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The Afloat Maintenance Command:
Organizational and Funding Issues in
Navy Ship Maintenance, Repair, and Modernization

by

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The goal of current Navy surface ship maintenance and repair strategy is to sustain readiness and to maximize both combat capability and the amount of time ships are available for employment during their lifetime. The established organizational framework of the Navy to perform this task includes a complex array of activities that are effective overall, but at the expense of efficiency. The current drawdown in budget resources requires that the goals of ship maintenance and modernization be met with improved efficiency. The Afloat Maintenance Command is a proposal to restructure the existing maintenance hierarchy. Improvements in the process of maintenance and modernization are incorporated in the Afloat Maintenance Command through the elimination of redundancies in capabilities and the improvement of funding flows to enhance organizational efficiency and effectiveness. This thesis will provide an overview of the Afloat Maintenance Command and its possible organization in consolidating assets from existing maintenance activities. Additionally, funding alternatives for the Afloat Maintenance Command will be developed and assessed.

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The Afloat Maintenance Command: Organizational and Funding Issues in Navy Ship Maintenance, Repair, and Modernization

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ABSTRACT

The goal of current Navy surface ship maintenance and repair strategy is to sustain readiness and to maximize both combat capability and the amount of time ships are available for employment during their lifetime. The established organizational framework of the Navy to perform this task includes a complex array of activities that are effective overall, but at the expense of efficiency. The current drawdown in budget resources requires that the goals of ship maintenance and modernization be met with improved efficiency. The Afloat Maintenance Command is a proposal to restructure the existing maintenance hierarchy. Improvements in the process of maintenance and modernization are incorporated in the Afloat Maintenance Command through the elimination of redundancies in capabilities and the improvement of funding flows to enhance organizational efficiency and effectiveness. This thesis will provide an overview of the Afloat Maintenance Command and its possible organization in consolidating assets from existing maintenance activities. Additionally, funding alternatives for the Afloat Maintenance Command will be developed and assessed.

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I INTRODUCTION

A. STATEMENT OF THE PROBLEM

The established goal of the Navy's ship maintenance program is to provide an effective strategy for maintaining and modernizing the fleet. The current framework for maintenance and modernization is a multifaceted program spanning numerous chains of command on both operational and fiscal responsibility levels. The system is filled with numerous complexities and frequent redundancies. The process is at best effective, but generally considered inefficient in accomplishment of the task at hand.

The challenge to keep a high percentage of ships available for employment, while still maintaining their systems fully capable and up to date, has never been greater. A decreasing fiscal base for completion of the maintenance strategy is probably an unavoidable reality. The ability to provide adequate customer service while reducing costs and infrastructure redundancy is paramount within the current period of budget constraints. Therefore, the need exists for a more consolidated ship's maintenance and repair process that can both effectively and efficiently meet the Navy's goals.

The Afloat Maintenance Command (AMC) concept is an attempt to improve upon the existing system. The improvements center around the areas of:

(1) reducing complexities within and consolidation of the system. This is to be accomplished by elimination of overlaps in responsibilities and efforts through consolidation of the numerous maintenance functions into the AMC.

(2) realignment of funding flows to ensure an effective and efficient management control system with the emphasis on more decision authority for the Fleet.

The AMC is designed to be a readily accessible, one stop shop, that easily provides maintenance and modernization services to the fleet in an efficient and effective customer oriented manner.

B. DEVELOPMENT OF RESEARCH QUESTIONS

This thesis will provide an overview of the organization designed to accomplish future ship maintenance and repair, the Afloat Maintenance Command (AMC). This examination will include how the AMC can be organized to maximize both fiscal and operational responsibility. The consolidation of existing maintenance support activities which are redundant within the current system will be considered. Additionally, the potential funding alternatives for the AMC and respective benefits and shortcoming will be developed. There are four primary research questions addressed by this thesis.

1. In what manner will the Afloat Maintenance Command be organized?

2. What are the possible consolidations and/or deletions of existing maintenance support groups resulting from establishment of the AMC?

3. What are the possible funding alternatives for the Afloat Maintenance Command?

4. What are the respective cost and benefit attributes of the options available for funding the AMC?

C. METHODOLOGY/SCOPE LIMITATIONS

Action research, including personal interviews and analysis of current Navy systems and data was used in determining potential organizational structures and funding alternatives for the Afloat Maintenance Command. Data from past organizational restructuring studies as well as ongoing process action team studies provided input to formulate possible funding alternatives and organizational design options. The Ship Maintenance and Repair Division of NAVSEA and the Pacific and Atlantic Fleets maintenance organizations assisted in providing data for analysis. The Comptroller from NAVSEA and NAVCOMPT staff also contributed data to assist in the research.

The organizational overview of the AMC is limited to its placement within the context of the new maintenance strategy and employment cycle. The funding aspects are limited to inclusion in the DBOF, reimbursable operation, annual appropriations or a possible combination of the three.

D. BACKGROUND

The Fleet Commanders in Chief (FLTCINCs) are responsible for the material condition of their assigned ships. The material readiness posture is based on several aspects including (1) the anticipated threat and corresponding strategy to counter the threat (2) any established or updated systems command technical requirements, and (3) CNO policy. FLTCINCs responsibility includes the requirement to make resource trade-offs between costs of operations and maintenance, employment availability, and mission

capabilities. However, the processes and infrastructure that are necessary to support these responsibilities often do not fall under either the operational or fiscal authority of the FLTCINCs.

This separation of control and responsibilities functions is a classic case of a design flaw within the management control system of an organization. In order for the FLTCINCs to efficiently and effectively accomplish their responsibilities, they must have either (1) the authority to operationally control the supporting assets or (2) the ability to apply fiscal pressure that can persuade the support activity to perform the specific maintenance desired.

One method to improve faults in the management control system is to give the FLTCINCs greater operational authority over the maintenance support functions. This would ensure that responsibility for fleet unit readiness posture is paired with control of the necessary support assets to meet these requirements. The resulting control system would in theory better allow the FLTCINCs to balance scarce resources between available maintenance support functions and fleet unit readiness standards.

A second method to achieve a match between readiness posture guidelines and the necessary maintenance support is through the ability to apply fiscal pressure. The maintenance support functions may be convinced to provide the services desired by FLTCINCs to meet their readiness requirements with the application of fiscal pressures. This fiscal pressure may be provided in part by the establishment of a customer-provider relationship. An open market system driven by the laws of supply and demand could ensure that customer requirements for goods and services are provided. The customer's

specific desires of quality, timeliness, and customer service should establish the acceptable price level. The provider must then control costs to approach this price level in order to continue market operations. The realignment of DoD funding to accomplish this open market relationship for revolving funds, is now being accomplished through the Defense Business Operations Fund (DBOF).

1. Defense Operations Business Fund

The DBOF is a $70 billion revolving fund with a primary purpose to provide a business management structure that encourages DoD support organizations to provide quality products or services at the lowest cost. Under this structure, customers establish requirements and are charged for the cost of industrial and commercial-type services and products provided. Providers, in turn, produce quality goods and services which satisfy customer requirements at the lowest cost. This is accomplished through the use of a self-renewing capital pool that the provider draws upon to meet customer requests. The capital pool is regenerated when the customer makes payment to the provider at work completion.

Funds that previously went to the providers directly may now be given to the customer for the acquisition of services from various providers. Thus, the support organization incurs costs based on customer orders. The producing organization is responsible for managing all costs associated with delivery of the goods or services. This linkage of support costs to customer funding ensures better communication between the customer and the provider. The support activities, by managing to total cost are forced to identify cost drivers and focus improvement efforts accordingly.

The business relationship between providers and customers fully supports the Navy's move towards total quality management (TQM). Unit cost resourcing and Business Operations Fund management provides a meaningful tool to focus and reinforce the effectiveness of such management improvement strategies as total quality management. Unit cost not only provides managers total cost per output, but also allows identification of the processes that increase total cost, which improves the managers ability to control cost drivers. It provides a framework for involving the work force to improve the quality of processes. Thus, process improvement eliminates costly rework and delays which lowers cost per output at a given level of performance. Productivity gains can be achieved through quality improvements. Unit cost data, in combination with performance measures, provides the ability to assess the effectiveness of process improvement initiatives. Customer-provider relationships ensure that level of performance is what the customer buys at a given price.

The concept of total cost management provides increased flexibility to both the customers and providers. Customers have the visibility of the true costs of their support requirements, so that efficient trade-off decisions may be made. The level of support services they require as compared to operational demands may now be effectively and efficiently assessed. Providers, have the visibility of the total costs required to satisfy customer demands. This allows for better evaluation of processes and implementation of efficiency improvements.

The DBOF approach is ideally suited to the majority of areas in ship repair and maintenance. The depot level is presently included in DBOF from consolidation of

the previous Navy industrial funds. The future plan is to include all ship maintenance and repair activities in which a true customer-provider relationship exists. This means that intermediate maintenance activities (IMAs), technical support, and modernization functions will likely be part of DBOF. The goal is to bring process improvement and monetary efficiency into areas where this was previously not the sole priority.

The DBOF concept leads potentially to several overall improvements. First, the use of total cost management may reduce production costs to the provider, which translate into lower prices to the customer. This will enable DoD to more effectively accomplish its mission within available resources. Second, the DBOF expands the relationship between the customer (operating forces) and the provider (support infrastructure). This should cause an emphasis on quality customer service at reduced costs. Finally, the inclusion of maintenance support functions within the DBOF framework may provide a better match between readiness responsibilities and the use of the support functions to accomplish the corresponding maintenance and modernization (efficiency applied to mission accomplishment).

2. Maintenance Strategy: Present and Future

The long standing goal of surface ship maintenance has been to provide the necessary support to accomplish repair and modernization of systems at the lowest effective cost. The established organizational framework of the Navy to perform this task is a complex array of activities. The intermediate maintenance and depot level availability are the vehicle to conduct the repair and modernization of ship systems. The availability planning process involves numerous participants from various commands and

funding chains. The participant's roles are not always clearly defined, which leads to varying degrees of duplicate effort. The differences in funding flows may at times cause double payments for redundant tasks and often leads to unhealthy internal competition. The final result is that the process may be effective overall, but does so at the expense of efficiency.

The current drawdown in both military personnel and budget dollars requires the goals of ship maintenance to be met with increased efficiency. The shift towards a system that maintains effectiveness and increases efficiency is the new goal.

The new maintenance strategy is not radically different from the past. The strategy is one that will fit within the framework of an evolving employment cycle (Miller,1992). This cycle provides the three phases of Refit, Ready Fleet, and Deployment. These distinct phases allow the Navy to improve efficiency in numerous areas including ship maintenance. The maintenance strategy that fits into this employment cycle is one that keeps combat and engineering systems fully capable and up to date without taking ships off line for extended time periods. Three elements of the new maintenance strategy are the phased maintenance concept (PMA), the progressive maintenance concept (PROG) and the engineering operating cycle (EOC). The goal of this new strategy is to sustain readiness and to maximize both combat capability and the amount of time ships are available for employment during their lifetime. Efficiencies in maintenance that reduce off-line days has the same effect as adding ships to the fleet.

This is of vital importance in these times of reducing ship numbers and continuing operational requirements. The three elements of the new maintenance strategy will be described in the following subsections (DeWitt,1988).

a. Phased Maintenance Concept

The Phased Maintenance Concept is a maintenance strategy in which depot level maintenance is performed through a series of short, frequent Phased Maintenance Availabilities (PMAs) in lieu of Regular Overhauls. Repairs are authorized, to the maximum extent practicable, on the basis of the actual material condition of the ship as determined by the Port Engineer. The program also employs innovative material support procedures. The goals of the Phased Maintenance Concept are maximum ship availability, improved operational readiness, and upgraded material condition. The essential features of Phased Maintenance are as follows:

(1) Operating and Maintenance Schedules. Ships are scheduled for PMAs of 2 to 4 month duration at intervals of approximately 15 to 18 months. One PMA in the cycle is extended by one month to include dry-docking. Repair and modernization are both included in the PMA.

(2) Condition-Directed Repairs. The main determinant of the repairs is the actual material condition of systems and equipment. Only those repairs necessary to sustain proper functioning of equipment are identified and authorized for accomplishment.

