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Improving the Coast Guard Reparable Management Program

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The Coast Guard reparable management program needs to be responsive in providing replacements to restore equipment to operational status. Without replacements, the operational readiness of the Coast Guard Fleet suffers because equipment is often unable either to perform its mission or perform it fully. The process that provides those replacements begins during the acquisition phase, when reparable items are designated and maintenance responsibility is assigned, and extends through the sustainment phase, when reparable item stocks are replenished – either repaired or procured. The Coast Guard tasked us to analyze policy and practice for planning maintenance and identifying the supply support requirements needed for reparable items. We found that Coast Guard reparable management policy is too general and when put into practice – during acquisition and throughout sustainment – does not establish a clear process for planning maintenance and identifying supply support requirements. We also found several initiatives being undertaken to improve reparables management. We believe those initiatives can be successful if supported by better headquarters-level policy. To achieve the most benefit from efforts to improve reparables management, we recommend that the Coast Guard:

- Prescribe a clear and logical procedure for planning reparable-item maintenance and establishing reparable-item supply capability during the acquisition phase
- Specify program and budget itemization of costs to develop reparable-item support capability during the acquisition phase
- Provide more explicit direction for project managers in assigning responsibility for reparable management support and in planning, monitoring, and enforcing performance
- Require that intermediate-level (I-level) maintenance activities be designated for reparable items coded for I-level repair
- Direct the use of requirements-type contracting for depot-level maintenance whenever possible
- Require revolving funds be used for field-level reparable items and consider their use for depot-level reparable items.

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Executive Summary

IMPROVING THE COAST GUARD REPARABLE MANAGEMENT PROGRAM

An effective Coast Guard reparable management program is needed to provide replacement items to restore equipment to operational status. Without replacements, the operational readiness of the Coast Guard Fleet suffers because equipment is often unable either to perform its mission or perform it fully. Normally, replacements are drawn from a pool of items purchased during the acquisition of equipment and replenished by repairing unserviceable reparables or procuring new ones. The process that provides those replacements begins during the acquisition phase, when reparable items are designated and maintenance responsibility is assigned. It extends to the sustainment phase, when reparable item supplies are replenished – either repaired or procured – and maintenance-level decisions made during the acquisition phase are validated and, if necessary, modified.

Our analysis focuses on policy and practice for planning maintenance and identifying the supply support requirements (spares, repair parts, tools, and test and support equipment) including determining the initial and replenishment quantities to be procured, establishing organic repair support, awarding contracts for commercial repair support, and funding reparable items. We found that Coast Guard reparable management policy is too general and when put into practice does not establish a clear process for this support.

During the acquisition phase, reparability and maintenance-level responsibility for specific reparable items are not determined and clearly communicated before the provisioning process begins. The Coast Guard supply centers have neither the time nor means to analyze the economics of repairing versus discarding items in order to make those decisions. Consequently, provisioning items and quantities will not reflect actual maintenance practice with any certainty because they are decided without determining whether an item can be economically repaired, the maintenance level at which repair is most economical, and whether repair should be performed

organically or commercially. Additionally, contracts for commercial repair support cannot be awarded until after equipment is fielded and such requirements emerge.

After the equipment is fielded, repairs are unnecessarily delayed because the Coast Guard must first develop a process for replenishing reparable items. Repair lead time is increased because repair specifications must be developed before using commercial repair support or support items must be obtained to enable organic repair. Equipment downtime lasts until a reparable item replacement can be obtained.

The use of appropriation purchase account funding is inconsistent with the designation of an item as reparable at the intermediate or organizational level. We found that under the current practice of such funding for many of these items, managers may requisition a replacement free of charge rather than repair the item at the designated maintenance level.

We found several initiatives being undertaken to improve reparables management. We believe those initiatives can be successful if supported by better headquarters level policy. To achieve the most benefit from efforts to improve reparables management, we recommend that the Logistics Management Division (G-ELM), the policy developer for integrated logistics management, take the following actions:

- Prescribe a clear and logical procedure for planning reparable item maintenance and establishing reparable item supply capability during the acquisition phase. The procedure should address the method for determining reparability and maintenance level responsibility, deciding supply support methodology, identifying provisioning item requirements, computing provisioning item quantities, and establishing commercial repair sources.

- Establish a logistics support analysis program that accommodates the development of reparable item support capability pursuant to established policy.

- Specify program and budget itemization of costs to develop reparable item support capability during the acquisition phase.

- Provide more explicit direction for project managers in assigning responsibility for tasks and supporting roles and in planning, monitoring, and enforcing performance of tasks required to develop reparable item support capability.

