figures used the relationship remains the same; the shore IMAs have twice as much time available to make repairs. Our figures show 13 percent for mobile and 28 percent for shore; the Navy's are 18 and 38 respectively. As previously stated, the cost figures should only be used as indicators because the data for productive hours is admittedly not pure.

We believe that the economic differences between shore and mobile IMAs should be considered by the Navy in allocating its intermediate level resources. As much as possible, providing intermediate capability ashore should be favored as a means of reducing maintenance costs.

Assessing potential for consolidation

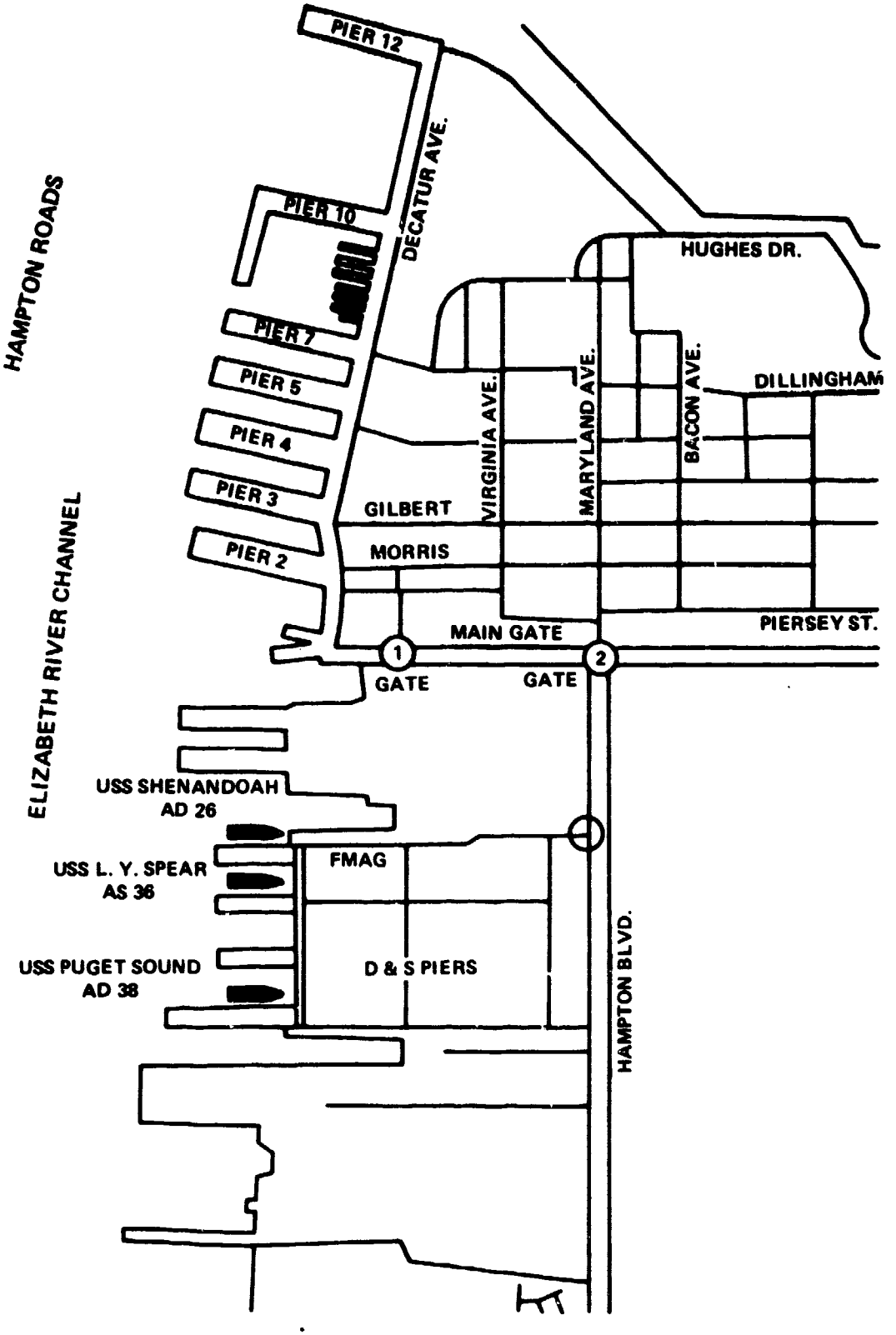
The Navy has no formal policy for locating its IMAs during peacetime. However, tenders and shore IMAs are usually home-ported in areas having large concentrations of assigned Navy ships, such as Charleston, South Carolina; Norfolk, Virginia; and San Diego, California. When several IMAs are assigned to the same area, considerable duplication results in facilities, repair capabilities, and overhead and support personnel.

The map on the following page shows the waterfront area of the Norfolk Naval Station and the locations of the four IMAs in that area at the time of our review: the U.S.S. Shenandoah, AD-26; the U.S.S. L.Y. Spear, AS-36; the U.S.S. Puget Sound, AD-38; and the FMAG. Except for infrequent training exercises and selective deployments overseas, the tenders remain at their waterfront piers in their home port.

Overall, these IMAs had 3,235 personnel assigned including 1,591 repair personnel. Although there were some differences, the repair capabilities of each IMA were generally the same. The following table lists some of the repair shops that were duplicated at each activity.

	Personnel Assigned			
Repair shop	U.S.S. Spear	U.S.S Shenandoah	U.S.S. Puget Sound	FMAG, Norfolk
Shipfitter	34	18	18	11
Sheet metal	20	11	17	8
Inside machine	53	33	45	12
Electrical repair	20	9	13	10
Pipe and copper	23	17	21	11
Refrigerator/ air-conditioning	1	3	3	3
Foundry	16	6	9	a/0
Sail loft/canvas	5	4	7	5
Electronics calibration	12	6	15	a/0
Engraving	2	1	3	5
Print	6	4	7	a/0
Photo	4	2	3	a/0

a/FMAG, Norfolk did not have this shop.



U.S. NAVAL STATION NORFOLK

Duplication also existed in support functions. Each of the Norfolk IMAs had administrative and supply departments and each of the tenders had personnel fulfilling ship engineering, ship operations, and medical functions.

There were similar duplications of personnel and repair capabilities in Charleston and San Diego. In the Charleston area, there were 3 tenders and 1 shore IMA with a total of 3,353 personnel assigned, and in San Diego, there were 5 tenders and 1 large shore IMA with about 8,000 personnel assigned.

As previously discussed, we believe the Navy should first of all reevaluate the necessity of having all of the existing shops at the IMAs. In addition, it should assess the potential economic benefits of consolidating IMA functions and capabilities.

The Navy did not agree with our alternatives to (1) reduce the peacetime manning in the active forces and add trained reserves during wars and (2) consolidate certain functions and work centers ashore in a particular geographic area. They said that peacetime manning is for peacetime workload and wartime reserve augmentations for IMAs are programed to enlarge the work force for expected wartime workloads. Also, they said it was militarily impractical to consolidate IMA functions and work centers ashore.

We consider these viable alternatives which should be considered in the Navy analyses. Certain functions, such as administrative personnel, medical, supply, workload planning estimating, and scheduling, etc., appear to be excellent candidates for consideration. Also, why can't one foundry or similar type shops be operable in a geographic area, minimally staffed, and supplemented staffing be furnished by reserves?

How can the Navy manage the peacetime operations of a foundry most efficiently? There are a multitude of variations, depending on many factors, and the Navy should analyze all. But, for example purposes, we present a solution based on these assumptions:

--There is a wartime requirement for 10 foundry shops and all should be on mobile IMAs.

--The peacetime requirement is minimal--the work can be done by commercial sources in the United States or at U.S. and allied country activities overseas.

--To satisfy the wartime requirement, equipment, trained people, supplies, etc., must be planned for and available on time.

--Shore IMAs improve the sea-to-shore rotation schedule.

--In peacetime, many IMAs operate within rather close proximity to each other.

The Navy could equip the 10 tenders, but not man them with active duty personnel. Reserves would be trained in the necessary skills and would either train on the tenders throughout the year if they are nearby, or during their 2 week annual training if they are not. Needed supplies could be part of war reserves either on the ship or elsewhere, but available when necessary. Keeping the tenders in an inactive status would improve sea-to-shore rotation by reducing the number of persons who would have to rotate from sea duty billets to shore duty assignments.

We might want to change one of the above assumptions; rather than depending entirely on commercial foundries in peacetime; selected shore IMAs might also have foundries. This would provide additional shore billets to improve the sea to shore rotation and also provide an additional personnel surge in time of war.

If consolidated activities are established, the management goal would be to satisfy Navy-wide demands, not just customer ship needs.

Again, we believe alternatives such as above should be considered by the Navy in developing more effective methods of operating IMAs in peacetime.

ELIMINATING UNNECESSARY WORK AND UNECONOMICAL WORK WHERE PRACTICAL

It it the Navy's policy that IMAs should perform only necessary work and that this work should be performed as efficiently and economically as possible. Adherence to this policy would help insure the best possible return from the Navy's investment in intermediate maintenance manpower and material resources.

At most of the IMAs we visited, however, we found many completed maintenance jobs that were either nonessential or very uneconomical when compared with civilian contractors' cost estimates to do the same work.

We recognize that at times trade-offs are made between economics and the need for training to maintain skill proficiency. The examples given below are used to illustrate that the Navy should continually seek more essential maintenance work to provide this training.