(3) Port Engineers. The port engineer has broad experience in ship maintenance and repair. They remain with the same ships through their cycles, and are involved in planning, budgeting, authorizing and execution of all maintenance actions.

b. Progressive Ship Maintenance

Progressive maintenance is a strategy that supports ship classes that are designed for reduced manning and limited organizational level maintenance capabilities. Additionally, specific ships homeported in forward deployed areas with operational tempos that limit the length of intervals available for accomplishment of maintenance are also included. Reduced manned ships are designed for component removal and replacement, with maintenance and repair being performed by intermediate and depot level activities to compensate for the reduced organizational level maintenance capability. These design concepts have required the development of maintenance and logistic support systems different from those required for other surface ships.

The progressive approach is to conduct engineering analyses of installed equipment and systems to determine their failure rates and evaluate what support is required. The analysis determines the preventative maintenance plan, estimates the corrective maintenance requirements, and establishes the level of repair. The supply requirements for rotatable pool items are determined based on the analyses. These pools consist of replacement machinery and parts. They are needed to achieve the quick turn around times necessary for the accomplishment of major maintenance items during the short maintenance periods. The progressive maintenance philosophy encompasses the following:

- Progressive SRAs/DSRAs
- Increased use of Engineered Maintenance Planning
- Increased use of modular replacement
- Constraints placed on shipboard at-sea maintenance by ship's force
- Upgrading of maintenance tasks from ship's force to the intermediate or depot level
- Improved material support and stock level management

c. Engineering Operating Cycle Programs

Engineering Operating Cycle Programs are intended to establish a structured engineering approach for maintaining various ship classes on a 5-7 year operating cycle. The principal goal of EOC is to keep ships ready for combat while maintaining or increasing their peacetime operational availability at an acceptable cost. The EOC program anticipates intermediate and depot level maintenance and modernization requirements and plans for required resources at appropriate points in the ship's operating cycle. Engineering analyses are the basis for defining maintenance to be scheduled and performed during periods of assigned maintenance availabilities. There are a number of EOC programs in various stages of planning, development or implementation, all with common goals and similar support and interface requirements. Similarities and commonalities are capitalized upon by making use of established support organizations, plans, procedures and engineering techniques.

During the engineering operating cycle, each ship is assigned (1) an interdeloyment SRA of 6-8 weeks and (2) IMAVs of 3-4 weeks between depot availabilities. A "key window" concept allows flexibility in scheduling availabilities and

work package planning. An Assessment of Equipment (AEC) for specific systems and equipment is performed by the Performance Monitoring Team (PMT). These teams periodically visit ships, usually 60-90 days before the start of an SRA and sometimes following the SRA. They measure designated systems and equipment condition parameters. Repairs are recommended based on the conditions found during the visit or subsequent technical analysis.

The Class Maintenance Plan (CMP) for each EOC ship identifies maintenance, maintenance frequency and repair level, and estimated manpower and logistics support for each identified task. CMPs use maintenance-oriented actions that, based on engineering analysis, are presumably predictable during the ships operating cycle. The two major categories of tasks included in the CMP are (1) engineered maintenance requirements and (2) qualified maintenance estimates. Typical engineered tasks include (1) Class B overhauls, (2) fundamental tests and inspections, (3) PMS actions requiring outside assistance, and (4) other well defined maintenance tasks. Qualified maintenance estimates identify corrective tasks that engineering analyses or historical data indicate will probably be required. Qualified tasks are performed as necessary.

The Afloat Maintenance Command concept is designed to accommodate the new strategy of maintenance and modernization. The basic idea of the new strategy is to cost effectively maintain a modern fleet at a high state of readiness. The ability to keep a smaller number of ships employment ready in a period of shrinking resources calls for innovative maintenance support processes. The alleviation of complexities by

tailoring the present infrastructure to eliminate redundancies in efforts is a primary concern. The realignment of reduced funding flows that will foster efficient use of resources is paramount. Additionally, identification of readiness expectations within the new defense guidance of regional conflict response must be established. The AMC concept is an effort to take a critical look at how to improve upon the existing infrastructure in order to meet this challenge.

E. AFLOAT MAINTENANCE COMMAND CONCEPT CONCERNS

This section will identify areas and concerns that are vital to the success of the Afloat Maintenance Command. These area include:

1. Reductions of current system complexities and centralization efforts
2. Realignment of basis for funding ship maintenance and repair functions
3. Assessment of required readiness posture

1. System Complexities and Centralization

The present system is massive in size and complex. It has evolved over many years during periods of both expansion and contraction. This has caused additions and deletions to numerous facets of the process as was deemed appropriate. The infrastructure that is currently designed to meet the needs of a 600 ship Navy must be reduced to match the current requirements.

A critical review of the maintenance assets that will be required to support the projected numbers and types of ships is needed. This review must recommend the elimination and consolidation of facilities. Since this action will cross numerous

activities and political spheres of power, a professional level of objectivity is mandatory. The ability to cost effectively field a modern and ready fleet to meet the anticipated threat is the bottom line goal.

The organization of the AMC should be one that addresses gains in customer services in addition to cost effectiveness. The movement towards a system that embraces principles of cost control with respect to customer demands in the areas of timeliness, quality, price, and ease of use is paramount. An organizational structure that supports these ideas is a priority. Theories of management control systems should be applied in the development of any new organizational infrastructure.

Innovative maintenance strategies that seek long term efficiency gains while maintaining flexibility are the most likely to survive. These strategies should address areas of equipment standardization between ship types, levels of reliability and capability, and manpower and fiscal support requirements. The maintenance strategies effects on the defense industrial base and impacts of proposed organizational changes must also be considered. The task is not a simple one, but it is a necessary task none-the-less.

2. Realignment of Basis for Funding

Current system funding is not designed to promote efficient or desired efforts. It causes a division, as previously discussed, between maintenance responsibilities and authority functions. This division leads to suboptimization of goals in operational readiness and maintenance effectiveness. The realignment of funding should be such that fiscal efficiency is achieved while addressing areas of customer service, quality, and total cost management.

The total cost/reimbursable funding concepts may address some of the current system inefficiencies. A customer-provider relationship and associated supporting flow of funds could improve shortcomings in customer requirements and maintenance support received. Under total cost management principles, visibility of costs by both the customer and provider result. This is key to cost efficiency gains. Additionally, a revolving fund reduces the year to year fluctuations in funding levels that currently exist and provides a degree of stability in planning maintenance actions.

However, several concerns with the reimburseability concept exist. First, the issue that the focus on lowest possible cost will adversely affect quality levels is present. Next, the concern that a true open market system can be established to promote effective and efficient maintenance services remains in question. These perceived strengths and weaknesses of the reimburseability concept as well as other proposed funding options, need to be carefully evaluated.

3. Readiness Assessment Posture

The concerns associated with assessing readiness posture involve the following: (1) Defense strategy relative to the anticipated threat, (2) Technical requirements imposed on fleet units, and (3) CNO policy objectives. These areas of concern will be addressed in the following paragraphs.

The ability to accurately assess the required readiness posture of fleet units is extremely difficult due to the magnitude and number of changes in the world today. The shift in anticipated threats towards the U.S. has caused enormous movement within national defense strategy. The defense strategy is directly related to setting a readiness

posture. A decision on the numbers and types of ships desired for employment is required. The resulting readiness posture then drives the appropriate maintenance strategy. The fact that several levels of dynamic change are occurring simultaneously places added concerns upon a maintenance system already resistent to change.

The large number and extent of technical requirements being placed on fleet units is an issue worthy of consideration. The issuance of additional technical requirements in the framework of fiscal reductions needs to be carefully evaluated. A close coordination is required between the issuing authority and the corresponding maintenance support activities/fleet units to optimize efficient accomplishment. Technical change requirements must now be limited to those systems designed to counter the threats identified. This is vital in the period of funding cuts.

The issue of a customer-provider relationship is also applicable to the area of technical requirements. An improved system that allows more direct and timely input and feedback is highly desirable. This would allow for improvements in cost effectiveness by prevention of unnecessary or poorly planned technical improvements. The customer's input may also be used in evaluating the attainment of readiness posture goals.

Finally, any special CNO directed policies that would affect the maintenance support provided through the AMC concept must be fully considered. Policy areas that may be included are manpower requirements, safety issues, and quality standards. Additionally, current plans for OPNAV and Fleet reorganization, as well as NAVSEA downsizing are factors that must be considered in the overall restructuring of maintenance

resources. The ripple effect that often occurs upon issuance of a policy change can be devastating on cost effectiveness when not properly researched.

F. ORGANIZATION OF THESIS

The remaining chapters will provide an overview of concepts vital to the Afloat Maintenance Command concept. A brief outline of the remaining chapters follows.

II AMC Organization. Research data on the AMC organization will be presented. The analysis will focus on organizational structure issues. An examination of the possible consolidations and/or deletions of redundant maintenance activities and functions will be presented.

III AMC Funding. Research data on AMC funding will be presented. The development of plausible funding alternatives will be addressed and contrasted with current funding methods. An assessment of the relative strengths and weaknesses of each alternative will be explored.

IV Conclusions. Answers to the research questions will be provided. A summary of thesis findings and relevant suggestions will be offered.

G. SUMMARY OF INTRODUCTION

The new Navy goal is to work smarter with reduced assets. A critical review to examine the existing ship maintenance structure and identify inefficiencies is necessary. Key problems of locating inefficiencies include the following aspects. First, gaining an understanding of the concept that maximization of desired outcomes such as reduced off line times, currency of systems, and customer satisfaction does not always mean lowest

dollar cost is an important to consider. Second, intangible issues such as quality are difficult to measure, but still represent a vital concern. Finally, the politics associated with the established structure and the tendency to resist change makes inefficiency identification more demanding. The challenge for innovation within the area of ship repair and modernization has never been higher. The ability to meet this challenge will determine the Navy's future success in a changing world.

II AFLOAT MAINTENANCE COMMAND ORGANIZATION

A. THE SHAPE OF THINGS TO COME

The maintenance support structure of the Afloat Maintenance Command should be tailored to provide the assets required to execute the new maintenance strategy. The new strategy makes use of the Phased Maintenance Program (PMP), Progressive Ship Maintenance (PROG), and Engineering Operating Cycle program (EOC). These maintenance programs all center on the notion of reduced off-line time through the use of short duration availabilities (PMAs/SRAs) to accomplish required maintenance and modernization. Increased operational availability for fleet assets is viewed as paramount in meeting future commitments with a decreased resource base.

The future size of our defense infrastructure will be much smaller. Current plans call for a reduction in surface ships to approximately four hundred fifty, and even this level probably will be reduced. The associated maintenance support activities should decline respectively. However, this cutback must be done in a proactive, not reactive manner. Careful planning will ensure current capabilities are maintained as well as the ability to meet future demands caused by reconstitution or wartime battle damage repair requirements. The process improvement principles of Total Quality Leadership (TQL) are especially relevant in the ship maintenance and repair field. Therefore, TQL provides a framework for implementation of the necessary changes and a method to ensure future cost efficiencies within the system.

This chapter addresses the maintenance organization required to service the smaller fleet of conventionally-powered surface ships expected in the future. The examination will be performed using the premises of the new maintenance strategy and principles of TQL. The areas to be covered include:

1. Availability Support Structure
2. Technical Assistance Support
3. Implications of the Organizational Change

B. AVAILABILITY SUPPORT STRUCTURE

The maintenance support organization required under the new strategy will use assets that aid in the (1) assessment of a ship's material condition, (2) planning of maintenance and modernization, and (3) execution of the desired improvements. Additionally, the organization will need the capability to address issues like reconstitution/battle damage repairs, TQL implementation, standardization of equipment/repair processes, and use of the Business Operations Center (BOC). This section will now discuss these critical areas of the availability support structure.

1. Material Condition Assessment Requirements

The starting point for ship maintenance, repair, and modernization efforts is to determine the material condition of the system and associated equipment. The primary method used to identify discrepancies is the Planned Maintenance System (PMS) through the use of Maintenance Requirement Cards (MRCs) at the organizational level. This assessment tool is available to all ships using either the Phased Maintenance Program

(PMP), the Progressive Maintenance Concept (PROG), or the Engineering Operational Cycle (EOC) strategy. This is the preferred level of deficiency identification, since these are the individuals directly operating the systems. These noted discrepancies are input into the Current Ship's Maintenance Plan (CSMP) for work package planning at the organizational, intermediate, or depot level maintenance activity.