- Require that intermediate-level maintenance activities be designated for reparable items coded for intermediate-level repair.
- Direct the use of requirements-type contracting for depot-level maintenance whenever possible.
- Require revolving funds be used for field-level reparable items and consider their use for depot-level reparable items.

Implementation of our recommendations will improve responsiveness of the Coast Guard reparable management program by determining reparable item investment quantities more appropriately and eliminating the lead time now required to establish repair capability after equipment has been fielded.

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CHAPTER 1

OVERVIEW

INTRODUCTION

In its *Logistics Master Plan*,[1] the United States Coast Guard states that responsiveness is the primary measure of effectiveness for a logistics system and describes an effective system as one that delivers required materiel to the customer/user within established time frames. Responsive logistics support is a goal pursued not only by the Coast Guard but by other Government agencies and industrial activities worldwide. Just-in-time purchasing and operational availability modeling are two examples of response-oriented inventory management approaches currently used by industry and the Department of Defense, respectively. Both the *Logistics Master Plan* and current approaches to response-oriented inventory management reflect the basic tenet that a response orientation can only be achieved through a solid partnership of logistics support organizations. That partnership must be founded upon a set of comprehensive policies and procedures that clearly and logically define each partner's contribution to the goal of responsiveness.

RESPONSE-ORIENTED REPARABLE ITEM MANAGEMENT

The Coast Guard logistics system supports a variety of complex electronic and naval engineering equipment required for the many Coast Guard missions. That equipment fails randomly as a result of time and use, and its problems are usually attributable to the failure of one or more parts embedded in assemblies or subassemblies. If the assembly or subassembly is a reparable item, the equipment failure can be corrected by replacing either the bad part or parts that caused the assembly or subassembly to fail or the unserviceable assembly or subassembly itself. The most responsive method is the one that more quickly corrects the equipment failure. It may be quicker and less expensive (in terms of the cost to provide the required diagnostics and maintenance capability) to replace the unserviceable assembly or

[1]The *U.S. Coast Guard Logistics Master Plan* was approved by the Chief of Staff in February 1992. It integrates the various modernization efforts to redesign Coast Guard logistics over the next 10 years.

subassembly. Replacement of the failed part, on the other hand, may be preferred. In either situation, the task of response-oriented reparable item management is to establish the capability to remove and replace the part, assembly, or subassembly, as appropriate, at the unit level and eliminate or minimize the time until a serviceable replacement part, assembly, or subassembly is available (i.e., response time).

Relationship Between Supply and Maintenance Functions in Response-Oriented Reparable Item Management

The *Logistics Master Plan* recognizes that a symbiotic relationship exists between the various logistics support functions. Nowhere is this relationship more evident than in the supply and maintenance functions relative to response-oriented reparable item support. The maintenance function depends upon the supply function for tools, test equipment, support equipment, replacement parts, assemblies, and subassemblies to repair equipment. The supply function, in turn, depends upon the maintenance function to repair items to replenish the inventory and to forecast the need for items used in providing maintenance support. Both functions, however, are united by a common objective, expressed by the *Logistics Master Plan* as the overall objective of logistics: to provide the right persons, things, and information, at the right time, at the right place, and at a reasonable cost.

To determine the right tools, test equipment, support equipment, replacement parts, assemblies, and subassemblies and the right place to provide them, certain maintenance planning decisions must be made before supply support can be tailored. Among those decisions are whether an item is to be designated as a reparable or a consumable and at what level of maintenance the reparable items are to be removed and replaced, repaired, condemned, and disposed of. Additionally, the supply function must know whether a reparable will be repaired organically or commercially. Table 1-1 shows the supply support decisions that are dependent upon maintenance planning information.

In order to determine the right time to provide the right tools, test equipment, and support equipment, the supply function must know when and how equipment will fail. Because equipment failures occur randomly, that information cannot be known with absolute certainty. Therefore, maintenance levels that are authorized to remove and replace, repair, and condemn/dispose of each item must have the tools, test equipment, and support equipment necessary to perform the authorized maintenance on those items when they are first required (i.e., when equipment is initially

TABLE 1-1

RELATIONSHIP BETWEEN MAINTENANCE PLANNING AND SUPPLY SUPPORT

Maintenance planning information	Supply support decisions
Item is reparable, not consumable	Repair will be the primary source of replenishing the supply of this item.
Maintenance level that is authorized to remove and replace the item	The item will be needed at level authorized to replace the item.
	Tools and support equipment (if any) will be needed at level authorized to remove and replace the item.
Maintenance level that is authorized to repair (organically) the item	Repair parts, tools, test, and support equipment will be needed at level authorized to repair the item.
Maintenance level that is authorized to repair (commercially) the item	A repair contract will be needed for level authorized to have item repaired commercially.
Maintenance level that is authorized to condemn/dispose of the item	Test and support equipment will be needed at level authorized to determine whether or not to condemn and dispose of the item.

placed into operation). If the maintenance is to be performed commercially, a repair contract is needed at that time.