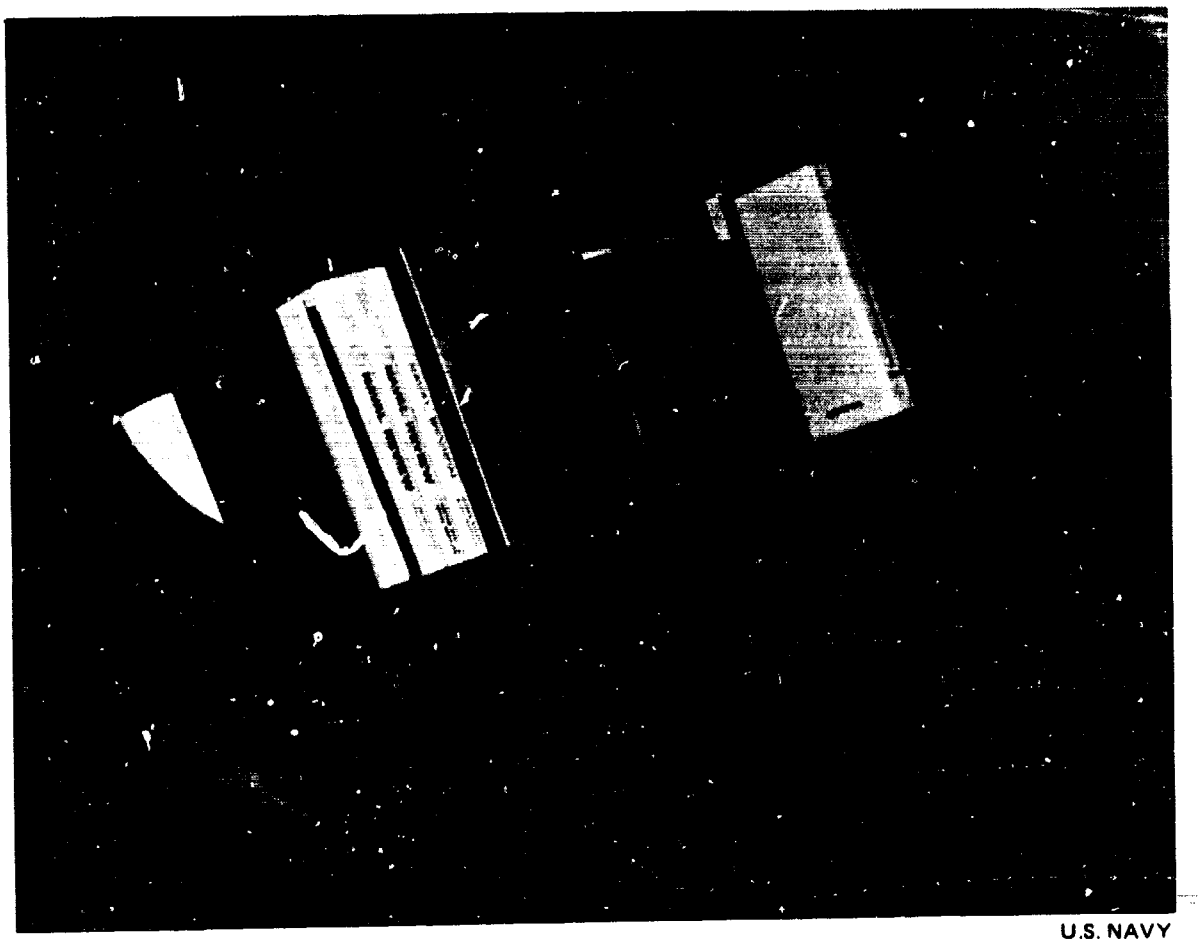
We are not saying that the Navy should have necessarily issued contracts with the civilian sector for the work described below and let the IMA personnel remain idle. We question first of all, whether some of the work should be done by anybody. Secondly, if the Navy determines in its studies that certain personnel need training in peacetime to maintain wartime repair work proficiency, we believe that there is sufficient essential work available in the Navy to train these persons, maintain productivity, and satisfy the above-mentioned Navy maintenance policy.

Questionable work

IMA work that did not seem to be essential included such items as printing standard forms that were available through the supply system and manufacturing picture frames, bookcases, tables, wall plaques for awards and souvenirs, and decorative pieces. Half or more of the available staff-hours in eight shops at three IMAs were used to make such items. During a 7-month period on one tender, the carpenter and pattern shops used 1,989 staff-hours to make ceremonial items and plaques. This is the equivalent of two persons working full time. Using an average cost of $27.80 for each IMA productive staff-hour, we estimate that this work cost over $55,000.

Below are three examples of questionable IMA work.

--The pattern sh[illegible] on a submarine tender made two mahogany bookshelves. (See photograph below.) According to the shop supervisor, the bookshelves would probably be used as office furniture. Based on the 56 productive staff-hours charged to this job, we estimate that the bookshelves cost the Navy $1,557. A local civilian woodworking shop would have made two identical bookshelves for $150.



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--A foundry shop on a destroyer tender used 132 productive staff-hours to make 24 brass plaques for a customer ship. (See photograph below.) The plaques were to be used as awards. We estimate that the plaques cost the Navy $153 each. The manager of a commercial foundry said his company would manufacture and sell the same plaque for $23 each.

U.S. NAVY

--On another tender, 40 hours were used by the carpenter shop to produce six mahogany projectile heads to fit 5-inch shell casings. The completed casings were to be used for decorative purposes on another ship. Based on productive hours used, we estimate that this job cost $1,112. A local vendor was willing to produce the items for $216.

Uneconomical work

Preventative maintenance, repairs, equipment calibrations, and many other services are necessary to keep ships in top operating condition. Because of the high cost of these services, IMA managers need to make timely, responsive, and economical decisions when determining whether to (1) repair or replace inoperative equipment or components and (2) perform certain maintenance in-house or have it done by private firms. Although such decisions are sometimes difficult and involve many variables, we believe improvements can be made to seek maintenance work which is both essential and will provide valuable training for Navy personnel.

On one tender, for example, the decision was made to repair rather than replace an inoperable portable air compressor (see photograph on next page). The compressor was used to supply fresh air to underwater divers. At the time of our visit, several shops had used a total of 1,299 productive hours repairing the compressor and an estimated 142 additional hours were needed to complete the repairs. Using the average cost of $27.80 per productive hour, we estimate that the repairs will cost over $40,000. The Navy could have purchased a new, technically equivalent air compressor through the Navy's supply system for $17,000.

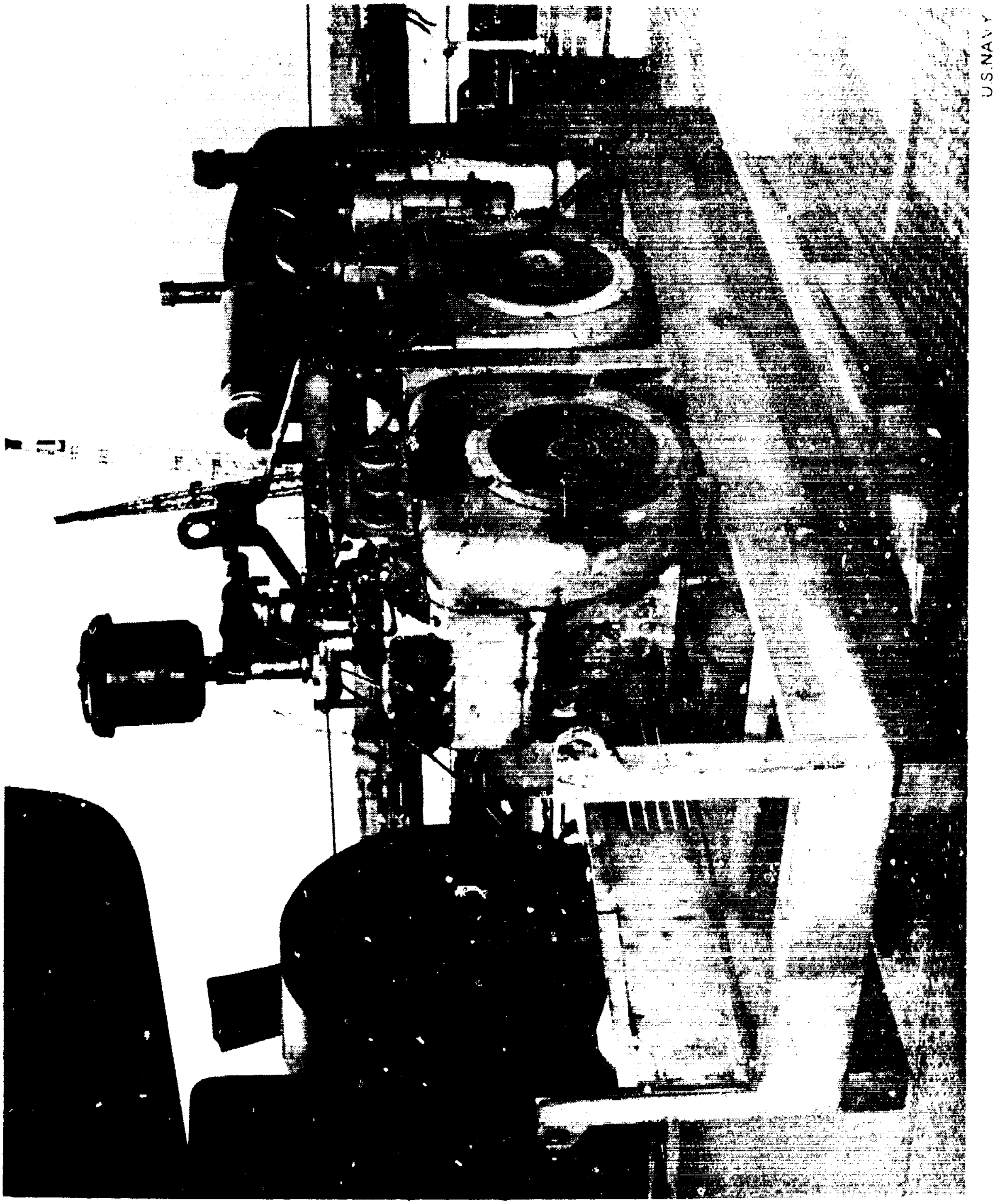
In another example from the same tender, the canvas shop made a cloth awning for the ship's signal bridge. (See photograph on p. 48.) Based on the 339 productive hours used on this job, we estimate that the awning cost the Navy $9,424. The owner of a local awning manufacturing company said he would make and install the awning for $1,100.

The typewriter shop on another tender used 20 hours to overhaul a manual typewriter at an estimated cost of $556. A commercial typewriter shop was willing to perform the same repair work for $150, $406 less. Or a new, equivalent typewriter could have been obtained from the Navy's supply system for $164.

Additional examples of questionable and uneconomical IMA work are presented in appendix II.