The next assessment occurs at the intermediate level. The Class Maintenance Plan (CMP) tasks associated with the EOC provide inspection and testing requirements to be performed by an IMA or depot level activity. These intermediate level assessments may include an Assessment of Equipment (AEC) performed by the Performance Monitoring Team (PMT), or an Aviation Safety Inspection of Readiness (ASIR).

Additionally, the Phased Maintenance Program (PMP) will make use of Material Self Assessments (MSAs) to determine system performance. These MSAs are inspections and tests performed by organizational level personnel with assistance provided by an intermediate level organization such as the Planning and Engineering for Repairs and Alterations (PERA). The results of these inspections will determine the degree of restoration if any, required.

The new maintenance strategy relies heavily on condition directed repairs instead of strict time directed repairs. The concept of Reliability-Centered Maintenance (RCM) which treats maintenance as a technology using age-reliability characteristics of equipment is the basis for determining inspection/maintenance requirements. This allows timing inspections of critical components prior to failures. Additionally, through a

logistics support system that stocks critical components, ships are able to effect repairs immediately and maintain high operational readiness.

The infrastructure to provide the material conditional assessment of ship systems is currently in place. These organizational units are varied and span numerous chains of command. Under the AMC concept, these elements will be consolidated within Fleet Support Centers (FSCs), to be located at the sites of major Navy ports. The FSC is responsible for all material conditional assessment as well as CSMP upkeep, and interavailability work which will be discussed later in the chapter. The elements within each FSC will vary based upon the number of ships assigned to that port. The typical FSC elements that will provide material conditional assessments are as shown below. A conceptual overview of these five elements of material condition assessment follows.

FLEET SUPPORT CENTER (MATERIAL CONDITION ASSESSMENT ELEMENTS)
* AVAILABILITY SQUADRON * PERFORMANCE MONITORING TEAM (PMT) (AEC) * AVIATION SAFETY INSPECTION READINESS (ASIR) * SHORE MANAGER OF CSMP * PORT ENGINEERS

The availability squadron will be a non-operational (readiness) organization. The squadron will be responsible for the conduct of Material Self Assessments (MSAs) previously performed by PERA. Ships will be assigned to the squadron during scheduled PMAs and SRAs/DSRAs. The squadron will be manned by personnel experienced in assessment of maintenance and availability execution.

The Performance Monitoring Team and Aviation Safety Inspection Readiness personnel will continue to operate as before. The size of each will need to be adjusted to meet the smaller numbers of ships expected.

The shore manager of the CSMP is an important part of the assessment team. An accurate and detailed CSMP which reflects the present material condition of installed systems is invaluable to successful availability planning. The personnel for this task will be drawn from the existing Readiness Support Group (RSG) organization.

The port engineer has broad experience in the material condition assessment phase of maintenance. This coupled with fact that they remain with the same ships through their maintenance cycles, makes them ideal for inclusion on the material condition assessment team.

These organizational elements provide the necessary tools to provide an effective assessment of the maintenance and repairs required. The combination of these previously decentralized assessment components will improve scheduling and response time to the fleet. This emphasis of customer service is one of the guiding principles of TQL. The next area of maintenance after material assessment is the planning function.

2. Planning for Required Modernization and Repair

The planning phase for the required modernization and repair of ships in the environment of today has significant challenges. These include high level of system complexity, rapid advances in desired technology, extensions in expected ship's service

life, and reductions in maintenance and modernization funding. An organizational structure to meet these planning challenges can be formed from existing elements of the maintenance hierarchy.

The availability planning structure will take the current PERA organization, SIMA planning, tender planning, and consolidate it within the SUPSHIP planning division. This planning division will be part of the FSC organization. The total staff size will require adjustment to reflect the reduced planning workload expected under a smaller fleet and the phased maintenance program (which uses an emphasis on the contractor for the majority of the planning effort). This combination of existing planning assets will allow for the removal of redundancies in capabilities while maintaining an experience base in availability planning.

The combined planning unit will have the following responsibilities:

- Maintenance and assessment of the CSMP
- Post availability testing package planning
- Preparation of modernization (FMP) and repair packages
- Forecast material requirements for CMP/FMP and availability repairs
- Configuration control record maintenance
- Input CMP items into CSMP via shore manager

A brief discussion of these responsibilities follows.

The maintenance and assessment of the CMP will be accomplished through the use of several inputs. The technical requirements for CMP tasks will continue to come from the NAVSEA technical experts. The vehicles for assessment of the CMP are

the material conditional assessment elements of the FSC (previously discussed), the CSMP, and casualty reporting data (CASREP). A feedback system for the CMP which allows direct input from the customers (fleet units) is vital to the effective and efficient maintenance/assessment of the program.

The post availability test package will use requirements as developed by the technical community. The packages will allow varying degrees of testing, starting at the minimum and increasing. This allows the customer (fleet units) to request additional testing according to the crew's level of technical/operational proficiency.

The preparation of modernization and availability repair packages relies on numerous inputs. The FMP uses capability upgrades based on previous system degradations and expected future threat changes. These system improvements are linked to the current technology base and funding restrictions. The development of the availability repair package will make use of planners expert in both depot level (SUPSHIP) and IMA level (SIMA) repair planning. The preparation of required repairs draws heavily on the input from the users through the CSMP. Additionally, degradations noted by the material conditional assessment assets are included. The timeliness and accuracy of this information is paramount to the planner, so that only necessary repairs are contained in the package.

The accurate and early identification of material requirements for CMP/FMP and availability repairs is crucial to a successful planning process. The fact that many long lead time material (LLTM) can take months to acquire indicates the importance of proper and timely identification. The inclusion of the supply and logistic assets is

important to correctly estimate future needs. This forecasting process needs to be acutely aware of the consequences of any late or unforseen changes in the scope of repairs required.

The accurate recording of ships configuration is key to the successful planning of future changes. The planning unit is ideally suited to maintain these vital records due to their proximity to the configuration change process. The technical community (NAVSEA) will retain the authority to develop and approve the required changes (SHIPALTS). However, the accurate recording and maintenance of the configuration for each ship will be the planning units responsibility.

The input of CMP task items into the CSMP is necessary to ensure that all planners from the ship to the contractor or IMA are aware of the scope of work that is planned. Since the planning unit is responsible for the CMP, they will enure proper inclusion of these items into the CSMP.

The consolidated planning unit addressed above will accomplish tasks that fall under the purview of the Progressive (PROG) and EOC maintenance strategies. However, the Phased Maintenance Program shifts the advanced planning role to the contractor. A discussion of the contractors responsibilities under the PMP will show how this strategy allows a streamlining of the previous maintenance and modernization planning organization (Lewis,1990).

a. Maintenance/Modernization Planning Under PMP

The advance planning function formerly performed by the government is one of the most significant responsibilities assumed by the private contractor in the

Phased Maintenance Program. The contractor, under the cognizance of SUPSHIP, obtains government furnished information (GFI) such as ship alteration records (SARs), basic alteration class drawings (BACDs), and ship alteration material lists (SAMIS). The contractor will then perform shipchecks and prepare drawing schedules. A specifications for modernization and repair work will result. This pre-availability effort accomplishes a great deal of the research previously done by government assets. Additionally, throughout any PMA, the contractor will be responsible for:

- Resolving problems found in technical documentation
- Updating and revising technical manuals and ships selected records
- Updating the coordinated shipboard allowance list (COSAL)

The contractor is now much more involved with the entire job, from planning to documentation. The interaction of government planning personnel from SUPSHIP to the port engineer, now occurs early and continuously through the maintenance/modernization process. This means that LLTM is identified earlier and more accurately, material problems are resolved sooner and shipchecks are done in a timely cost effective manner with the entire plan prepared and finalized well in advance of the availability. The momentum generated throughout the advance planning stages carries through to the departure of the ship from the availability.

The PMP allows the contractor to perform a better job at a reasonable cost since the obstacles that waste time and money are reduced. These obstacles previously included:

- Poor GFI (contractor prepares)
- Labor skill shortages (long-term contracts ensure a more stable work force)
- Materials (can be ordered in ship sets, ordered early)
- Expertise (learning curve is improved through repetition)

The contractor can now repair ships while adhering to sound business practices.

The modernization effort (FMP) receives similar benefits under the PMP. The contractor has the opportunity to be involved in the development of ship alterations as well as their installation. This allows drawing verification, recommending changes, material identification, and resolving problems in both the planning and production phases. The final result is that in most cases, a typical ship alteration is programmed, financed, engineered and installed accurately, on time and within budget.

b. Program Objectives Memorandum (POM) and Budget Preparation

The planning for future maintenance resource requirements is done using the Planning, Programming, and Budgeting System (PPBS). The system is a logical process that identifies needs, determines resource requirements, and allocates the resources available. There are a multitude of people involved in the system and it possess numerous complexities. These facts drive the planning unit of the AMC to have experts that can organize the required inputs (POMs) in the budget process. The AMC will have a planning element that is responsible for the preparation, defense, and execution phase of the budget. The skillful obtaining and timely execution of these scarce resources is foremost in the future planning process. Therefore, the POM/Budget division of the AMC will provide this vital function for the entire organization.

c. Summary of Planning Restructuring

The restructured planning organization for ship maintenance and modernization is a combination of the PERA, SIMA planning, Tender planning, and SUPSHIPS planning division. These elements will be consolidated within the FSC as shown below.

FLEET SUPPORT CENTER (AVAILABILITY PLANNING ELEMENTS)
*SUPSHIP PLANNING DIVISION PERA Planning SIMA Planning TENDER Planning CONTRACTOR Planning

This consolidated planning unit will link planning responsibilities closer with the TQL principles of customer service and process improvement. The increased reliance on the contractor to perform various planning functions is present under the Phased Maintenance Program. The consolidation of current planning assets and the shift towards more contractor planning allows for an elimination of redundancies in capabilities and efforts. This improvement in the planning process coupled with reductions in the required infrastructure will lead to an effective and cost efficient maintenance and modernization planning process.

3. Execution of Desired Improvements

The execution of correctly assessed and carefully planned maintenance and modernization tasks should be relatively easy; however, this phase determines the final outcome of the entire process in terms of quality, timeliness, and cost. Therefore, the

importance of the execution phase cannot be overemphasized. This section addresses the restructuring of existing organizations to accomplish the effective and efficient execution of required improvements.

The execution authority for maintenance and modernization efforts will be centralized in the SUPSHIP overhaul division. This maintenance execution team will include the elements of various established organizations. These elements are as follows.

FLEET SUPPORT CENTER (MAINTENANCE/MODERNIZATION EXECUTION ELEMENTS)
*SUPSHIP OVERHAUL DIVISION SIMA Assets Tender Assets Depot Level Facilities (Naval/Civilian) Supship Repair Representative Availability Squadron RSG Type Desk Port Engineer

The SUPSHIP overhaul division will be responsible for the following tasks in the execution of the maintenance and modernization strategy.

- Brief ships prior to depot availability
- Manage milestones
- Schedule conditional assessments
- Chair Work Definition Conference (WDC)
- Approve depot work package
- Coordinate interavailability/emergent repairs

The consolidation of many previously decentralized maintenance and modernization elements will accomplish several improvements to the process. First, is the elimination of costly redundancies in availability execution assets. The ability to draw upon the strengths of numerous previous organizational elements and combine these best features together allows for enormous potential gains in process and cost improvements. Second, the placement of repair and improvement assets within the authority range (chain of command) of the FLTCINCs, provides a match between maintenance responsibilities and the authority to get the job done that was previously missing. These resulting improvements to the process of repair/upgrade to ships is exactly the outcome desired under the TQL premise.

The execution phase includes two aspects. First, is the facilities to accomplish desired repair and maintenance tasks. These assets are the personnel and equipment present at the IMA and depot level. The SIMAs, tenders, and Navy/Civilian ship repair facilities comprise the tools necessary to execute the planned changes to repair and upgrades to fleet units. The second aspect, is the personnel and tracking system that monitor the progress of these maintenance efforts. This feedback loop determines how the repairs and improvements are advancing in terms of quality, timeliness, and cost. The personnel must be trained to identify problem areas early and accurately in order to provide a timely and sufficient solution to any perceived difficulties. Furthermore, the tracking system must be designed to provide sufficient detail but not become restrictive in providing meaningful data to make assessments and decisions on future corrective actions needed. These two aspects of the execution phase will now be examined further.

The restructuring of the IMA and depot level assets will allow the entire "bag of tools" to be used as effectively and efficiently as possible. The FLTCINCs, who are responsible for the material condition of their ships, can now make the decision on the allocation of repair resources. The merging of numerous facilities into a cohesive unit for the execution of maintenance and modernization will allow numerous improvements. The ability to learn how other elements previously performed is invaluable. This allows for the identification of strengths which can then be implemented throughout the entire unit. The capability to act in a proactive manner and determine the beneficial elements to retain and the less efficient ones to eliminate is vital. This will provide a method to reduce the current infrastructure to meet the needs of a smaller fleet while still preserving an effective and cost efficient system. Cost savings from the removal of excess capabilities and redundancies will permit the use of economies of scale in acquiring of new and improved maintenance equipment/systems that can benefit the entire fleet.

The conduct of interavailability maintenance or emergent repairs will be the responsibility of the FSC using the availability execution assets previously mentioned. The availability execution assets will be allocated as the FLTCINC determines is appropriate, based on operational necessity and current scheduled availability workload. The emphasis for interavailability work will be placed at the organizational level. The ship is capable of considerable "self help" if actual manning approaches planned manning and it is provided with the right tools, technical documentation, test equipment, and parts. Exercising this capability will not only reduce depot maintenance dollars but will also improve the ship's personnel technical skills. Considerable work can be done at sea

when most of the crew is aboard with careful scheduling. The critical issue is the authorized versus actual onboard personnel (Jacobs/Smith,1989).

The combination of the personnel resources and availability monitoring systems has the potential for numerous process improvements. The integration of the people from several previous organizations can provide synergetic effects to improvements in the availability execution process. The benefits of training across previous organizational boundaries is now feasible. The availability execution can draw on a vast pool of experience that includes knowledge from military members, government civilians, and private contractor personal. Sharing this information is critical in identifying the high and low points of the existing process. By simply eliminating the duplications of efforts within the execution phase, enormous savings in the number of personnel required to accomplish the task can be realized. The idea of doing more with less can more realistically be attempted if done with a carefully orchestrated plan that builds on available strong points and eliminates the weak ones.

The concurrent examination of each availability monitoring system currently in use with the associated experts is now possible. The ability to make use of the system's aspects that best meet the needs of the new maintenance strategy has become feasible. A system or systems that best meets the requirements of the customers while allowing the providers to effectively operate is important. A close examination of the systems that the civilian contractor and fleet unit use are the first step in identifying the customers requirements. The monitoring system should be fully compatible with the tools that are in use by the customer. The use of two different monitoring systems to

accomplish the same task is one of the inefficiencies in the current process that must be overcome. The system/s must allow the efficient and effective use of pertinent data in a timely manner. The ability to successful track the availability's progress and make the correct adjustments in a timely fashion is paramount to the overall effectiveness and cost efficiency of maintenance execution. The next section addresses several specific areas that the availability support restructuring will need to consider.

4. Issues for Special Consideration

There are several items that require special attention within the restructuring of the availability support area. The issues that will be considered are:

1. Reconstitution and Battle Damage Repair
2. TQL Implementation
3. Standardization of equipment and repair processes
4. Business Operations Center (BOC)

Each of these areas will be examined in further detail.

a. Reconstitution and Battle Damage Repair

The National Military Strategy (NMS) of the United States identifies Reconstitution as one of the four pillars for future defense (NMS 1992). Reconstitution includes the ability to mobilize the industrial base in areas critical for defense (Jeremiah, 1992). One of these essential areas is in shipbuilding and repair. The ability to maintain an acceptable level of flexibility in this area is directly tied to the future maintenance and

modernization strategy. The strategy should give consideration to reconstitution concerns by prudent planning in the support of both civilian and Navy depot level facilities.

The ship repair area of maintenance should give due consideration to the recent cases of at-sea battle damage repair of maritime forces under war and "peacetime" conditions of operation. The USS Stark (FFG-31) missile damage and the mine damage to USS Samuel B. Roberts (FFG-58), USS Princeton (CG-59), and USS Tripoli (LPH-10) have elevated at-sea battle damage repair (BDR) considerations to a new plateau. The ability to identify and maintain these special capabilities is a consideration that the maintenance and repair process must address.

The sustenance of an adequate shipbuilding and ship maintenance industrial base during peacetime funding cuts is difficult. This coupled with the need for effective at-sea battle damage repair capabilities in tactical combat zones presents further challenges. These challenges can be met by capitalizing on past experiences, the experience of other navies, the technologies and platforms used by other military services and commercial industries, and the dedication to continuous improvement in the maintenance and repair process (Ramsay,1989).

b. TQL Implementation

Total Quality Leadership is the Navy's long-term program to improve the way business is done. It is not a quick fix, but it promises to affect every aspect of naval operations, from procurement to maintenance (Garrett/Kelso/Gray,1991). TQL is

a customer based, systems thinking, statistically oriented, scientific method to improve processes continuously. Therefore, this methodology is ideally suited to address the process of ship maintenance, modernization, and repair.

The focus of TQL is on work processes like those repetitive steps that are accomplished over and over in the maintenance and modernization of ships. Repetitive processes such as periodic maintenance tasks, system tests/inspections, availability work package development, contract development/award, and execution of maintenance tasks. Basically, all the steps in the maintenance, modernization, and repair process are included.

The foundations of TQL are that the customer (fleet) sets the requirements for quality, quality is an entire organization process, and that quality and cost are a sum not a difference. The total quality leadership approach is a way of managing that is guided by a total view of how various processes work together within the organization to meet the mission requirements. The continual improvement of the process will lead to lower operating costs, increased customer satisfaction, productivity gains, and improved operational readiness.

A Navy wide change in from the current mind-set is necessary. The Navy as a whole must alter receptivity to new thinking and processes, creativity, the notion that failures will happen, and that continuous change is both good and necessary. This shift from the established culture will take much time and effort to institutionalize. However, in the long run, TQL has the potential to significantly reduce required

inspections, deficiency numbers, equipment failures, and resources spent to accomplish tasks. These productivity gains, increased customer satisfaction and quality, and savings of scarce resources is exactly what is needed in the current environment.

c. Standardization of Equipment and Repair Processes

Future maintenance strategy emphasis on reduced off-line time will require improvements in standardization of shipboard equipment and repair processes. The standardization of non-technology critical equipment between future ship classes will allow improved logistic and maintenance support at reduced costs. These equipments include pumps, valves, fans, compressors, and cooling units. The reductions in supply overhead costs and procurement costs due to savings from economies of scale will be significant if carefully planned.

The standardization in modernization and repair efforts will also lead to cost savings. Improvements in configuration control will result if all modernization tasks are performed identically. The resulting savings from unnecessary shipchecks, incorrect material procurement, and documentation correction will be significant in the long run. Consistency between post repair testing procedures and requirements will yield further savings. The process by which interavailability or emergent work is accomplished should be standardized between fleets. This will ensure that as personnel and ships transfer between fleets that there will be minimum productivity losses.

d. Business Operations Center

The restructuring of the ship maintenance, modernization, and repair organization focuses on eliminating redundancies and improving the processes involved. These goals are to be met on the business end of the process through the use of the Business Operations Center (BOC). The BOC is a matrix style organization that allows various elements to draw upon various business services offered. The idea is to reduce redundancies in capabilities between elements that can be performed more efficiently by a centralized unit. The consolidation of these business functions within one organization and having the services available to numerous elements of the process allows the reduction in overhead costs to be applied directly maintenance tasks.

The BOC will preform the following business functions for all elements of the Afloat Maintenance Command (AMC).

- Order material CMP/FMP/LLTM
- Let Bid Specifications (BIDSPECS)
- Award contracts
- Authorize/Make progress payments
- Handle protests/Congressional concerns

The duplication of various business functions between SIMA, SUPSHIPS, and Navy depot facilities is not cost effective. The reduced maintenance infrastructure of the future will mean that the same functions can be performed for all concerned using a single element. The BOC using the process improvement and customer oriented

principles of TQL will allow accomplishment of these functions in an effective and cost efficient manner. The various planning, assessment, and execution elements of the maintenance process will use the BOC as a service center to conduct their numerous business function needs. The resulting cost savings will allow reductions in the overhead rate currently applied to maintenance and repair tasks. This means that the same repairs can be completed at a lower cost. An improvement in the process which maintains or improves existing quality and lowers the overall cost is the exact goal of TQL.

C. TECHNICAL ASSISTANCE SUPPORT

The Afloat Maintenance Command (AMC) will consolidate the waterfront technical support under one organization. This will allow the customer (fleet) to have direct access to the knowledge pool on technical issues. The old technical support organization crossed many chains of command, making it difficult for the fleet to easily obtain accurate and timely technical support. The technical support element of the AMC will overcome this shortcoming. This element will consist of primarily two areas, direct fleet support (DFS) and engineering design services. The DFS area will be composed of the following:

TECHNICAL SUPPORT ELEMENT AMC (DIRECT FLEET SUPPORT)
* NAVSEACEN * MOTU * PMT (AEC) * ASIR * NAVELEX * IMA/SUPSHIP TECHNICAL DIVISIONS

The elements of the DFS area will change in size and identity as the technical support requirements of the fleet change in the coming years. The addition of new classes of ships and the decommissioning of others will alter the shape of technical support. The benefits to both the fleet and the technical community (NAVSEA) that result from a single organization are numerous. The fleet can receive assistance with a single message or phone call. The technical authority can disseminate changes to technical guidance in a timely and complete manner through a consolidated unit. The benefits from the consolidation arise by emphasizing the strengths of one area, eliminating duplications, and expanding into areas previously lacking. This can all be done using TQL principles at a cost savings.

The other area of the technical support element will be engineering design services. This section will provide design support services to fleet, IMA, or depot level facilities as required. The same gains are present from the interaction of previously separated support elements. The ability to provide improved technical design support in a technically rich environment with reduced resources is only possible if the consolidations and deletions of capabilities are done in a carefully planned manner.

D. IMPLICATIONS OF THE ORGANIZATIONAL CHANGE

A restructuring of any organization will involve consolidations, deletions, and changes in individual's roles. The change will never work if the dynamics of organizational change are not understood and given proper consideration. The use of a proven method to implement the restructuring is key to success. The Navy's choice to

use the established principles of total quality management (TQM/TQL) in implementing future changes is a good start. The study of corporate change programs is directly applicable to the business like area of maintenance and modernization. This section examines a model developed from successful corporate changes and apply it towards the restructuring effort in ship repair and modernization.

One way to think about the challenge of change is in terms of three interrelated factors required for effective reorganization (Beer/Eisenstat/Spector, 1990). **Coordination** is especially important if the organization is to discover and act upon cost, quality, and process improvement opportunities. The performance of high quality, lower-cost maintenance depends on the close coordination of planning, assessment, material/labor support, and execution elements. High levels of **commitment** are essential for the effort, initiative, and cooperation that coordinated action demands. New **competencies** such as knowledge of the new maintenance strategy, analytical skills, and interpersonal skills are necessary if people are to identify and solve problems as a team. If any of these elements are missing, the change process will break down.

The avoidance of problems with programmatic change can occur by concentrating on "task alignment". The reorganizing of personnel roles, responsibilities, and relationships in the maintenance process is crucial. Task alignment is easiest if done from the bottom-up in small units where goals and tasks are clearly defined. The achievement of successful task alignment can occur through a sequence of six overlapping but distinctive steps called the **critical path** (Beer, Eisenstat,Spector,1990). This path

develops a self-reinforcing cycle of commitment, coordination, and competence. The sequence of steps is important because activities mistimed can be counterproductive. Timing is everything in the management of change.

1. Mobilize commitment to change through joint diagnosis of the problems. The starting point of any effective change effort, TQL included, is to clearly identify the problem. The use of a bottom-up approach to problem identification in TQL helps foster initial commitment that is necessary to begin the change process.

2. Develop a shared vision of how to organize and manage for competitiveness. The definition of competitiveness in the maintenance arena is high quality, low cost. The vision of the organization will define the new roles and responsibilities. The new arrangements should coordinate the flow of work and information across interdependent functions at all levels of the organization. This is the goal of consolidation of similar capabilities within the AMC.