ASSESSING CHANGING MAINTENANCE CONCEPTS

As technology advances, ship designs and weapons systems change and new maintenance concepts are developed. For military readiness as well as economic reasons, the impact of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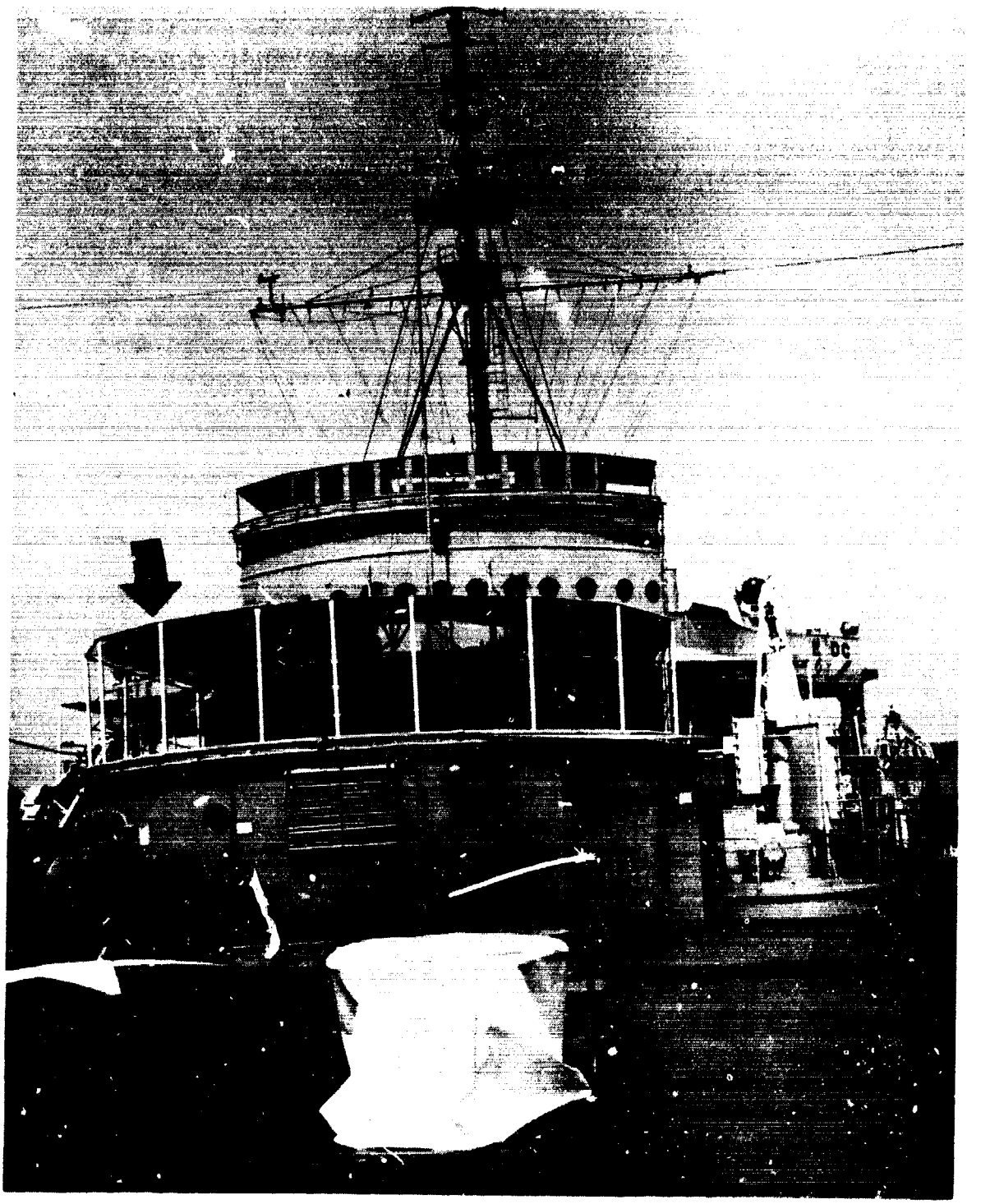

U.S. NAVY

such changes on maintenance requirements should be assessed early and needed adjustments should be made to the appropriate maintenance echelons.

The development of the Mark 48 torpedo is an example where improvements are needed in determining maintenance support requirements prior to systems introduction into the fleet. Although the Navy spent about $5.8 million modifying IMA tenders to provide maintenance support of these torpedoes, we were told that current plans call for all maintenance support to be furnished by selected shore-based overhaul facilities, not the tenders. The IMAs will store complete torpedo rounds but will not provide maintenance support except in an emergency.

In our report, "Why Improved Navy Planning and Logistic Support For The Mark-48 Torpedo Are Essential," dated May 9, 1977, we reported that the Navy did a good job initially in applying the Integrated Logistic Support concept during torpedo development. However, the acquisition of facilities to establish maintenance shops aboard tenders and at shore locations was made with no assurance that they would be needed to support the torpedo as originally designed.

The IMA workload in support of the extended submarine overhaul cycle is another example where actual demands on IMAs may be less than original estimates. The goal of this program is to extend the time between major overhauls for newer nuclear attack submarines. To compensate for the reduced frequency of overhauls, the Navy planned for short but intensive shipyard availabilities and increased maintenance at the IMA level. In preparing for the impact of this new maintenance concept, the Navy officials stated they estimated the maximum amount of work that could be performed at the IMA level. Although there were differences of opinion within the Navy as to who would perform much of this work, shipyards or IMAs, we were told that the Navy planned for additional IMA manpower to meet the maximum effort.

According to Navy officials, actual experience on the first few submarines entering the program has shown that much work planned for the IMA level is being performed at the shipyard level. Also, it now appears that the major portion of the extended submarine operating cycle work will be performed by shipyards. A similar program for destroyers is under development, but its impact on IMA workload has not been estimated.

Another new maintenance concept which affects requirements is the repairable components concept. Under this concept, ship personnel remove inoperable modular components

and install new or repaired components. Most inoperable components are sent to a rework facility for repair rather than to an IMA.

New ships of the FFG-7 and PHM-1 classes were designed to take full advantage of the remove and replace concept. The Navy has determined that there is a requirement to provide dedicated rework capability and capacity to support these ships. Incremental buildup of electronics, mechanical, and electrical rework capabilities at existing facilities is in progress. However, the full impact of this program on the Navy's maintenance organization is still being evaluated.

Another major change in maintenance support involves the fleet ballistic missile submarines. The Navy plans to construct 10 Trident submarines by the early 1980s. Due to the increased range of the new Trident missile, the submarine does not have to be deployed to forward areas for the missile to reach its target. Therefore, maintenance support for these submarines will be provided at a shore-based facility. There is no need for mobile IMA support for the Trident. The Navy also plans to install the Trident missile system on existing Poseidon submarines beginning in 1979. Although plans for maintenance support of the converted Poseidons have not been formalized, mobile IMA support will not be needed. One Navy official stated that ballistic submarine tenders not considered necessary after the Poseidon conversions will be retired from the fleet or shifted to support attack submarines.

CHAPTER 5

OPPORTUNITIES TO IMPROVE INTERMEDIATE MAINTENANCE EFFICIENCY

Productivity of repair personnel is a key issue in developing a maintenance stragegy. Currently, military personnel costs account for over half of the total amount spent on intermediate maintenance of ships. The Navy has recognized the need to promote IMA producitivity and has initiated various plans to do so. However, attempts to assess and improve productivity have been impeded because of weaknesses in the IMA management information system and a continued lack of well-trained personnel.

NEED FOR BETTER MANAGEMENT VISIBILITY

The key to productivity improvements is an effective information system which gives management the data needed to identify and correct problem areas. A decrease in the staff-hours used for each unit of desired output is generally accepted as an indication of productivity improvement. Therefore, to improve productivity, an information system should help maintenance managers answer the following questions:

--What was the productivity during the base period? In other words, how many staff-hours were used, and how much work was done?

--How many staff-hours should be required to do a given task? Or, to what degree can effective management result in productivity improvements?

--What was the productivity during the test period? Did management actions achieve the desired result?

Certain elements should be built into the information system to provide the data needed to answer these questions. First, there must be controls over the accuracy of data in the system. Second, the system must include a staff-hour accounting system which tracks all available staff-hours, both productive and nonproductive. Third, independently and economically developed labor standards must be used. Such standards indicate the time an experienced mechanic needs to do a task effectively, at a normal pace and in a predetermined manner, allowing adequate time for fatigue and and personal needs. Besides helping to control productivity, labor

standards can be used to schedule workloads. And finally, an information system should provide comparisons and summaries of data, so that the data will be readily available to management. For example, by comparing a labor standard with the reported actual time do a task, management can determine the reasonableness of the actual time.

The Navy's system and its shortcomings

Managers at all but one IMA we visited relied upon the management information system to control intermediate maintenance, and report the productivity of assigned personnel. Data entered into this system is to include:

--The identity of all items accepted by the IMA for maintenance.

--A brief description of the repairs needed and references to applicable technical data.

--Scheduled start and completion dates and estimated staff-hours for each job and each assigned IMA shop.

--Direct staff-hours charged to the repairs.

Although the information system was designed to provide managers at all levels with much useful data, it had several shortcomings in controlling productivity. For example, because the system tracked only staff-hours actually charged to maintenance, managers of the IMAs we visited did not know how about 40 percent of the direct staff-hours assigned to them was used. Also, the staff-hour estimates to perform maintenance tasks were mostly based on the estimator's personal judgment and experience rather than independent, engineered estimates of the time it should take to do the work. Since the estimators at many IMAs were also shop supervisors who would later be responsible for completing the work, unbiased estimates were usually not obtained.

The Navy's information system also failed to routinely provide managers with summary data comparing actual hours charged with the initial estimates. Thus, no real attempt was made to measure IMA's productivity. Finally, the information system did not adequately control the accuracy of reported hours. As a result, much of the data was inaccurate and unreliable.

Inaccurate reporting on productivity

Each of the nine IMAs we visited which used the IMAs information system incorrectly reported direct hours used on maintenance tasks. Although the extent of this problem varied among the IMAs, in each case it resulted in the overstatement of productive hours used. The potential impact of this overstatement on budgeting for future requirements was discussed in chapter 4.

Most reporting errors were caused by clerical mistakes or misunderstandings of reporting procedures--particularly the reporting of nonproductive time as productive. Under the Navy's system, only productive hours, those used directly on maintenance tasks, are to be reported. But many shop supervisors reported all available direct hours as productive including nonproductive time, such as leave, liberty, training, military duties, shop cleanup, and coffee breaks.

The following examples show the variety of reporting inaccuracies by IMAs we visited.

--On one tender, 7 of one shop's 22 productive workers were absent for a portion of the day on February 20, 1976. Three workers were temporarily assigned to kitchen duty and quarters cleaning, two were on special liberty, one was on leave, and one was away for training. Because of these absences, the shop had only 138 hours available. Yet, the shop reported working 174 hours on this day to avoid the appearance of being nonproductive.

--The hose shop on another tender had three productive workers assigned. On August 2, 1976, one worker was on leave, one was away for training, and one was performing nonproductive tasks for another shop. Although no work was performed on this date, 28 productive hours were reported for this shop. The shop supervisor could not explain how this happened.

--The electric shop at a shore IMA reported working 6,016 hours on one job on March 23, 1976, although the shop had only 120 direct hours available each day. The shop supervisor said this was a clerical error--only 16 hours were actually worked on the job. When we completed our review, the overstatement of 6,000 hours had not been corrected.

Reporting inaccuracies such as those described above greatly restricted the usefulness of the Navy's IMA information system for all management levels. Errors in input data can only lead to errors in the output data used by managers for budgeting, workload planning, and scheduling decisions.

NEED FOR ASSIGNING BETTER TRAINED PERSONNEL TO IMAs

Intermediate maintenance activities, like other labor-intensive industrial organizations, need well-trained personnel to accompish their work efficiently and effectively. Well-trained, experienced personnel need less supervision, work faster, and produce more and better quality products than personnel with little or no training or experience. Generally, as the quality of workers increases, so does productivity.

During our visits to the IMAs, particularly tenders, we noted that many of the productive personnel lacked experience and training in their assigned skill areas. The Navy has also expressed its concern for the quality of personnel assigned to its IMAs. Navy's Program Objective Memorandum 1977 states:

> "The managers of Navy's IMA assets, afloat and ashore, are in substantial agreement that the manpower furnished to them is not adequately trained for the maintenance and repair work it is expected to accomplish. * * * In general, their low level of training for such work is reflected in the low level of productivity found in IMA's."

Top management at five of the seven tenders we visited agreed that the quality of personnel assigned hampered IMA productivity. For example, one repair officer complained that because of the large number of unqualified personnel assigned, his IMA lost many productive hours redoing unsatisfactory work and providing extensive on-the-job training and supervision.

Measuring quality of IMA personnel

To assess the manpower quality problem, we measured three indicators of IMA personnel experience and training--rank, completed tours of duty, and service school completion. Overall, we found that 35 percent of productive

personnel assigned to tenders are pay grade E-3 1/ or below, 62 percent have not completed their first tour of duty, and 17 percent have not completed service school. As expected, the quality of productive personnel was much higher at the shore IMAs where many higher ranked and experienced personnel are assigned for sea-shore rotation.

The following examples illustrate the manpower quality problem at the tenders we visited.

--On one destroyer tender, the electric repair shop was responsible for repairing and rewinding various types of electric motors. Yet only four of the eight productive workers assigned had completed a service school. Furthermore, seven of these workers had not completed their first tour of duty and only three were above pay grade E-3.

--The pipe shop on a submarine tender was responsible for repairing or replacing any piping system normally installed in submarines. Of the 20 productive personnel assigned, 17 were below pay grade E-4 and only 5 had completed their first tour of duty.

--Although only 8 percent of the productive personnel in another submarine tender's shipfitter shop had completed their first tour of duty, the shop was responsible for both minor and major repairs to submarine hulls and superstructures. This work included cutting, burning, grinding, drilling, and shaping metals used on submarines. Twenty-five percent of the workers had not completed a service school and 75 percent were below pay grade E-4.

A summary of the personnel statistics we developed for each IMA visited is presented in appendix III.

Navy's assignment policies and possible alternatives

Navy officials stated that personnel are assigned to tenders in the same manner as all operating surface ships based on shortages and required replacements. Since the primary missions of the Navy are sea missions, initial personnel

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1/Enlisted personnel pay grades are E-1 thru 9. E-3 is one level higher than that received upon successful completion of recruit training.

assignments are usually to sea duty. This practice results in many lower graded and inexperienced sailors being assigned to all surface vessels, including tenders.

We were told that shore IMAs are manned differently. Shore IMA jobs have been developed primarily to provide sea-to-shore duty rotation. Personnel ordinarily are not assigned to a shore IMA until completion of a tour of shipboard duty. By this time, the sailors are usually better trained and more experienced.

Several assignment alternatives exist which, if implemented, could result in higher quality personnel being assigned to tenders. One alternative is to assign personnel to tenders only after completion of service schools.

In the Navy there are few skills which are solely dedicated to repair maintenance assignments; so few people are repeatedly assigned to IMAs as part of their sea-to-shore rotation. Another alternative would therefore, be to increase the number of repair-dedicated personnel and rotate them between mobile and shore IMAs.

Officials told us that the Navy is currently considering such IMA personnel assignement alternatives as one method to increase the quality of IMA repair personnel. Another method being considered is assigning civilians to shore IMA facilities. Some of these alternatives may be counterproductive to the sea-to-shore rotation program and will have to be weighed accordingly.

Another aspect which should be considered in Navy anlayses of IMAs is the potential for transferring personnel billets from mobile IMAs to either shore activities or to reserve duty billets. In the latter case the mobile IMA manning would be reduced in peacetime, presuming the wartime requirement is more than that in peacetime, and reserves would be trained in repair skills and supplment this manning in time of war.

These actions would provide a twofold benefit. They would reduce sea duty billets with their inherent morale problems. They would also improve the sea-to-shore rotation requirement first by reducing the number of personnel which would have to rotate and second by providing for more billets to which sea duty personnel can rotate. If the IMA level does not provide for enough billets to satisfy meaningful sea-to-shore rotation requirements, assigning military to shipyards may be an alternative. We recognize that problems associated with shipyard unions would have to be overcome.

CHAPTER 6

CONCLUSIONS, RECOMMENDATIONS, AND AGENCY COMMENTS

CONCLUSIONS

The Navy's intermediate maintenance program has evolved to its current level without systematic consideration of many basic issues. Scientific engineering studies are needed to quantify IMA workload during both peace and war conditions. These studies would enable the Navy to accurately estimate the total IMA requirements and what portion of these requirements needs to be mobile.

Several opportunities exist to improve the efficiency and economy of IMA peacetime operations. Some can be accomplished within the existing organizations. For these, the Navy should:

--Perform only necessary work.

--Improve workload screening and scheduling to assure that the optimum trade-off is achieved between maintaining skill proficiency, keeping personnel productive, and repairing materiel economically.

--Improve IMA productivity. Improvements in IMA productivity have been impeded by the ineffectiveness of the Navy's management information system and by a lack of well-trained personnel assigned to repair shops.

--Improve IMA budgeting procedures so as to more accurately project future requirements.

In addition, we believe that there is potential for dramatic improvement in IMA operations. To realize this potential the Navy should:

--Define more specifically the types of work that should be performed at each maintenance level, emphasizing the wartime requirement, and then matching them against peacetime needs.

--Determine the most effective means for satisfying the wartime requirement--IMA capabilities that are mobile, located in the United States, located overseas, provided with assistance from our allies, mobile-air-transportable, or a combination thereof.

--Analyze cost differences between maintenance echelons and between alternative approaches within the IMA level. IMA productive labor is not necessarily less expensive than depot-level productive labor. Also, shore IMAs are more efficient and economical than mobile IMAs.

--Assess the impact of changing maintenance concepts. Some planned maintenance changes may significantly reduce requirements at the IMA level.

Presuming that the wartime capability/capacity exceeds that of peacetime, some of the alternatives available to promote efficient and economic peacetime operations could be to:

--Program work into the IMAs, not only from customer ships but from all Navy activities.

--Reduce the peacetime manning in the active forces and in case of war supplement it with trained reserve personnel.

--Deactivate mobile IMAs not absolutely necessary for military emergencies and eliminate redundant IMA maintenance functions and work centers in certain geographic areas and consolidate facilities ashore. Then provide for a phased increase in activity as necessary for war.

--Use any combination of the above.

RECOMMENDATIONS

We recommend that the Secretary of the Navy reassess the intermediate maintenance program and take advantage of several opportunities to reduce the cost of intermediate level maintenance. More specifically, we recommend that the Secretary:

--Use scientific engineering analyses to (1) define the maintenance work that should be performed at each maintenance level during peacetime and wartime and (2) quantify total peacetime and wartime IMA requirements. With such analyses, an optimum IMA effort can be determined and minimum necessary mobile capacity can be defined.

--Assess the impact of new maintenance concepts on intermediate level requirements. Particular attention should be given to the use of ballistic missile submarine mobile IMAs not needed in the 1980s because of the Trident program. These IMAs possibly could

be used to replace older ones instead of building new ones currently proposed.

--Based on the above analyses, reassess (1) the need for new mobile IMAs and deactivate those not absolutely essential for wartime emergencies and (2) the need for new shore IMAs in light of peace and war requirements. Also, where feasible, reduce redundant IMA maintenance functions and work centers in certain geographic areas, and consolidate facilities at the more efficient and economic shore-based activities.

--Improve IMA productivity by (1) establishing an improved management information system which uses labor standards, tracks all labor hours, and controls the accuracy of data, (2) evaluating personnel assignment alternatives to identify means to improve IMA personnel training and experience levels, (3) establishing procedures to prevent unnecessary work from being done, and (4) where certain proficiency skills are required to be maintained in peacetime for wartime needs, improve procedures to assure that the work scheduled is reasonably economical to perform in relation to results achieved.

AGENCY COMMENTS AND OUR EVALUATION

The Navy generally concurred with our conclusions and recommendations stating that we had correctly evaluated the management problems. They added that the Navy has many existing programs to correct the majority of problems we identified and is acting to originate programs to deal with problems not covered by existing programs.

We have included where appropriate the Navy's comments when they did not completely concur with our position or where they believed their position needed clarification.

We commend the Navy for their efforts in trying to define intermediate maintenance requirements. The difficult analyses may require many years to complete. Because of this, we will continue to monitor the implementation of the recomemndations in this report to determine whether the many issues raised are addressed and whether effective corrective actions are taken.