3. Foster consensus for the new vision, competence to enact it, and cohesion to move it along. The support for the change must come from the top management. Commitment to change is always uneven. The change in organizational culture will be slow but eventually should infect the majority. However, some people, just cannot or will not change, despite all the direction and support in the world. This step is the appropriate time to replace those personnel who cannot function in the new organization- after they have had a chance to prove themselves. The use of training is necessary to ensure that personnel have the competency to function within the framework of the change.

4. Spread the change to all levels of the organization without pushing it from the top. The new functional departments of the restructured organization must be responsible for making decisions on how to proceed. Members of teams cannot be effective unless the department from which they come is organized and managed in a way that supports their roles as participants in future decisions. The roles and authority centers within the organization may have to be adjusted as the change progresses.

5. Institutionalize change through formal policies,systems, and structures. The organization must take steps to ensure that the process of change continues. The Navy's plan of TQL ensures that change is institutionalized and that future improvements in the process are part of the norm.

6. Monitor and adjust strategies in response to problems in the change process. The purpose of change is to create an asset that did not exist before. The organization has to be capable of adapting to a changing competitive environment, in effect, to learn how to learn. This is one of the premises of TQL, that failure is expected to be a part of improving the process. The fact is simply that not every idea will succeed. The system must allow for these setbacks, learn from them, and continue to improve.

The six step process provides a way to elicit change without imposing it. The Navy must apply the ideas of TQL carefully using lessons learned from past organizational changes. The emphasis on the importance of people in the change process cannot be over emphasized. The ideas that change must be continuous, failures will occur in improving the process, and that people's contributions are paramount must be understood by all involved. The mind-set for management change is one that emphasizes

process over specific content, recognizes organizational change as a unit by unit learning process rather than a series of programs, and acknowledges the payoffs that result from persistence over a long period of time as opposed to quick fixes. This mind-set is difficult to maintain in an environment that presses for instantaneous gains, but this approach is the only one that will bring about successful change.

E. SUMMARY OF AVAILABILITY SUPPORT STRUCTURE

This chapter has described the restructuring of existing maintenance, repair, and modernization organizations into a consolidated Afloat Maintenance Command (AMC). The AMC consists of several elements to improve the process. These elements include the Fleet Support Center, Technical Support Structure, Business Operations Center, and the POM/Budget division. The FSC is a consolidation of existing organizations responsible for the assessment, planning, and execution phases of the maintenance and modernization process. The technical support structure combines current fleet technical support activities into a single cohesive unit. The BOC is designed to provide business support functions for the entire AMC. The POM/Budget division performs the task of obtaining and executing the resource dollars provided with the PPBS. These consolidations seek to derive cost savings from the elimination of duplicity in capabilities and efforts. In summary, the AMC will provide the following improvements to the maintenance, modernization, and repair process.

- A single point of contact on the waterfront for maintenance issues
- An improved availability planning process by "consolidation" under one organization

- A reduction in overhead through consolidation of core management functions at AMC within the Business Operations Center (BOC)
- A consolidation of waterfront technical support under one organization
- The more efficient brokering of work to IMAs and maintenance depots

A chart of this restructuring is provided in an AMC organizational diagram (Figure 1).

The dynamics associated with organizational change have been presented. Additionally, the discussion included the Navy's use of the TQL initiative in starting and maintaining the changes in process improvement. The restructuring has centered on the elimination of redundancies in the current system. The notion that gains in cost savings can result from consolidation of efforts is also key. Additionally, the attempt to provide an improved match between responsibilities and resource control in accomplishment of required maintenance is stressed. Improvements in quality and efficiency in cost outlays can result if proactive planning is conducted using proven management methods including TQL. Finally, the future is sure to be filled with unforseen challenges, and the strategy to meet these will require innovation and commitment from all involved.

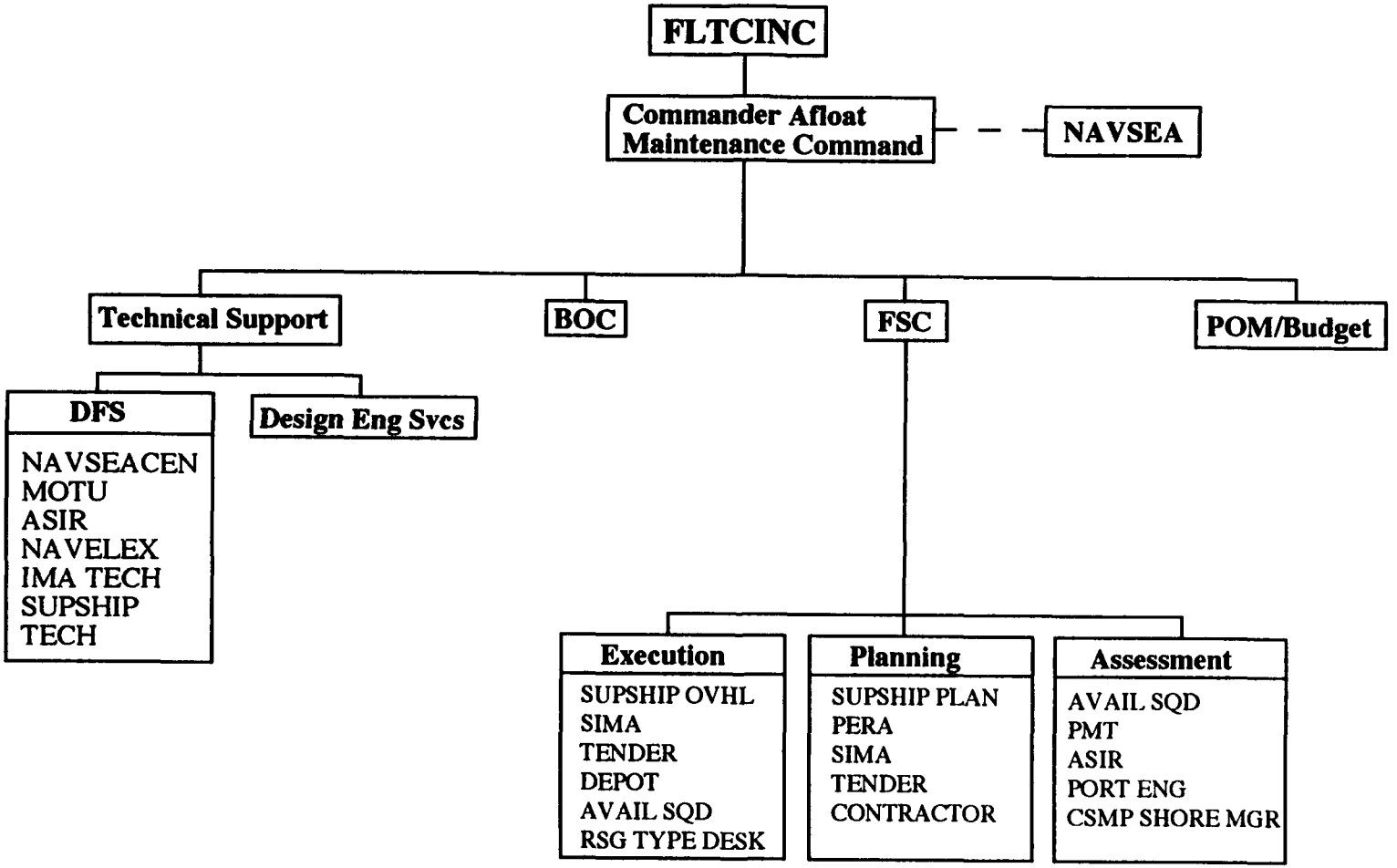

Figure 1
Afloat Maintenance Command Organization

III AFLOAT MAINTENANCE COMMAND FUNDING

A. CURRENT AND FUTURE MAINTENANCE FUNDING

The current flow of funding for fleet maintenance and modernization is complex and involves numerous sources and destinations. Resource allocation is often inefficient in terms of identification of cost drivers, matching of authority/responsibility spheres, and stability/flexibility of operations. Funding flow impact on effective and efficient ship repair, modernization, and maintenance is an important consideration in the ongoing infrastructure downsizing. An understanding of the principles involved and potential benefits or shortcomings in various funding options should be critical for improving the process of ship maintenance.

The future will require that scarce resources be used to provide quality services at the lowest possible cost. Funding options will need to allow continuous process improvement, customer orientation, and the quality focused ideas of Total Quality Leadership (TQL) to flourish. An integrated systems approach that gives consideration to all aspects of the operation and how they interact is vital to the future success of ship maintenance.

This chapter addresses the possible funding alternatives that might be used for the Afloat Maintenance Command (AMC) to enhance ship maintenance, modernization, and repair efficiency. The discussion includes:

1. Defense Business Operations Fund (DBOF)
2. Reimbursable Funding
3. Appropriation Funding
4. Hybrid Funding

B. DEFENSE BUSINESS OPERATIONS FUND (DBOF)

The Defense Business Operations Fund (DBOF) was established on October 1, 1991, in response to the Defense Management Report 971 (DMR) which sought to achieve the financial management initiatives of increasing cost visibility, consolidating of similar functions, and realizing significant monetary savings through better business practices (DBOF Implementation Plan,1992). The Fund builds on revolving fund principles previously used for industrial and commercial type activities. The primary goal of the DBOF is to provide a business management structure that encourages managers and employees of DoD support organizations to deliver quality products or services at the lowest cost. This is directly related to the Navy's program of continuous improvement (quality verses cost), paramount in the ideals of TQL.

A major feature of this business management structure is an increased emphasis on businesslike operations. Those operations that demonstrate a business style of buyer and seller relationship are suited for inclusion in the DBOF. This relationship is currently present in the majority of ship maintenance, repair, and modernization functions. Currently, only maintenance activities such as the Business Operation Centers (BOC),

and naval shipyards are presently operating under the DBOF concept. One funding option is to include all functions provided by the Afloat Maintenance Command (AMC) under the DBOF.

1. Advantages of the Defense Business Operations Fund

Under the DBOF structure, fleet units (customers) establish maintenance and modernization services desired of the provider (AMC), and are charged for the cost of industrial and commercial-type services and products provided. The AMC will be responsible to provide quality services which satisfy the fleet at the lowest cost. The AMC's costs will be customer driven. This linkage of support costs to customer funding is intended to ensure better communications between the fleet and the maintenance support activity.

The responsibility of the producing organization to manage all costs associated with providing the requested services, forces the identification of cost drivers. Cost drivers are those activities in the process that contribute to the overall total cost of the service. Knowledge of the amount that specific activities contribute to overall costs allows the provider to focus process improvements in those areas that yield the greatest savings. Additionally, unit cost data combined with performance measures can provide the ability to assess the effectiveness of process improvement initiatives, and also provides a basis for gain sharing and other organizational incentives.

The visibility of total costs related to operational mission requirements may improved under DBOF. A more comprehensive range of support services is to be included in the budgets and costs of the operational forces requiring these services. This

is designed to permits the FLTCINCs more flexibility in the allocation of resources between units for operations, maintenance, repair, and modernization. A match of the responsibilities for maintenance would be better tied to the authority (allocation of maintenance resource dollars) necessary to accomplish the requisite tasks.

The financial procedures to be used under DBOF are intended to increase flexibility for enhanced management discretion. The annual budget documents for each business activity in the Fund provide clear guidance as to DoD's expectation of financial performance. An operational and capital budget are given to each business area. The delineation is expected to provide better visibility and more meaningful identification of operating costs. Base operations support and headquarters costs, which were often excluded in the past, are to be included as part of the operating cost of the business area. Depreciation of capital investments are included to reflect the impact of investment decisions in the prices of services. Therefore, the Fund is proposed to provide better visibility, at every level of management, of the total cost of operating maintenance support activities.

There are no other planned dollar or personnel restrictions associated with the operating budgets (DBOF Implementation Plan,1992). The overall resource use is designed to be ultimately determined by the level of outputs provided. The manager of each business area is expected to maintain costs within the sum of approved cost goals times the customer determined work load. The theoretical advantage of this management concept is that the manager has the opportunity to make trade-off decisions for the best

operating result. In the past, restrictions or limitations on trade-offs between elements of cost may have driven managers to make less efficient decisions, that increased the total cost of the service.

The DBOF use of the revolving fund concept of a capital corpus is intended to lend stability in year to year funding. Maintenance, modernization, and repair activities draw upon a self regenerating capital fund to perform the services requested by the customer. The capital corpus is then renewed after the service is provided and the customer pays. This is designed to avoid the fluctuations that may occur from year to year in appropriation style funding of maintenance operations.