PRIMARY INTERMEDIATE MAINTENANCE ACTIVITIES

ATLANTIC FLEET

Norfolk, Va.

U.S.S. L. Y. Spear (AS-36)
U.S.S. Shenandoah (AD-26)
U.S.S. Piedmont (AD-17)
U.S.S. Vulcan (AR-5)
FMAG, Norfolk
Readiness Support, Little Creek (note a)

Charleston, S.C.

U.S.S. Orion (AS-18)
U.S.S. Canopus (AS-34)
U.S.S. Hunley (AS-31)
U.S.S. Sierra (AD-18)
Surface Force Altantic Support Group (note a)

Mayport, Fla.

U.S.S. Yosemite (AD-19)
U.S.S. Grand Canyon (AR-28)
FMAG, Mayport

New London, Conn.

U.S.S. Fulton (AS-11)
Submarine Support Facility, New London (note a)

Overseas

U.S.S. Gilmore (AS-16), LaMaddalena, Italy
U.S.S. Simon Lake (AS-33), Rota, Spain
U.S.S. Holland (AS-32), Holy Loch, Scotland
U.S.S. Puget Sound (AD-38), Naples Italy

PACIFIC FLEET

San Diego, Cal.

U.S.S. Dixon (AS-37)
U.S.S. Sperry (AS-12)
U.S.S. Dixie (AD-14)
U.S.S. Prairie (AD-15)
U.S.S. Sammuel Gompers (AD-37)
U.S.S. Ajax (AR-6)
U.S.S. Jason (AR-8)
Development and Training Center, San Diego (note a)

San Francisco, Cal.

U.S.S. Hector (AR-7)
Development and Training Center San Francisco (note a)

Pearl Harbor, Hawaii

U.S.S. Bryce Canyon (AD-36)
Submarine Base, Pearl Harbor (note a)
Development and Training Center, Pearl Harbor (note a)

Guam

U.S.S. Proteus (AS-19)

a/FMAG unit included.

APPENDIX I

EXAMPLES OF QUESTIONABLE AND UNECONOMICAL WORK

Work performed	Staff-hours used	Estimated Navy cost to do work	Vendor's estimated cost to do same work	Difference had vendor performed work	Other information
Manufactured six ornamental wood projectile heads	10	$ 278	$ 108	$ 170	
Manufactured four aluminum boat cleats	82	2,280	75	2,205	
Printed 200 change-of-command announcements and envelopes	55	1,529	210	1,319	
Manufactured four signal light covers	94	2,613	120	2,493	
Manufactured wood door	24	667	100	567	
Engraved 102 identification labels	80	2,224	335	1,889	
Manufactured 25 plaques	450	12,510	911	11,599	
Overhauled blower motor	71	1,974	72	1,902	A new motor could have been obtained through the supply system for $479.
Overhauled compressor motor	74	2,057	1,762	295	A new motor could have been obtained through the supply system for $1,610.
Manufactured 20 metal plaques	351	9,758	610	9,148	
Manufactured 14 parking signs for pier	40	1,112	883	229	
Overhauled vent motor	24	667	286	381	
Overhauled exhaust fan motor	23	639	245	394	A new motor could have been obtained through the supply system for $695.

APPENDIX II

EXPERIENCE AND TRAINING INDICATORS FOR IMA REPAIR PERSONNEL

IMA's visited	Productive personnel				Repair shops with 50 percent or more of assigned personnel			
	Total assigned	Below E-4	On first tour	With no service school	Total repair shops	Below E-4	On first tour	With no service school
Tenders:								
U.S.S. L. Y. Spear	496	203	333	50	65	16	35	4
U.S.S. Shenandoah	215	87	151	41	34	9	24	7
U.S.S. Sierra	321	130	231	80	53	20	41	9
U.S.S. Orion	454	115	230	74	52	6	26	5
U.S.S. Hunley	498	142	255	42	63	14	33	5
U.S.S. Dixon	216	93	169	68	37	4	12	4
U.S.S. Samuel Gompers	283	94	131	56	46	9	30	3
	2,483	864	1,550	411	350	78	201	37
Shore IMA's:								
FMAG, Norfolk	213	4	8	20	33	0	0	5
Support Group, Charleston	173	4	13	11	25	0	2	1
Develpment and Training Center, San Diego	1,017	33	48	150	56	1	1	4
	1,403	41	69	181	114	1	3	10
Total	3,886	905	1,619	592	464	79	204	47

APPENDIX III

APPENDIX IV

REPAIR ORGANIZATION WORK CENTERS ON A MOBILE IMA WHICH SUPPORTS SURFACE UNITS

REPAIR DEPARTMENT

R-5 DIVISION (REPAIR SERVICES)

SHOP NAME	WORK CENTER
Repair Admin. & A.R.R.S.	-10A
Conventional Planning	-10C
Nuclear Planning	-10D
Technical Library	-10E
NDT & Quality Assurance	-93A

R-1 DIVISION (HULL REPAIR)

Division Office	-09A
Shipfitter	-11A
Sheetmetal	-17A
Welding	-26A
Pipe	-56A
Lagging	-57A
Carpenter	-64B
Pattern	-64C
Key & Lock	-64E
Divers	-72B
Canvas	-74A
Foundry	-81A

R-2 DIVISION (MACHINERY REPAIR)

Division Office	-09B
Tool Room	-06A
Inside Machine	-31A
Engraving	-31B
Valve	-31D
I.C.E.	-31E
Printing	-37A
Outside Repair	-39C
Nuclear Repair	-38N
Photo	-39A
Boiler	-41A

R-3 DIVISION (ELECTRICAL REPAIR)

Division Office	-09C
Electrical	-51A
Outside Electrical	-51B
Interior Communications	-51G
Gyro	-51F

R-4 DIVISION (ELECTRONIC REPAIR)

SHOP NAME	WORK CENTER
Division Office	-09D
Electronics	-67A
Electronics Calibration	-67B
Crypto	-67C
Teletype	-67D

R-5 DIVISION (ORDNANCE REPAIR)

Division Office	-09E
Optical	-35A
Watch & Clock	-35D
Typewriter	-35E
Gun & Launcher	-38D
Fire Control	-67E
Sonar	-67G
Mech. Instr. Calibration	-96A

R-6 DIVISION (RADIOLOGICAL CONTROLS)

Division Office	-09F
Radiac Cal. & Inst.	-67F
Nucleonics	-94A

ENGINEERING DEPARTMENT

Battery	-51E
Oil & Water Test	-95A
CO^2 Recharging/OBA Repair	-25C
PQS Assist	-95C

WEAPONS LOGISTICS DEPARTMENT

Department Office	-10B
Asroc	-91B
Torpedo	-91C

DECK DEPARTMENT

Rigger	-72A
Paint	-99B

APPENDIX V

DEPARTMENT OF THE NAVY
OFFICE OF THE SECRETARY
WASHINGTON, D. C. 20350

23 June 1977

Mr. Fred J. Shafer, Director
Logistics and Communications Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Shafer:

This is in reply to your letter of 16 March 1977 to the Assistant Secretary of Defense (Comptroller) regarding "Navy's Intermediate Ship Maintenance Can Be Improved", (OSD Case #4578). The matter has been investigated and the results are provided in the attached report.

Sincerely,

E. Hidalgo

Edward Hidalgo
Assistant Secretary of the Navy
(Manpower, Reserve Affairs & Logistics)

Enclosure

APPENDIX V

Department of the Navy Reply

To

GAO Draft Report of March 1977

Navy's Intermediate Ship Maintenance Program

Can Be Improved

(OSD Case No. 4578)

APPENDIX V

1. Summary of GAO Findings and Recommendations

Many opportunities exist to improve efficiency, economy, and productivity of IMAs. Scientific, engineered studies are needed to quantify IMA workload during both war and peace to enable the Navy to accurately estimate IMA requirements. Based on these studies the need for new mobile IMAs and new shore IMAs can be assessed. Other significant recommendations are to improve work screening and scheduling, improve the definition of IMA level work, and establish an improved management information system.

2. Summary of Department of the Navy Position

The GAO draft report conclusions and recommendations are generally concurred in. The GAO has correctly evaluated the management problems facing the Navy in developing the full potential of the IMAs. The Navy has many existing programs which are intended to correct the majority of the problems identified by the GAO, and is acting to originate additional steps to correct those problems not correctable by the existing programs.

Certain specific findings addressed in the body of the report seem to reflect either misunderstandings of Navy policy, or possibly erroneous impressions drawn from discussions with officials not in a position to be fully informed of Navy policy in certain areas. These findings require comment to correct wrong impressions, to prevent misstatement of Navy policy or actions, and to state Navy concepts where in disagreement with GAO. Specific comments are provided on these findings in Section C of the detailed comments on the following pages.

3. Statement

The Navy is vitally interested in the full development of its IMAs, and is taking every step within its means to improve IMA performance. Much progress has been achieved already, and much more improvement is expected to be realized. The Navy Ship Support Improvement Program, a many faceted endeavor to develop an integrated, engineered ship maintenance strategy, contains the bulk of the programs which are designed to improve the IMA productivity, through training, improved facilities, and better work definition. Command attention at every echelon has resulted in many quick gains through schedule stability and advance planning improvements.

In the section that follows detailed comments are provided on each conclusion (Section A) and recommendation (Section B). In Section C comments are provided regarding findings discussed in the body of the report.

APPENDIX V

SPECIFIC COMMENTS ON CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

1. GAO Finding. The Navy's intermediate maintenance program has evolved to its current level of effort without systematic review and consideration of many basic issues.

Navy Position. Concur in part only.

Statement. Since 1975, IMA's have received substantial review, leading to the development of the following specific projects aimed at developing an IMA capability equal to the need in both wartime and peacetime, deployed and in the United States:

Shore Intermediate Maintenance Activity (SIMA) Program - to upgrade SIMA facilities to match today's state of the art.

Tender and Repair Ship Upgrade Program - to modernize older tenders and repair ships (which will remain in the fleet until 1985) to match today's state of the art.

IMA Training Plan - to train IMA personnel at all levels.

Mobile Repair Facilities Study - to determine the number of tenders required for wartime, based on wartime workload.

SIMA Mobilization Manpower Requirement Study - to determine the size of the reserve force required at SIMAs.

IMA Workload Analysis - Analyzed the peacetime IMA workload and programmed resources to accomplish.