Stabilization of prices to customers is expected to help insure that the programs approved by the Administration and the Congress are executed as planned. At a minimum, the system is intended to enhance identification of trouble areas. Although Congress does not appropriate directly to the supporting activities, but to their customers, it maintains visibility over the supporting units cost of doing business and operating results. Any losses in the business fund are to be reflected in the next budget submission. Additionally, it is envisioned that the Congress maintain control over investments in the business activities by approving the capital portion of the budgets.

Funding the AMC through the DBOF may also facilitate the elimination of redundancies in personnel and capabilities. This might be accomplished by maintenance costs being customer driven. The fleet would only pay for the services required. The services within the maintenance and repair process that have reduced or eliminated

demand due to downsizing or decommissionings are forced to become cost efficient to meet the break even point. The manning levels and capabilities are expected to be driven towards cost efficiency in order to survive in a smaller fleet.

In summary, the alleged benefits of the AMC being funded under DBOF are a better communication between fleet units and the maintenance support activity, improved identification of cost drivers for the providers of maintenance and repair services, enhanced visibility to all levels of total cost through use of both an operational and capital budgets, and a customer work-load driven cost structure that allows managers of maintenance services the ability to make efficient trade-off decisions. Additionally, an improved match between the FLTCINCs maintenance responsibility and authority is intended along with stability of funding from year to year associated with a revolving fund. Finally, a mechanism that forces activities to become cost efficient in operations while maintaining quality is desired.

2. Concerns with the Defense Business Operations Fund

There is concern about several of the premises that the DBOF operates under (DoD Financial Systems Memo,1990). The existence of a true business environment within the operational forces is questionable. There is no true free market since customers are not permitted to seek alternatives for most services. The placing of maintenance, repair, and modernization services in a revolving fund actually removes control from the customer. This is because these services are required of the operational

forces to maintain readiness regardless of the cost implications to the individual customer. The customer is basically left to trust the supplier to manage costs effectively, and the only recourse is not to buy the services, which is not really an option.

The premise that decisions are designed to be based on the least cost alternative ignores the fact that no meaningful choices exist in many circumstances. For example, geographic circumstances, lack of a specific capability from other sources, and the need to maintain in-house capabilities for mobilization are just several considerations. The lack of management's freedom to exercise control over the civilian workforce is ignored. Current rules about placement, hiring, firing and reductions in force prohibit management from taking actions required for efficiency. These are serious issues to be considered.

A potential problem regarding accounting system workload and ability to accurately determine unit costing data is present. The use of DBOF may increase accounting requirements and complexity by creating a multiplicity of reimbursable costing and billings for basic and support costs. The workload of the budget effort might be double since defense of a two budgets for each dollar is required. One budget for the costs of the operational units and another representing planned expenditures within the fund are likely. Current accounting and financial management systems are believed inadequate to accommodate the unit cost concept effectively or efficiently.

The cost accounting system used to compute the unit cost rate must, of necessity, be complex and dynamic to be effective. The current accounting systems are not effective at providing the degree of true cost identity necessary to post large cost

efficiency gains. The use of volume based costing systems run the risk of systematically misallocating costs. This type of system means that high-volume services/products tend to be overcosted relative to the low-volume services. This occurs based on the extent that overhead cost are driven, in the long run, by transactions which are not proportional to output volume (Shank/Govindarajan,1989). The majority of overhead costs may be caused by special infrequent services. These overhead costs are then applied to high-volume services at a disproportionately higher price. The low volume special services may be underpriced or show higher margins. The high-volume services are allegedly subsidizing the low-volume ones, but the accounting system camouflages this fact. This systematic misallocation may be overcome through the use of transaction costing.

Transaction based overhead allocation systems adopt a long range focus on cost behavior. The determination of what activities ultimately cause costs are identified and based on the appropriate measure of workload, costs can be more accurately allocated. For example, receiving costs are partly caused by the bulk of receipts, partly by weight of receipts, and partly by fragility of receipts as well as the number of shipments received. A cost accounting system must be complex enough to identify and track transaction costs at this level. This allows accurate cost information to be used to implement a viable and efficient strategy. The current systems make use of volume style cost allocation that may force incorrect management decisions for process improvements. A cost accounting system that provides realistic transaction-based cost data is needed if the cost savings anticipated under DBOF are to be accomplished.

A significant infu'on to the corpus is envisioned. This is necessary to include the additional activities of maintenance, repair, and modernization not presently part of DBOF and to accommodate the increased cash requirements of the proposed billing of accounts quarterly. This may invite additional Congressional oversight into an area that is still in the delicate early stages of development. The justification of a large infusion may lead to program cuts in areas previously supported.

There is a concern the DBOF places too much emphasis on a peacetime business approach of lowest cost and that this might have a harmful impact on future mobilization capability (DMRD,1991). The drive to cost efficiency may force management decisions that possibly would reduce or eliminate capabilities needed only in times of reconstitution or unforseen circumstances. The requirement of break even profits and attention to customer's current needs may force sacrifices in the area of planning for future contingencies.

A DBOF approach may cause unhealthy internal competition between elements within an organization. The area of Direct Fleet Support (DFS), that provides technical assistance to fleet units, may suffer from unhealthy competition. The numerous elements of the technical community may be required to become aggressive at selling their services in order to survive. This might result in the various technical elements forcing several similar programs on the fleet simultaneously. The result is potentially inefficient technical support. This area of fleet customer service is one that may not be needed frequently, but when required is of vital importance. Therefore, the competition of DBOF within the technical support arena may prove unsatisfactory to meet fleet needs.

The DBOF concept focuses on improved quality at the lowest cost. The notion that one never gets more then one pays for makes the high quality at lowest cost principle suspect. Skeptics believe that since the DBOF forces producing services and goods at the lowest cost that quality may suffer accordingly. This quality includes reliability and timeliness of the maintenance services provided. The fear is that operational readiness might be reduced because repairs will take longer and be less reliable if driven solely by a lowest cost approach.

There potentially exists a feeling that the DBOF concept is being forced upon the Navy by the DoD Comptroller. The push for a centralization of power at the DoD level may be behind this funding approach. The previous system of the Navy Industrial Fund (NIF) was believed effective by many. Additionally, there is question to whether more efficiency gains would result from process improvements under the NIF or from implementation of the DBOF. The ability of the NIF to meet required efficiency gains may have not been allowed adequate time to react. The issue that DBOF may be forcing compliance from the top instead of fostering commitment from within is worthy of careful consideration.

In summary, the concerns with the use of the DBOF for funding the AMC are that there does not exist a true free market environment within the Navy's maintenance system. The current accounting systems seem inadequate to provide the accurate cost accounting data for unit cost determination. A large infusion to the current capital corpus of the fund appears to be required if the Afloat Maintenance Command is included in DBOF. The occurrence of unhealthy competition within the area of technical

support may result. Mobility and reconstitution capability may suffer due to the emphasis on cost efficiency and break even cost requirements. Finally, the risk that quality in terms of timeliness and reliability of maintenance services might decline under the focus of lowest cost operations is present.

C. REIMBURSABLE FUNDING

The lateral transfer of financial resources is referred to as a reimbursable. A reimbursable work order is issued to another activity when the in-house assets or expertise are not available to accomplish the desired work from within the activity. The reimbursable work order is a written agreement between components of the federal government requiring the performance of work or services by the receipt of the order, with ultimate payment to be made by the issuer of the order. If accepted, the reimbursable order is a source of funding which increases the obligational authority of the performing activity and decreases that of the performing activity. The order is initiated by the requesting activity and contains a description of the work requested in addition to a funding citation and a specific dollar amount for the work to be completed. This document is then transmitted to the providing activity which will determine whether the work requested can be accomplished within the constraints of its expertise and resources. The performing activity has the option to accept or reject the reimbursable order based on its ability to meet the job requirements. The reimbursable work order used for the repair and maintenance of materials or equipment is the project order.

Project orders are essentially the same as contracts with commercial concerns because the performing activity agrees to perform a discrete task. Funds appropriated through the issuance of a project order are accounted for by the requesting activity. The funds remain available until the requested work is completed regardless of when the funds expire for obligation purposes and, thus, can cross fiscal year boundaries.

A reimbursable funding system for ships maintenance, modernization, and repair is designed to be very similar to the idea of funding under the Defense Business Operations Fund, with the exception that a capital corpus is not available for the performing activity to draw upon for resources to accomplish the job prior to payment. This would mean that the performing activity must have sufficient resources allotted within its operating budget to perform each job requested until payment is received at the completion of work. The use of reimbursable funding for the Afloat Maintenance Command has numerous advantages and disadvantages.

1. Advantages of Reimbursable Funding

According to the Department of Defense (DoD) Regulation 4000.19R, reimbursable funding is designed to:

> ...promote interservice, interdepartmental, and interagency support within the Department of Defense and among participating non-DoD agencies and to improve effectiveness and economy in operations by eliminating duplicate support services among DoD components and participating non-DoD agencies without jeopardizing mission accomplishments.

The principle behind the reimbursable concept is that efficiency and effectiveness in support services may be accomplished through the elimination of duplicate capabilities. This idea supports the new maintenance strategy within the Afloat Maintenance Command concept.

The advantages associated with the use of reimbursable funding within the AMC are to improve the communication between the fleet and the maintenance support activities. A customer/provider business relationship is established since the fleet requests specific work to be accomplished and the support activities are required to accept or decline the requests based on capabilities and resource limitations. This improved understanding is intended to lead to a quality service being provided in accordance with the customers wishes.

The cost accounting system may be enhanced through the use of reimbursable funding. The support activities are expected to better identify and track costs associated with jobs requested. This is because the project order gives a dollar limit for the work desired and the performing activity must be aware if the job can be done within the funding allowed.

The reimbursable funding concept theoretically improves the match between the responsibility for and authority to accomplish the necessary ship maintenance and repair. The FLTCINCs decide how to allocate their resources available for the accomplishment of specific maintenance, repair, and modernization requirements to enhance operational readiness.

2. Concerns with Reimbursable Funding

Complexity associated with the reimbursable accounting process makes it difficult for the financial manager to exercise control over these funds. This complexity is due to (1) the requirement for extensive cost accounting procedures which makes matching difficult, and (2) the multiplier effect. Accurate accounting records are essential if an activity and its cost centers are to stay within the spending limits set by higher authority. Failure to stay within established spending limits is a violation of federal law and additionally reflects poorly on the activity's ability to efficiently manage funds. Reimbursable accounting relies heavily upon the cost accounting function to attribute obligation and accrual accounting values against the reimbursable order. Therefore, accurate cost accounting is essential to ensure that the correct activity is charged the correct amount for the services provided.

The multiplier effect is a factor that further complicates the reimbursable process. The phenomenon occurs when the support activity receives a reimbursable order and then decides to subcontract the work out to another activity. This chain reaction of increasing and decreasing numerous activities obligational authority increases the transactions required to account for the same funds. The number of transactions required to account for the funds obligated by the original project order increases by two with each new subcontractor involved. As the quantity of transactions increases, so does the potential for error. Matching outstanding obligations with expenditures becomes even more difficult and the inability to trace unmatched bills to the correct obligation can ultimately lead to the loss of expired funds.

The customer is required to perform increased administrative functions. The definition of work desired, preparation of project orders, and tracking of reimbursable funds places an additional administrative burden on operational units. These units are often lacking in the capabilities to accurately and efficiently perform the necessary functions.

The use of a budget of estimated work by the support activity is required to provide sufficient resources to undertake requested jobs. The customer, then pays for the services rendered. This two directional funding for work is inefficient. The supporting activity's funding is not workload driven but based on estimates of potential work. The activity may accept work requests based on cash flow abilities between the direct funded budget and the income from reimbursable orders. This might not force a break even cost/revenue requirement. The supporting activity lacks the incentive to continuously improve the process by lowering costs and increasing quality. This is because the direct funded budget portion of the support activity's budget can be padded to provide the ability to match reimbursable work orders by refusing new jobs that may over obligate the budget.

The bi-directional funding to the supporting activities under this method is possibly subject to annual fluctuations associated with direct funding sources. Funding instability makes it difficult for capital improvements in processes to be efficiently initiated. The focus is placed on short range instead of long range cost savings. This emphasis is inconsistent with the principles of continuous process improvement associated with TQL.