IMA Combat Systems Repair Cability Improvement Program - to upgrade in a coordinated way the capability of IMAs to repair electronics and weapon systems.

Intermediate Maintenance Management System - Developed a Navy-wide computer based ADP management system for management of IMAs.

IMA Quality Assurance Requirements - To establish Navy-wide quality assurance standards for IMA work.

IMA Commercial Services Manual - to set forth instructions for SIMAs on handling IMA work contracted out.

IMA Productivity Objective Program - to establish standard productivity measures and Navy-wide standards of IMA productivity.

See digest, page v for GAO comments.

2. GAO Finding. Scientific, engineered studies are needed to quantify IMA workload during both peace and war conditions. These studies would enable the Navy to accurately estimate the total IMA requirements and what portion of these requirements needs to be mobile.

Navy Position. Concur. Such studies are being implemented.

Statement. Two programs, both now underway, are being conducted to solve a portion of this problem:

- Destroyer Engineered Operating Cycles - extends intervals between overhauls by determining, through engineering analysis, the precise maintenance requirements for each level of maintenance, and the schedule for accomplishing the maintenance. 43% of the Navy's ships will be encompassed in this program by the mid 80's.

- FFG-7 class maintenance strategy - this new class of ships is designed with a small crew in order to reduce the number of sailors required to maintain the ships. Much maintenance must be performed by IMAs. Major modernizations will occur at only 10-year intervals. To achieve this the maintenance is being carefully pre-planned through engineering analyses, which will define the IMA requirements precisely.

In addition, the Navy is now engaged in a complete analysis of its maintenance strategy, under the Ship Support Improvement Program. One of the tasks within the maintenance strategy analysis is to develop a logic to determine the maintenance requirements for all ships. With this logic the IMA requirements for every ship can be determined under any scenario or operating condition. When completed (analysis of maintenance requirements for a sample ship are scheduled for completion by early FY 78) the total IMA requirements, both afloat and ashore, can be accurately estimated. It must be pointed out that this is technically a very difficult and time-consuming task, and may require many years to complete, using the best engineering and analytical talent available in the United States.

3. GAO Finding. The Navy has begun to reassess its maintenance program but its studies are not addressing many key issues and some will not be complete for several years.

Navy Position. The Navy does not concur that Navy studies or programs are not addressing many key issues.

Statement. The objective of the Ship Support Improvement Program is to achieve an integrated, engineered ship maintenance strategy. Within this program the maintenance strategy analysis is scrutinizing the entire maintenance system and every existing institution. Although the full results are years away, interim developments from this effort will be implemented as soon as possible. In addition, the many short term programs listed in 1. above will provide improvements in many of the key areas.

See digest, page v for GAO comments.

4. GAO Finding. Several opportunities exist to improve the efficiency and economy of IMA peacetime operations.

Navy Position. Concur.

Statement. Programs to improve efficiency are (described in para. 1 above).

- Shore Intermediate Maintenance Activity Program
- Tender and Repair Ship Upgrade Program
- IMA Training Plan
- Intermediate Maintenance Management System
- IMA Productivity Objective Program

Programs to improve economy are:

- IMA Training Plan (will reduce the job rejection rate)
- IMA Quality Assurance Requirements.
- IMA Productivity Improvement Program

5. GAO finding. To do this (improve efficiency and economy) the Navy should:

a. Perform only that work which is necessary.

Navy Position. Concur

APPENDIX V

b. Improve workload screening and scheduling to assure that the optimum trade off is achieved between maintaining skill proficiency, keeping personnel productive, and repairing material economically.

Navy Position: Concur.

Statement. Improvement in this area has already been realized, although more can be expected. Progress to date has been achieved through high level command emphasis, particularly in scheduling. Navy is developing an expanded intermediate level work definition to improve workload screening.

c. Improve IMA productivity. Improvements in IMA productivity have been impeded by the weakness in the Navy's management information system and a lack of well-trained personnel assigned to repair shops.

Navy Position. Concur.

Statement. Some IMA productivity improvement has already been achieved through:

(1) Increased availability of repair parts through fully funded parts requirements.

(2) Currently implemented training for IMA repairmen and supervisors.

Nevertheless, much greater productivity improvements are expected through the programs listed in paragraph 4 above, and through an improved management information system. The current system does not account for sufficient data to accurately measure productivity. An earlier version of the system which did provide adequate data proved too cumbersome, and was revised to form the current system. The Navy plans to revise the system again upon replacement of the current computer with a more modern computer which will make proper data keeping much less cumbersome.

d. Improve IMA budgeting procedures to more accurately project future requirements. Current manpower requirements are overstated.

Navy Position. The Navy concurs that it should improve IMA budgeting procedures, but does not concur that current manpower requirements are overstated. Current manpower requirements are believed to be understated.

Statement. Current manpower requirements are based on the historical demand from customer ships for repair services. To project the historical workload into the future, the known backlog and the estimates of work required for new ships are added, and the work required for old ships being retired is subtracted. The projected workload is then ajusted for programmed productivity increases. Thus the manpower requirement is a function of the historical demand. That demand is a product, in recent years, of crews that have been short of experience and petty officers. Inexperienced personnel frequently fail to detect the need for maintenance until a condition deteriorates to the point that the machine fails, and depot repairs are required to restore it. Inspections of open machinery during overhauls often reveal conditions that could have been more easily corrected by an IMA had the condition been detected earlier. As the experience level increases aboard ship, the greater the expected demand for IMA repair services.

The maintenance strategy analysis will ultimately determine analytically the workload at all maintenance levels, and define the IMA workload for each ship type. The manpower requirement can then be based upon an engineered, analytical workload.

See pages 30 and 31 for GAO comments.

6. GAO Finding. We believe that there is potential for dramatic improvement in IMA operations. To confirm this potential the Navy should:

a. Define more specifically the types of work that should be performed at each maintenance level; emphasizing the wartime requirement, then matching them against peacetime needs.

Navy Position. Concur.

Statement. Navy is taking two actions to achieve this:

(1) Expanded definition of intermediate level work.

(2) Maintenance strategy analysis to determine all requirements and allocate them to maintenance levels.

b. Determine the most effective means for satisfying the wartime requirement -- IMA capabilities that are mobile, located in the U. S., located overseas, provided with assistance from our allies, mobile-air-transportable, or a combination thereof.

Navy Position. Concur.

Statement. The Navy is currently conducting a mobile repair facilities study to determine the number of tenders and repair ships needed for both wartime and peacetime.

c. Analyze cost differences between maintenance echelons and between alternate approaches within the IMA level. IMA productive labor is not necessarily less expensive than depot-level productive labor. Also, shore IMAs are more efficient and economical than mobile IMAs.

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Navy Position. It is not obvious that analysis of cost differences between maintenance echelons will lead to improvement in IMA operations. The Navy concurs that shore IMAs are more efficient and economical than mobile IMAs. However, the necessity for mobile IMAs in wartime makes it necessary to retain tenders and repair ships as a portion of the total IMA capability.

d. Assess the impact of changing maintenance concepts. Some planned maintenance changes may significantly reduce requirements at the IMA level.

Statement. This conclusion is being carried out through the analyses being conducted in the Destroyer Engineered Operating Cycle program, FFG-7 program, and the maintenance strategy analysis. It is doubtful that significant gains can be found here, though, because the Navy is short of qualified maintenance personnel at all maintenance levels.

7. GAO finding. Presuming that the wartime capability/capacity exceeds that in peacetime, some of the alternatives available to promote efficient and economic peacetime operations could be to:

a. Program work into the IMAs not only from customer ships but from any and all Navy activities to maintain high productivity.

Navy Position. This is now done to a limited degree in certain shops, such as the foundry where such work is programmed to maintain proficiency and safe operating procedures.

b. Reduce the peacetime manning in the active forces and supplement it with trained reserve personnel in war.

Navy Position. Do not concur. Peacetime manning is based on peacetime workload. Wartime reserve augmentations for IMAs are programmed to enlarge the workforce for expected wartime workloads.

See page 41 for GAO comments.

c. Deactivate mobile IMAs not absolutely necessary for military emergencies, and/or eliminate redundant IMA maintenance functions and work centers in certain geographic areas and consolidate facilities ashore. And provide for a phased increase in activity as necessary for war.

Navy Position. Mobile IMAs not necessary for either peacetime deployed support (see statement page 76, C.2) or wartime requirements should be deactivated. However, the Navy finds it militarily impractical to consolidate IMA functions and work centers ashore in certain geographic areas.

Statement. The Navy's Mobile Repair Facilities Study is aimed at determining the number of afloat IMAs, based on wartime needs. Those afloat IMAs that are remaining must keep all their work centers operating in order that they be fully capable in wartime. It is anticipated that tenders and repair ships will deploy early in any wartime scenario, and therefore will not be able to conduct a phased increase in activity in wartime.

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In order to ensure efficient loading of all work centers in each geographic area, the Navy has established IMA coordinators who monitor work center loading and balance work assignments so that overloading and underloading do not occur.

See page 41 for GAO comments.

B. RECOMMENDATIONS

1. GAO Finding. Use scientific engineered analysis to (a) define the maintenance work that should be performed at each maintenance level during peacetime and wartime, and (b) quantify total peacetime and wartime IMA requirements. With such analysis, an optimum IMA level of effort can be determined and minimum necessary mobile capacity can be defined.

Navy Position. Concur.

Statement. Analysis is currently being conducted for the new FFG-7 class of ships and ships to be placed under the destroyer engineered operating cycles. In the long run such analysis will be conducted for all ships by the maintenance requirement logic being developed by the maintenance strategy analysis.

The current Mobile Repair Facilities Study will assess the number of tenders and repair ships required based on today's best projections of workloads in peacetime and in wartime. When the long range maintenance strategy analysis is completed, and the workload is defined analytically, a redetermination of the mobile repair facilities required can be made as recommended by the GAO.

2. GAO Finding. Assess the impact of new maintenance concepts on intermediate level requirements. Particular attention should be given to the use of ballistic missile submarine mobile IMAs not needed in the 1980's because of the Trident Program. These IMAs possibly could be used to replace older ones instead of building those new ones currently proposed.

Navy Position. Concur.