In summary, the concerns with a reimbursable funding method for the AMC are potential increased complexity in the accounting tracking and recording system. An increased administrative burden may be placed on operational units in requesting and tracking requested services. The lack of a capital corpus fund may force a bi-directional funding flow to be required for the supporting activity. This might prevent cost efficiency gains from process improvements since the notion of work load driven break even costs/revenues does not exist. Additionally, there may be funding instability because of direct annual appropriations are required. This makes improvements in the process difficult to obtain due to ineffective capital investments. An undesirable emphasis on the short run survival and not the long run improvement of process costs and quality is present.

D. APPROPRIATION FUNDING

Funding is approved by Congress through appropriations. By, definition, an appropriation is a statute that provides budget authority for federal agencies to incur obligations and make payments out of the Treasury for specific purposes. Appropriations are categorized by purpose, such as operations and maintenance, and ship construction, which are primarily associated with the ships maintenance, repair, and modernization process. Appropriations have a specific obligational availability period which can be either annual, multiple year, or continuing/no year. Annual year appropriations are available for incurring obligations only during the fiscal year specified in the Appropriations Act. Multiple year appropriations are available for obligation for a

definite period of time in excess of one fiscal year. Continuing/no year appropriations are available for obligation for an indefinite period of time (e.g. revolving funds). Generally the duration period is consistent with the funding characteristics of the appropriation. Upon completion of the obligation availability period, the expenditure availability period begins. This period lasts five years for all appropriations, during which time detailed accounting records must be maintained and no new obligations may be created.

An expired appropriation is an appropriation that is no longer available to be used to establish new obligations, but is still available for disbursement to liquidate existing obligations. Unobligated funds still remaining at the end of an obligation availability period may be used to cover price increases. A lapsed appropriation is an appropriation, the undisbursed balance of which is no longer available for disbursement, as the two-year expenditure availability period has concluded. Upon lapse of an annual and multiple year appropriations (end of expenditure availability period), the obligated but unexpended balances are canceled and returned to the treasury.

Reprogramming/transferring is the process of shifting funds from the original purpose for which they were justified to Congress to be used for other purposes. The transfer or reprogramming may occur between programs in an appropriation or between different appropriations. The reasons for reprogramming/transferring include changes in operating conditions, new and urgent requirements, price changes, and the enactment of new legislation. There are limits to the amount and type of reprogramming that can be done. In general, funds may only be reprogrammed from lower priority programs to

higher ones or if Congress has noted the item in question to be of special interest. Reprogramming that exceeds limits, is performed improperly, or fails to disclose all transactions can lead to serious consequences, such as budget cuts or jail terms.

The DoD Appropriation Act permits the Secretary of Defense to transfer funds, with the approval of the Office of Management and Budget and Congress, between appropriations or funds in the current fiscal year. The limitations to the amount of funds that can be transferred and their proposed uses are written in the appropriation bill. Transfer authority must be exercised within certain dollar of percent limits. Those items must be of higher priority and not previously denied by Congress.

The limits of an appropriation are purpose, dollar limit, and time limitation. The use of these funds is very restricted and administered by specifics set in law and accompanying language. The incorrect execution of an appropriation is a serious offense that requires notification of the chain of command back to the Congress of the violation. This degree of oversight indicates the level of importance that is placed upon appropriation type funding.

1. Advantages of Appropriation Funding

The primary advantage of appropriation funding is the control of funds. Appropriations have very specific directions and restrictions on what, how much, and when they can be spent. This ensures that the funds are used exclusively in the manner for which they are intended. Therefore, over obligation of funds is reduced. The general adherence to planned budgets is enhanced through appropriation style funding.

A feedback mechanism is available for timely identification of over obligations. The oversight function of the Congress is maintained through the use of appropriation funding.

The system of appropriation funding provides a controlled flexibility mechanism. Changes in resource requirements that were not anticipated are able to be met in several ways. The flexibility to reprogram of transfer resources as changes dictate is available but controlled. The ability to request supplemental or deficiency appropriations for unforseen requirements is present. Therefore, a controlled flexibility is built into the appropriation funding method.

The use of appropriation funding is an efficient and effective method when a true customer/provider free market mechanism is not present. Appropriations may prevent unhealthy internal competition between elements that may result in suboptimization. The area of technical support to fleet units is an example of an area of potential suboptimization.

2. Concerns with Appropriation Funding

There are several concerns associated with the use of appropriation funding for fleet maintenance functions. The potential administrative burden of record keeping is sizeable. The accounting records are required to be kept until the appropriation account closes. This may be for a period of up to six years. A difficult and lengthy process of record verification and maintenance is the result.

The ability to match maintenance responsibilities with the authority to accomplish the actions is lacking. The FLTCINC, who is responsible for the readiness

state of ships, has little control over how the maintenance support activities decide to use their available resources in the upkeep and modernization of ships. This classic design flaw in organizational structure is further degraded through a flow of funds that prevents a match between responsibility and authority.

Appropriation funding is often highly unstable from year to year. The current drawdown in military resources, coupled with constant changes in the political system membership, results in fluctuations of funding. The Operations and Maintenance Navy (OM&N) appropriation is renegotiated on an annual basis. The continual battle to obtain, maintain, and justify budget funding makes it difficult to develop proactive long range capitalization plans that foster effective and efficient future maintenance.

The use of appropriation funding stresses a focus on costs and not customer service which is the thrust of the Total Quality Leadership program. The work performed by the maintenance activities is input driven based on funding availability. An effective and efficient system might center upon the customer's needs, and be output driven. The readiness level is the ultimate output of the maintenance activities efforts. However, the funding flow of appropriations potentially prevents the emphasis from being placed on readiness. The level of readiness is being driven from the maintenance support activity through the decision on what jobs are funded. This decision should be made by the party responsible for readiness (FLTCINCs) through selection of necessary maintenance based on a cost/readiness benefit analysis. This split at times results in suboptimization within the Navy. The optimization of the maintenance budget is possibly accomplished at the expense of overall ship readiness.

E. HYBRID FUNDING

The idea behind a hybrid system of funding is to integrate elements or principles from the various funding options described above to maximize the advantages and minimizes the disadvantages of each plan. The premise of doing a better job with decreased resources seems to indicate that responsibility be matched with authority. A funding system like DBOF/reimbursables ensures that the customer (FLTCINCs) may participate in the decision process that links the responsibility/authority pair. These system additionally support the Navy's move towards continuous process improvement, customer oriented principles of Total Quality Leadership.

As noted, the problem with the DBOF/reimbursable system is that a true free market of a customer/provider relationship may be absent. The notion that competition is not always wanted due to suboptimization, readiness, and industrial base concerns that must sacrifice efficiency for an effective capability are also worthy of consideration. These concerns indicate that not all areas of ships maintenance, repair, and modernization are best suited for a competitive environment such as the DBOF or reimbursable funding. A funding system that places the true elements of maintenance that are free market like under the DBOF/reimbursable concept and allows a modified system to address capabilities that are essential regardless of cost efficiency is needed.

The idea of separate capital and operational budgets allows for proactive long range decisions to be made that will benefit future maintenance capabilities is paramount (DMRD,1991). A stability in funding for operations would be provided by the DBOF capital corpus. The corpus also embraces the output driven principles of TQL.

Customer requirements would determines quality service at the lowest feasible cost. A healthy team relationship with improved communication and responsiveness to changes is highly desired. The DBOF/reimbursable funding addresses many of these concerns, but is far from perfect in meeting all requirements.

The focus on costs and a break even strategy associated with the DBOF/reimbursable may occur at the expense of other things. The readiness level of ships and the timeliness of repairs and modernization are not the primary concern under a lowest cost funding strategy. Issues of mobility and reconstitution within the defense industrial base are sacrificed under a break even strategy. An effective hybrid system should give consideration to the necessary optimization level of these more qualitative concerns.

A funding system that addresses the strengths and limitations of the accounting mechanisms is necessary. The hybrid system of funding may require capabilities in cost identification, tracking, and recording that currently are lacking. Additionally, the level of administrative burden encountered and the effects on timely and accurate task accomplishment is worthy of regard. A hybrid system that can provide these types of improvements while minimizing the corresponding complexities is the goal.

A potential hybrid funding system may be examined by reviewing the maintenance and modernization characteristics of assessment, planning, execution, technical support, and business operations within the Afloat Maintenance Command. The material condition assessment elements may be direct appropriation funded based on historical and

expected future workload data. These assessment elements include the availability squadron, performance monitoring team, shore managers of CSMP, and port engineers.

The existence of a true customer/provider relationship is not generally present in the assessment of ship equipment. The primary assessment should come from the personnel assigned to the ship. Their hands-on experience with some expertise and help from the port engineers, performance monitoring team, or the availability squadron may efficiently and effectively meet the needs of equipment material conditional assessment. If these elements are forced to operate on a reimbursable basis, some of their capabilities that are infrequently required may be lost.

Lost capabilities result when a reimbursable break-even cost/benefit analysis is applied to all capabilities. The likelihood exists that some assessment expertise, which may be currently under utilized on a strictly revenue/expense bottom line, might be in high demand later as original operating life cycles of various equipment is extended due to future resource restrictions.

For example, the expertise to assess the material condition of a gas turbine engine that was originally planned for a 10,000 hour life span, may be used only once a year during the first 5000 hours of operation, however the demand for these skills may rise to four or more times per year during the last 5000 hours. However, if the capabilities to assess the engine had to survive on a break-even basis (reimbursable), it may have not survived the first half of operational life. Additionally, the situation may occur where the engines life span may have safely been increased to 15,000 hours because of better then expected performance, but the assessment capability to make this decision had been

lost earlier since it was not cost efficient. The savings from increasing the service life 5000 hours may have been several times the cost of maintaining the capabilities. The emphasis in maintaining assessment assets acquires a short run break-even focus instead of one founded on long term profitability.

The use of appropriation funding for assessment capabilities may allow the flexibility to maintain skills that might prove cost efficient in the long run, but are difficult to justify keeping in the short run. Additionally, the elements may not be required to sell capabilities actually needed in order to remain in business. The need for undesirable internal marketing and suboptimization of overall maintenance objectives may also be reduced.

The availability planning elements of SUPSHIP, PERA, SIMA, and private contractor exist within a potentially viable business style environment. A ship with its assessment of equipment degradations and required modernizations could seek a provider to render planning services. Therefore, the availability planning elements could potentially be funded on a reimbursable basis. Under this condition, the government supported planning elements of PERA, SUPSHIP, and SIMA would be required to compete against private contractor planners. This could force gains in both cost efficiency and overall effectiveness. Efficiency gains in availability planning may come from improvements in technical drawing accuracy, proper scoping of work, required material identification, and timeliness of the planning process. A crucial element of an open planning phase would be the availability of government furnished information to all parties concerned, both government and private.

The availability execution elements of the AMC could be funded by several methods. Navy Industrial Fund activities are basically suited for inclusion within the DBOF. The existence of a true customer/provider relationship is most nearly present in this area of maintenance. Competition between private and government shipyards and industrial facilities may enhance cost efficiency and improve quality. The use of depot level facilities is generally well planned in advance and allows the customer to determine services and quality desired. Therefore, the TQL principles of improved quality at the lowest possible cost that are reinforced in DBOF, appear to fit this maintenance and modernization availability execution element.

The availability execution elements of the SIMAs could be funded on a modified reimbursable basis. The cost of direct materials, and the majority of labor for a job would be reimbursable. The modification of this funding flow would be that the overhead, indirect expenses, and remaining labor costs would be direct funded (subsidized). Several arguments support this arrangement. First, the SIMAs are designed to provide training to sailors, in addition to the accomplishment of maintenance and repair work. The fact that expertise and training is short lived and generally beyond the control of the element, means that the customer should not be charged for the entire cost. Second, the ability to maintain cost inefficient but mission vital capabilities can be provided through direct funding of the capital budget. The often short-fused and operationally critical work performed by the SIMAs justifies the direct subsidization of costs. The SIMAs would still have the incentive to be cost efficient through partial

reimbursable funding, but also would be given the added flexibility to meet the operational needs and cost inefficient maintenance/repair capability requirements of the fleet.

Tenders are a key repair asset designed to perform maintenance and repair (limited battle damage repair) in forward deployed areas. The issue of operational readiness and timeliness of repairs is therefore crucial to funding these availability execution assets. Accordingly, an appropriation style of funding based on historical and expected future (including contingency operations) resource levels may be most appropriate. This is because the lack of a free market environment associated with the tenders area of operation. A tender is, generally the only total maintenance and repair asset (assessment,planning,execution) available in many forward deployed areas. The funding level of these assets should be at a sufficient level to ensure the operational requirements of ships are a priority.

The area of fleet technical support (DFS) has appropriation funding characteristics. The technical support service is an area in which capabilities must be maintained even if not cost efficient from an work output standpoint. The capability may not be cost efficient in the short run, but when long term costs are accounted for, its presence is vital. For example, a small class of ship like the KIDD class destroyers, may not justify maintaining a technical expert on a pure cost efficiency basis. However, when these four ships were needed to participate in Operation Desert Shield/Storm, the cost of maintaining the technical expertise base prior to the operation was probably far less then

the cost of not having these assets fully mission capable due to a lack of technical support capability. The maintaining of the technical capability was most likely very cost efficient in this situation.

The cost savings from a reduction in technical support capabilities may appear artificially high until the negative externalities such as increases in operational downtime, spare parts, and frequency of failures are considered. The use of a reimbursable/DBOF manner of funding could lead to unhealthy internal marketing previously discussed, and to fleet units not obtaining needed services due to prohibitive costs. Technical support should be funded so that the customer (fleet) is given the incentive to take full advantage of available technical assistance resources whenever possible. The pay offs in increased operator knowledge as well as reduced failures and downtime of systems are the key factors to consider.

Finally, business support functions may be funded on a reimbursable basis. Cost efficiency gains from the centralization of business functions may be substantial from the elimination of duplication of capability. The effects of specialization may also add to overall cost efficiency and effectiveness. Timeliness and quality of work are maintained by the need for the BOC to ensure customer satisfaction in order to receive funding. The existence of a true customer/provider relationship is crucial to successful performance of requested services.

In summary, a hybrid system of funding must be carefully chosen and developed. The system must capitalize on the advantages of existing funding methods, provide capabilities not present, and anticipate future requirements. This must all be done out

of a concern for customer service, overall cost efficiency, preservation of capability, development costs, and control of system complexity. This is by no means a simple task in theory or in practice. However, the optimal system appears to require a flexible funding methodology.

F. SUMMARY

This chapter addressed several funding options for the Afloat Maintenance Command and their associated advantages and disadvantages. This cost/benefit analysis has shown that each option has numerous strengths as well as weaknesses. These options included funding the AMC under the DBOF, reimbursable, appropriation, or combination of one or more of these systems. The advantages and concerns with each funding option is as follows.

The benefits of funding under DBOF include a better communication between fleet units and the maintenance support activity. There is improved identification of cost drivers for the providers of maintenance and repair services. Enhanced visibility to all levels of total cost through use of both an operational and capital budgets is made available. There exists a customer work load driven cost structure that allows managers of maintenance services the ability to make efficient trade-off decisions. An improved match between the FLTCINCs maintenance responsibility and authority is possible. The stability of funding from year to year associated with a revolving fund is present. Finally, a mechanism that forces activities to become cost efficient in operations while maintaining quality is may result.

The concerns with the use of the DBOF for funding the AMC are that there does not exist a true free market environment within the Navy's maintenance system. The current accounting systems are inadequate to provide the accurate cost accounting data for unit cost determination. A large infusion to the current capital corpus of the fund will be required if the Afloat Maintenance Command is included in DBOF. The occurrence of unhealthy competition within the area of technical support will likely result. Mobility and reconstitution capability will suffer due to the emphasis on cost efficiency and break even cost requirements. Finally, the idea exists that quality in terms of timeliness and reliability of maintenance services will decline under the focus of lowest cost operations.

The advantages of a reimbursable mechanism of funding are the establishment of a customer/provider relationship. This relationship enhances the communication between the operational and support activity. The cost accounting system will be improved in its ability to identify and track costs of doing business. Finally, there is a match of the responsibility for readiness with the authority to accomplish the required maintenance.

The disadvantages with a reimbursable funding method for the AMC are the increased complexity in the accounting tracking and recording system. An increased administrative burden will be placed on operational units in requesting and tracking requested services. The lack of a capital corpus fund forces a bi-directional funding flow to be required for the supporting activity. This prevents cost efficiency gains from process improvements since the notion of work load driven break even costs/revenues does not exist. Additionally, there is funding instability because of direct annual

appropriations are required. This makes improvements in the process difficult to obtain due to ineffective capital investments. An emphasis on the short run survival and not the long run improvement of process costs and quality is present.

Strengths in the use of appropriation funding are a strict control of funds. The purpose for which the funds may be used, when they may be spent, and how much may be expended are well controlled. There is a controlled flexibility within appropriation funding that allows for timely identification of over obligations and a mechanism to obtain additional funds as changes arise.

Weaknesses associated with appropriation funding are a lack of matching between readiness responsibility and maintenance authority. There is an instability inherent in the funding of appropriations annually by the Congress. Finally, the focus under appropriated funding is on the inputs (budget dollars), instead of the desired output of readiness.

The benefits of hybrid funding are that the strong points of existing systems may be drawn upon and improved to develop a new process. This allows for the establishment of a new and improved methodology that is tailored to the current environment. The maximization of cost efficiency and goal optimization are met.

Specifically, operational readiness and timeliness of repairs are given added consideration under a hybrid system of funding. The ability to maintain and enhance contingency capabilities that may be cost inefficient is present with hybrid funding. Subjective cost values for areas such as training, expertise levels, and technical support are afforded attention.

The costs connected with a hybrid system include potentially increased complexity. There are also possible development, training, and implementation costs. A hybrid system may require additional time until fully operational. Additionally, there are probable hurdles for an unproven system to overcome that existing systems (no matter how poor) do not have to contend with.

The funding options available for use in conjunction with the Afloat Maintenance Command are numerous. Each possesses specific advantages and short comings. The ability to draw upon past experience, look to future possibilities, and chose a funding option that can effectively and efficiently optimize maintenance, modernization, and repair capabilities is vital to fleet readiness.

IV CONCLUSIONS

This chapter addresses the research questions posed in chapter one. A brief synopsis of potential solutions to each question is provided. Additionally, a summary of thesis findings is offered.

A. RESEARCH QUESTION ANSWERS

The first and second research questions inquired about an organizational structure and possible consolidations/deletions of the existing maintenance support infrastructure for the Afloat Maintenance Command (AMC). "In what manner will the Afloat Maintenance Command be organized?" "What are the possible consolidations and/or deletions of existing maintenance support groups resulting from establishment of the AMC?" A possible organizational structure for an improved maintenance, modernization, and ship repair process is the AMC. The Afloat Maintenance Command is designed to be a centralized support facility providing maintenance, modernization, repair, and technical services to the fleet. The command may be organized around the TQL principles of customer service, low cost, high quality, and continuous process improvement. The proposed restructuring focuses on the elimination of capability redundancies and centralization of maintenance functions.

The maintenance functions addressed by the AMC proposal include material assessment, availability planning, work execution, technical support, and business

operations. These areas and associated assets have been examined in the framework of a maintenance strategy that focuses

on short availabilities in lieu of extended overhauls. The use of phased maintenance (PMA), engineering operating cycle (EOC), and progressive maintenance (PROG) are the tools within this strategy.

Organizational considerations regarding the ability to effectively implement the AMC restructuring are important. The use of an established model is key to any successful organizational change. The model used in the AMC centers on a critical path of coordination, commitment, and competency to enhance the change process. The Navy's plan is to implement improvements through the process of Total Quality Leadership (TQL).

The process improvements in the ship maintenance and repair area are to be driven by the organizational structure of the AMC. Proposed elements of the AMC include the Fleet Support Center (FSC), Technical Support Structure, Business Operations Center (BOC), and the POM/Budget division. The FSC is a consolidation of existing organizations responsible for the assessment, planning, and execution phases of the maintenance and modernization process. The technical support structure combines current fleet technical activities into a single cohesive unit. The BOC is designed to provide business support functions for the entire AMC. The POM/Budget division performs the task of obtaining and executing the resource dollars provided with the PPBS. These consolidations seek to derive cost savings from the elimination of duplication in capabilities and efforts.

The third and fourth research questions concern possible funding alternatives for the AMC and their associated benefits and concerns. "What are the possible funding alternatives for the Afloat Maintenance Command?" "What are the respective cost and benefit attributes of the options available for funding the AMC?" Options addressed include administration under the Defense Business Operations Fund (DBOF), reimbursable, appropriation, and hybrid funding methods. The specific details associated with each method and their respective benefits and concerns are addressed in Chapter III.

The potential benefits of DBOF and reimbursable funding are the establishment of a customer/provider relationship that may improve communication, quality, and cost. The process becomes output driven (quality services) instead of the current system that relies on input driven processes (limited resources). A focus on cost drivers and how they effect total process costs are available using these methods. Concerns with this approach include possible accounting administrative burden/complexity, large infusion to the capital corpus, and absence of a true business market atmosphere.

The use of appropriation funding permits a high degree of control over programs and the administration and execution of scarce resources. A controlled flexibility for needed changes or unforseen requirements is designed to be available. Concern with the appropriation basis for funding include a likely inherent instability for funding from year to year. Additionally, there may be a mismatch between the responsibility for readiness and the financial administrative authority to accomplish required maintenance tasks.

The advantages of a hybrid funding method, blending reimbursable and direct funding, is that the strengths of existing systems may be combined with improvements to correct past weaknesses in developing a superior funding methodology. Consideration must be given to issues including operational readiness, timeliness of repairs, and contingency capabilities in any funding process change. The drawbacks center on potential complexity and the task of implementing an unproven system. The time and costs required to bring a revised system to full operational capability may be extensive. Potentially, this may make the hybrid method difficult to defend in the resource restrictive environment of today.

B. SUMMARY OF THESIS FINDINGS

The current maintenance, modernization, and ship repair process involves numerous organizations with similar functions and capabilities. Improvements to the organization are possible if decisions and work processes can be standardized and redundancies eliminated. The identification of potential cost savings should be accomplished in a professional and proactive manner if desired capabilities are to be maintained. The current environment may no longer allow the suboptimization of numerous maintenance spheres of influence at the expense of efficiency. The way to optimize the overall process should involve consolidation and elimination of redundant and obsolete capabilities.

The effects of types of funding flows on organizational effectiveness and efficiency is an important consideration. The ability to establish a customer/provider relationship

in areas of the maintenance process where this is possible may lead to improvements in quality, customer service, and total cost. Principles of TQL, like continuous process improvement, may be used to enhance necessary changes. Additionally, the matching of maintenance responsibility with authority to accomplish the task may be improved through proper organization of flow of funds and the selection of appropriate type of funding method.

Finally, issues related to ship maintenance and modernization include how to sustain readiness levels, mobilization/reconstitution capability, timeliness of repairs, and preservation of the defense industrial base. These concerns often do not fit conveniently into a framework of cost efficiency, and are difficult to assign a quantitative dollar value. However, these issues require special consideration if future requirements and national security uncertainties are to be met effectively.

C. AREAS FOR FURTHER RESEARCH

The research for this thesis has identified areas for further study. The following topics are suggested:

1. The Afloat Maintenance Command concept may be applicable for use in other maintenance strategies. The notion of continuous maintenance is a viable option for ship maintenance and repair in the current environment. The feasibility of the AMC within a framework of continuous maintenance may identify further cost savings and process improvements.

2. The move to permanent battle group integrity leads to interesting questions for the timely, effective, and efficient maintenance of all assets within a battle group. Can cost effective maintenance be performed within the same geographical region on several different ship types simultaneously as required?

3. The use of strategic homeporting has placed an additional complexity on the maintenance support activities in the present environment of budgetary restrictions. How can the demand for effective yet cost efficient maintenance be provided for ships in remote ports?

4. The decision to restructure an organization is ultimately based on quantifying the resultant cost savings. Specific data on dollar savings are often difficult to obtain and may contain a high degree of subjectivity. The use of an objectively-based cost savings model would be an invaluable tool for decision makers. A quantitative cost/benefit study is needed in the area of ship maintenance and modernization to assess organizational and funding change options.

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