Statement. The recommended assessment is already being conducted by the Naval Sea Systems Command. However, in regard to the use of ballistic missile submarine mobile IMAs, the establishment of the TRIDENT base will not eliminate the need for afloat tender support of SSBNs on the East Coast. Long range plans do exist. New TRIDENT submarines will go to the West Coast. However, several older SSBNs will be backfitted to carry TRIDENT missiles and tender support will be required through the 1980's. POLARIS SSBNs will be operational for some time to come. New TRIDENT submarines, if deployed in the Atlantic, will not be assigned to COMSUBLANT until the late 1980's.

3. GAO Finding. Based on the above analyses, reassess (1) the need for new mobile IMAs and deactivate those not absolutely essential for wartime emergencies, (2) the need for new shore IMAs in light of peace and war requirements. Also, where feasible, reduce redundant IMA maintenance functions and work centers in certain geographic areas, and consolidate facilities at the more efficient and economic shore-based activities.

Navy Position. The Navy concurs that when the analyses are complete it must reassess the need for new mobile IMAs and new shore IMAs. The Navy does not concur that it can consolidate facilities ashore, except where mobile IMA deactivations take place.

Statement. The afloat IMAs must continue to operate all their work centers in order that they be fully capable in wartime. It is anticipated that tenders and repair ships will deploy early in any wartime scenario, and therefore must remain fully operational in peacetime to maintain proficiency levels. Therefore, it is impractical to consolidate work centers ashore for operating mobile IMAs. The Navy has established IMA coordinators in every port who monitor work center loading in all the IMAs in that port and assign IMA work in a way that work center overloading and underloading do not occur.

See page 41 for GAO comments.

4. GAO Finding. Improve IMA productivity by (1) establishing an improved management information system which uses labor standards, tracks all labor hours, and controls the accuracy of data, (2) evaluating personnel assignment alternatives to identify means to improve IMA personnel training and experience levels, (3) establishing procedures to insure that unnecessary work is not performed, and (4) where certain proficiency skills are required to be maintained in peacetime for wartime needs, improve procedures to assure that the work scheduled is reasonably economic to perform in relation to results achieved.

Navy Position. Concur.

Statement. The Navy now has several programs in being to improve productivity, specifically:

- Shore Intermediate Maintenance Activity Program
- Tender and Repair Ship Upgrade Program
- IMA Training Plan
- Intermediate Maintenance Management System
- IMA productivity objective program
- IMA Quality Assurance Requirements

APPENDIX V

In the long term Navy, under the maintenance strategy analysis, is developing an improved management information system.

Regarding the recommendation to establish procedures to insure that unnecessary work is not performed, such procedures now exist. Screening by officials designated by the ship type commanders is specified in current maintenance directives. Work such as wood making and typewriter repairs are authorized to keep underutilized shops productive, in order that proficiency and shop safety procedures can be maintained. The IMA training plan and tender upgrade program will improve the capability level of many low-capability shops and make it possible for them to accept a wider range of repair tasks, and, therefore, perform more necessary work.

C. COMMENTS ON REPORT TEXT

1. GAO Finding (page 8). ...the Navy has made only the most elementary efforts to establish its wartime requirements.

Navy Position. Do not concur.

Statement. The Navy is currently conducting a mobile Repair Facilities Study which will determine wartime Mobile IMA requirements using the following:

(a) Repair workload which will project peacetime repair demands into a wartime operating scenario.

(b) Battle damage based upon a study (SEAMIX I Campaign Analysis) which used war-gaming techniques to determine battle losses and battle damage.

The Navy has completed a study (January 1977) of the wartime workload for shore IMAs, based upon the same two factors listed above.

See pages v, 9, 15 and 21 for GAO comments.

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2. GAO Finding (page 11). ...the reasons cited by the Navy for not considering shore-based IMA's in Europe do not appear to be valid, at least for the European theater.

Navy Position. Do not concur with this observation.

Statement. Navy forces must be self-sufficient insofar as is possible. The intermediate level of maintenance is part of the operating forces, and exists to keep ships at sea in wartime (and to keep ships operationally ready in peacetime) Naval forces must be able to conduct sustained operations anywhere in the world. Retaining a minimum mobile repair force is just as vital to that capability as is having adequate mobile logistics support, or having adequate personnel. The mission of the Navy differs from that of the Army and Air Force. Our carriers, their aircraft, and their escorts are designed to be independent from shore support for long periods. The mobile IMAs are essential to maintaining the material readiness of the Navy's ships anywhere in the world. Trading off tenders and repair ships for shore based IMAs would reduce the Navy's capability to operate effectively world-wide.

See page 11 for GAO comments.

3. GAO Finding (page 12)

Although there are no shore IMAs in the Pacific area, there are four repair facilities which do depot level type work and are capable of performing IMA work. They are located in Pearl Harbor, Hawaii, Guam, Philippines and Japan. Most often the mobile IMAs in the Pacific are in the same ports where these facilities are located. This co-location was also true during the Navy's most intensive action since the Korean war; i.e., the Vietnam conflict. Mobility does not appear to have been a key factor in maintenance of ships in the Pacific in recent history.

As evidenced in congressional testimony, the Navy has been, because of economics, attempting to phase down the Guam repair facility and move the repair work to the Philippines and Japan. According to them, it is less expensive to repair ships in the Philippines because of the labor costs and less expensive for ships to go to and from their normal operating areas.

This does not appear to be consistent with the Navy's previously stated overseas basing concern of jeopardy from political change. Guam is a U.S. territory, not in jeopardy of

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being lost politically or subject to negotiation for its use. If we presume that the repair facilities in the Philippines and Japan will be available in war, serious questions can be raised on the need for all of the mobile IMAs planned for that theater.

Navy Position. Additional considerations should be discussed to properly state the Navy's position regarding the Ship Repair Facilities (SRFs) in relation to mobile IMA requirements.

Statement. The Western Pacific - Indian Ocean is a huge area. Little direct IMA support can be gained from the SRFs for ships operating in wartime in the majority of that region, where distances are as great as from Europe to the U. S. The SRFs do not fulfill the repair support requirements necessary for the sustained operation of Naval forces in remote areas of the world in wartime. The Vietnam War was unique in that respect, because Subic Bay is reasonably close to Vietnam. But the mobile IMAs supporting the fleet during the Vietnam War often moored at Vung Tau, An Thoi and DaNang, where they could provide direct support to Navy forces very near the scene of the conflict. Furthermore, the Navy supported its craft in Vietnamese waters with ships moored in the rivers of Vietnam and just offshore, very near the areas of intense fighting. These ships provided immense support that was impossible for SRF Subic Bay to provide. Without these ships the riverine warfare could not have been conducted.

In peacetime the Navy can choose its operating areas, and ports of call, and can therefore remain as close to the SRFs as it desires. The forces are there for rapid application of seapower if needed. The deployed mobile IMA is there to support the forces if such a contingency arises. And while it is deployed its repair capacity is utilized to its fullest.

If it were known that hostilities would not arise requiring Naval forces in WESTPAC, a deployed mobile IMA would not be necessary; SRFs could provide most of the required support. It is the requirement to be ready to deploy U. S. Naval forces to a trouble spot anywhere that requires the continued deployment of a mobile IMA with the Seventh Fleet.

The SRFs, on the other hand, provide a depot capability in the theatre for wartime use. The distances from anywhere in WESTPAC to CONUS, or even Pearl Harbor, are so vast that steaming or towing a damaged ship back to U. S. shipyards are far more risky (both in vulnerability to the enemy and in danger of sinking) than to a WESTPAC SRF. In the determination of the number of mobile IMAs required, however, a contribution by the SRFs toward the intermediate workload is accounted for.

See page 12 for GAO comments.

4. GAO Finding (page 16). The Vietnam effort exemplified a period of increased tempo without significant changes in IMA workload.

Navy Position. Do not concur.

Statement. Although the demand placed upon the IMAs did not significantly change, the poor material condition of the Navy's ships at the end of the war indicates that much required maintenance had not been accomplished.

See page 16 for GAO comments.

5. GAO Finding (page 20). No wartime role has been established for most of the Navy's shore-based IMAs.

Navy Position. Since the completion of the GAO survey, a study has been completed which establishes a wartime role for shore-based IMAs.

See pages 21 and 22 for GAO comments.

6. GAO Finding (page 22). Because of the extensive shore-based maintenance capability in the Pacific area, the need for any deployed IMA capability in peacetime could be questioned.

Navy Position. Please see item C.3. above.

7. GAO Finding (page 23). Although the size of the fleet doubled during Vietnam, the IMA's role was not vital in returning the ships to their battle station and, therefore, their need, especially in a mobile form, is questionable.

Navy Position. The Navy does not concur that the role of IMAs in Vietnam is a valid basis for questioning their wartime need.

Statement. Please see the statement in item C.3. above.

See page 16 for GAO comments.

8. GAO Finding (page 23). The Navy is trying to phase out the facility in Guam, a U. S. Territory and not in jeopardy of being lost, and increase the maintenance activity on non-U.S. soil in the Philippines and Japan.

Navy Position. The Navy does not concur.

Statement. The need for SRF Guam and the vulnerability of SRF Subic Bay are recognized by the Navy. There has been a general decrease in repair demand at all of the SRFs since the end of the Vietnam War. A significant portion of the workload at SRF Guam was the overhaul of Vietnamese ships.

That workload has disappeared, along with the support for PG's, whose homeport was changed from Guam to CONUS in 1974. There is, however, no intent to phase out SRF Guam. (See page 24 for GAO comments.

9. GAO Finding (page 26). We believe there are several opportunities to improve IMA efficiency and reduce maintenance costs. To reassess its peacetime maintenance requirements and achieve certain economic benefits, the Navy should:

-- Analyze all maintenance requirements to define the types of work that should be performed at each maintenance level -- organizational, intermediate, and depot.

-- Validate total intermediate maintenance requirements using scientific workload analyses and accurate historical data to arrive at realistic estimates of total manpower needs. The Navy's current requirements estimates are overstated.

-- Evaluate the economic differences among the various maintenance levels with particular attention to the economic advantages of shore IMA's. Also, the feasibility of consolidating redundant capabilities in certain geographic areas should be studied.

-- Assess current work tasks to eliminate non-essential and uneconomical work.

-- Consider the impact of changing maintenance concepts on the total maintenance strategies and requirements.

Navy Position. Concur.

Statement. Please see the comment on item A.2 and A.6.

10. GAO Finding (page 28). The Navy plans to expand the Equipment Maintenance Related Material program in fiscal year 1977 at a cost of $74 million. However, no analyses have been made to measure the corresponding impact on requirements at the IMA and depot levels. In addition, the Navy has not measured the true success of the program--whether real economies and efficiencies were obtained by completing more maintenance tasks at the organizational level versus the other maintenance levels.

Navy Position. Do not concur.

Statement. The program is an initiative to provide shipboard personnel with the full level of resources needed to pay for repair parts used in organizational level maintenance. It was initiated as a test in FY 1976 with 38 test ships, the initial results of which have permitted a $26 million reduction in depot level emergent repair funds in the 1978 budget request. The test is being expanded in FY 1977, and as more results are evaluated, additional refinements can be made.

See page 28 for GAO comments.

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11. GAO Finding (page 28). We found many overstatements in the historical information used by the Navy for projecting its future IMA workload and manpower needs. As a result, Navy's estimated future IMA personnel requirements are also overstated.

Navy Position. Do not concur.

Statement. Even though some instances occur of overstatements of productive output, the Navy believes that this is far offset by a situation related to the shortage of experienced petty officers aboard ship. Because of the low experience level, ships' crews are unable to identify all work that is required. Frequently, a deteriorated condition is overlooked that, if detected at that time, could be corrected at the IMA level. Undetected, the condition worsens until a more serious problem develops, often which requires depot assistance to repair. Thus, all the work that should be submitted to IMAs is not identified. To alleviate the experience level problem, the Navy now fully mans quantitatively all authorized sea billets and, beginning is FY 78, will fully fund the training account. To prevent continuation of overstating productive output the Navy has initiated the measurement of productive man-hours expended per work request completed, as an additional measure of productivity. Formerly, only the productive man-hours expended per day were reported. The latter report tends to encourage overstated productivity reporting, whereas the new measure regards the fewer productive hours per job as desirable. It is believed that use of the two measures together will help to promote accurate reporting.

See pages 30 and 31 for GAO comments.

12. GAO Finding (page 30).

Based on discussions with shop supervisors and our tests of the reporting system, we believe the majority of the difference is due to an overstatement of productive staff-hours. Below are selected examples showing the results of the comparison. (3rd Quarter FY 76 with 3rd Quarter FY 75).

IMA	Percentage increase (decrease) in jobs completed	Percentage increase (decrease) in staff-hours used
USS SIMON LAKE	(19)	64
USS L.Y. SPEAR	(12)	77
USS SHENANDOAH	17	67
USS PROTEUS	22	57
USS PRAIRIE	61	127
USS SAMUEL GOMPERS	7	45

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Navy Position. The Navy strongly disagrees with the conclusion drawn by GAO, and with the display of the data above without discussing all the factors that are involved.

Statement. During the period involved the following situations and procedures occurred, in an effort to improve IMA support of the fleet:

a. Instituted Quality Assurance procedures, which add significantly to productive hours required for each job.

b. Augmented repair personnel with personnel from other departments to increase productive output.

c. Worked appreciable amount of overtime. The overtime hours are not recorded separately, nor are they considered as time available to do work.

These items increase the productive hours out of proportion to the increased number of jobs completed, due to the addition of quality assurance standards. Yet quality work will mean longer lasting repairs, and, therefore, a reduced workload in the long run.

See pages 30 and 31 for GAO comments.

13. GAO Finding (page 33). Our analysis showed that the average hour of productive labor at an IMA costs: First method: $27.80 -- Shore IMA $21.15, Mobile IMA $30.66. Second method $46.59 ... Shore IMA $32.98, Mobile IMA $61.19. At the shipyard level an average hour of productive labor cost $23.51.

Navy Position. Do not concur.

Statement. Navy calculations for the 1976 budget show the cost of productive labor at a shore IMA to be $26.55 per hour, including labor, overhead, training, support, military benefits, and material. A direct comparison between productive labor costs at IMAs and shipyards is not valid. Trade skills differ between civilians and military, and in general more civilian personnel are required than military to accomplish the same job. In addition, the definition of "productive labor" differ between IMAs and shipyards.

See pages 33 and 34 for GAO comments.

14. GAO Finding (page 35) ... estimated cost for a new shore IMA is $39 million.

Navy Position. Navy average estimated cost for a new shore IMA is $35.6 million.

15. GAO Finding (pages 35 to 38)

For tenders, the actual percentage of personnel available for customer work to total ship manning ranged from 3 to 18 percent. The range for shore IMA's was 17 to 39 percent. Percentages of

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productive hours used on self maintenance varied on tenders from 10 to 54 percent with 29 percent as an average. For shore IMA's, this figure ranged from 0 to 14 percent with 9 percent as an average.

The following table summarizes some of the economic differences between an average tender and an average shore IMA.

	Average Tender	Average Shore IMA
Estimated replacement cost (millions)	$260	$39
Estimated cost per productive staff-hour (note a)	$61.19	$32.98
Overhead personnel to productive personnel ratio	3.1 to 1	1.8 to 1
Percent of productive hours used for self-maintenance	29	9
Percent of total personnel supporting needs of customer ships	13	28

Navy Position. Do not concur with the findings shown above or displayed in pages 36 and 37 of the report.

Statement. Navy determination of percent of total mobile IMA hours available for customer maintenance support is as follows (using same basis figures as GAO).

AFLOAT IMA

	%	Persons	hours*
Total average manning	100	930	1,867,440
Repair department personnel	44	408	819,264
Repair department personnel assigned to repair work (58% of time)	25	237	475,896
Repair department personnel assigned to customer repair work (71% of time) (remaining time on self maintenance)	18	168	337,344

SHORE IMA

	%	Persons	Hours*
Total average manning	100	479	961,832
Repair department personnel	76	353	708,824
Repair department personnel assigned to repair work (57% of time)	42	201	403,606

*one man-year equals 2008 hours, vice 2080 used by GAO which ignors nine national holidays.

Repair department personnel assigned to customer repair work (91% of the time) (remaining time on self-maintenance	38	183	367,464

*one man-year equals 2008 hours, vice 2080 used by GAO which ignors nine national holidays.

The GAO considers only those people assigned to direct productive labor as available for customer maintenance support. It does not include supervisors, managers, shop supply personnel, planning and estimating personnel, repair coordination, radiation control personnel, repair office personnel, etc., as contributing to customer maintenance support. However, the function of providing maintenance support could not be performed without both productive and productive support personnel. The Navy considers productive support as essential as the direct productive labor, and believes the following table accurately reflects the facts:

	Average Tenders	Average Shore IMA
Estimated replacement cost (millions)	$260	$35.6
Estimated cost per productive staff-hours	61.19**	$26.55
Overhead personnel to productive personnel ratio	2.13 to 1	.85 to 1
Percent of productive hours used for self- maintenance	29	9
Percent of total personnel supporting needs of customer ships	18	38

**GAO Figure

See page 38 for GAO comments.

16. GAO Finding. (pages 43 to 46) Questionable work.

Navy Position. The Navy concurs that some work identified by the GAO could have been done more cheaply by contractors.

Statement. Please see the statement on item B.4., page 10. Intermediate level maintenance is direct maintenance; much of which is unscheduled. IMA's must frequently respond within minutes to emergency ship repair requirements, in order to maintain ships' readiness. The IMA's must themselves be ready at all times to respond to ship casualties in peacetime, and to support the fleet in wartime. For that reason all IMA work centers must be maintained in a fully operational condition. If

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work is assigned to contractors solely because it can be performed more cheaply, a few of the small, specialized work centers may be underutilized. These work centers are assigned the minimum number of personnel required to be effective (for example, tender foundry - 10 men, typewriter repair - 4 men, pattern shop - 7 men). The cost of the personnel assigned to these work centers remains whether utilized or not, and the cost of the contractor-performed work increases by the cost of the idle IMA military personnel. Furthermore, the proficiency of the work center personnel is difficult to maintain if the work center is not constantly exercised. In foundries, safe operation is dependent upon a full time, fully utilized work force. For these reasons, the Navy schedules sufficient work in all work centers to fully utilize the assigned work force.

APPENDIX VI

PRINCIPAL OFFICIALS RESPONSIBLE FOR ACTIVITIES DISCUSSED IN THIS REPORT

	Tenure of office From	To
DEPARTMENT OF DEFENSE		
SECRETARY OF DEFENSE:		
Harold Brown	Feb. 1977	Present
Donald Rumsfeld	Nov. 1975	Feb. 1977
James R. Schlesinger, Jr.	June 1973	Nov. 1975
William P. Clements, Jr. (acting)	Apr. 1973	June 1973
Elliot L. Richardson	Jan. 1973	Apr. 1973
ASSISTANT SECRETARY OF DEFENSE (INSTALLATIONS AND LOGISTICS):		
Dale R. Babione (acting)	Jan. 1977	Present
Frank A. Schrontz	Feb. 1976	May 1977
John T. Bennett (acting)	Apr. 1975	Feb. 1976
Arthur T. Mendolia	Apr. 1973	Mar. 1975
Hugh McCollough (acting)	Jan. 1973	Apr. 1973
ASSISTANT SECRETARY OF DEFENSE (MANPOWER AND RESERVE AFFAIRS):		
Carl W. Clewlow	Feb. 1977	May 1977
David P. Taylor	June 1976	Feb. 1977
John F. Ahearne (acting)	Feb. 1976	June 1976
William K. Brehm	Sept. 1973	Feb. 1976
ASSISTANT SECRETARY OF DEFENSE (MANPOWER RESERVE AFFAIRS AND LOGISTICS):		
Dr. John P. White	May 1977	Present
DEPARTMENT OF THE NAVY		
SECRETARY OF THE NAVY:		
William G. Clayton, Jr.	Feb. 1977	Present
J. William Middendorf II	Apr. 1974	Jan. 1977
John W. Warner	May 1972	Apr. 1974
CHIEF OF NAVAL OPERATIONS:		
Adm. James L. Holloway III	July 1974	Present
Adm. Elmo R. Zumwalt, Jr.	July 1970	July 1974

The offices of Assistant Secretary of Defense for Installations and Logistics and Assistant Secretary of Defense for Manpower and Reserve Affairs were merged in May 1977.