The right time for the right replacement parts, assemblies, and subassemblies is when the maintenance engineer needs them to repair equipment. Again, this information cannot be known with absolute certainty. Consequently, two types of supply stock exist – unit-level stock (allowances) and system-level stock. Unit-level stock is the maintenance engineer's first recourse for repairing equipment failures caused by unserviceable parts, assemblies, or subassemblies that the maintenance engineer can remove and replace. According to the *Supply Center Business Systems Planning Study*,[2] allowances for unit-level stock should reflect consideration of, and tradeoffs among, mission criticality, consumption rates, configuration, logistics support plans, and weight and volume. Table 1-2 reflects the relevance of each factor.

[2]Volpe National Transportation Systems Center, *Supply Center Business Systems Planning Study*, Final Draft, October 1991, page 35.

TABLE 1-2

RELEVANCE OF FACTORS TO UNIT-LEVEL ALLOWANCES

Factor	Relevance
Mission criticality	Influences both the eligibility as an allowance item and the depth of unit-level stockage. The higher its criticality, the more reason to stock a reparable item and the greater the protection needed against "stock out".[a] Criticality is a function of the equipment application (e.g., propulsion equipment may be more critical to mission success than communications equipment) and the degree to which failure of the reparable item affects the ability of the next higher assembly to perform its intended operation.
Consumption rates	Influences the depth of unit-level stockage. Depending upon criticality, the unit-level allowance should be set to satisfy expected consumption during order and shipping time.
Configuration	Influences eligibility as an allowance item. The higher the indenture level, the greater the contribution to equipment readiness. A first-indenture-level spare will correct equipment failures attributed to all indentures of that item while a second-indenture-level spare will not correct failure attributed to the first level of indenture.
Logistics support plans	Influences an item's eligibility as an allowance item. The unit should only be given allowances for assemblies that it can remove and replace and parts that it can remove and replace in order to repair assemblies. To the maximum extent practical (subject to weight and volume constraints) and affordable (subject to the expense associated with the ability to remove and replace a failed item), logistics support plans should strive to provide the unit or shore support activity with the capability to repair critical equipment failures by removing and replacing reparable component assemblies or parts, whichever is more economical and responsive. Responsibility for repairing removed assemblies should be elevated to higher maintenance levels unless repair at lower levels accommodates more responsive equipment support.
Weight and volume	Influences both eligibility as an allowance item and the depth of unit-level stockage. The total weight and volume of shipboard allowance items is constrained by the ship's capacity.

[a] Stock out = the absence of an item from a supply stock.

The maintenance engineer who requires a spare to correct an equipment failure requests it from the unit-level supply officer. The unit-level supply officer issues a serviceable spare if one is in stock, returns the unserviceable item to the supply system, and requisitions a serviceable replacement to be held for the next time the maintenance engineer requires it or to repair equipment upon receipt (if unit-level stock is out).

System-level spares perform two functions for the unit level: they replenish the unit level's stock, and they serve as a maintenance engineer's alternative source of supply when the unit level cannot satisfy a requirement (i.e., unit-level stock out or nonstockage). In terms of responsiveness, a maintenance engineer's requirements should most often be satisfied from unit-level stock since that source entails the shortest response time. To the extent that occurs, system-level spares are only needed to replenish unit-level stock, thereby reducing response time to the amount of time it takes for the maintenance engineer to obtain a spare from the unit-level supply department. For those occasions on which the unit level cannot accommodate the maintenance engineer's requirement, system-level spares are far more responsive than depot-level repair or procurement.

System-level spares are stocked and replenished (through maintenance and procurement) at levels above the unit. Maintenance is the primary source of replenishing the supply of system-level spares. The Coast Guard must procure new reparables to replace those that are condemned and disposed of. In a three-level maintenance and supply structure that consists of an organizational level and two supporting levels – intermediate and depot – several combinations of support for a given reparable item are possible. Certain reparable items may be repaired, or if they cannot be repaired, they must be condemned and disposed of at the intermediate level. Some reparable items may be repaired at the intermediate level, or if they cannot be repaired at that level, they must be sent to the depot level for repair, condemnation, or disposal. Other reparables may be repaired or condemned and disposed of at only the depot level.

Requirements for system-level stock include intermediate-level, repair-cycle-time spares for items that are repaired at the intermediate level; depot-repair-cycle-time spares for items that are repaired at the depot level; and procurement lead time spares for items that are condemned at either level. System-level spares could be stocked at the intermediate level, the depot level, or both (e.g., intermediate-level,

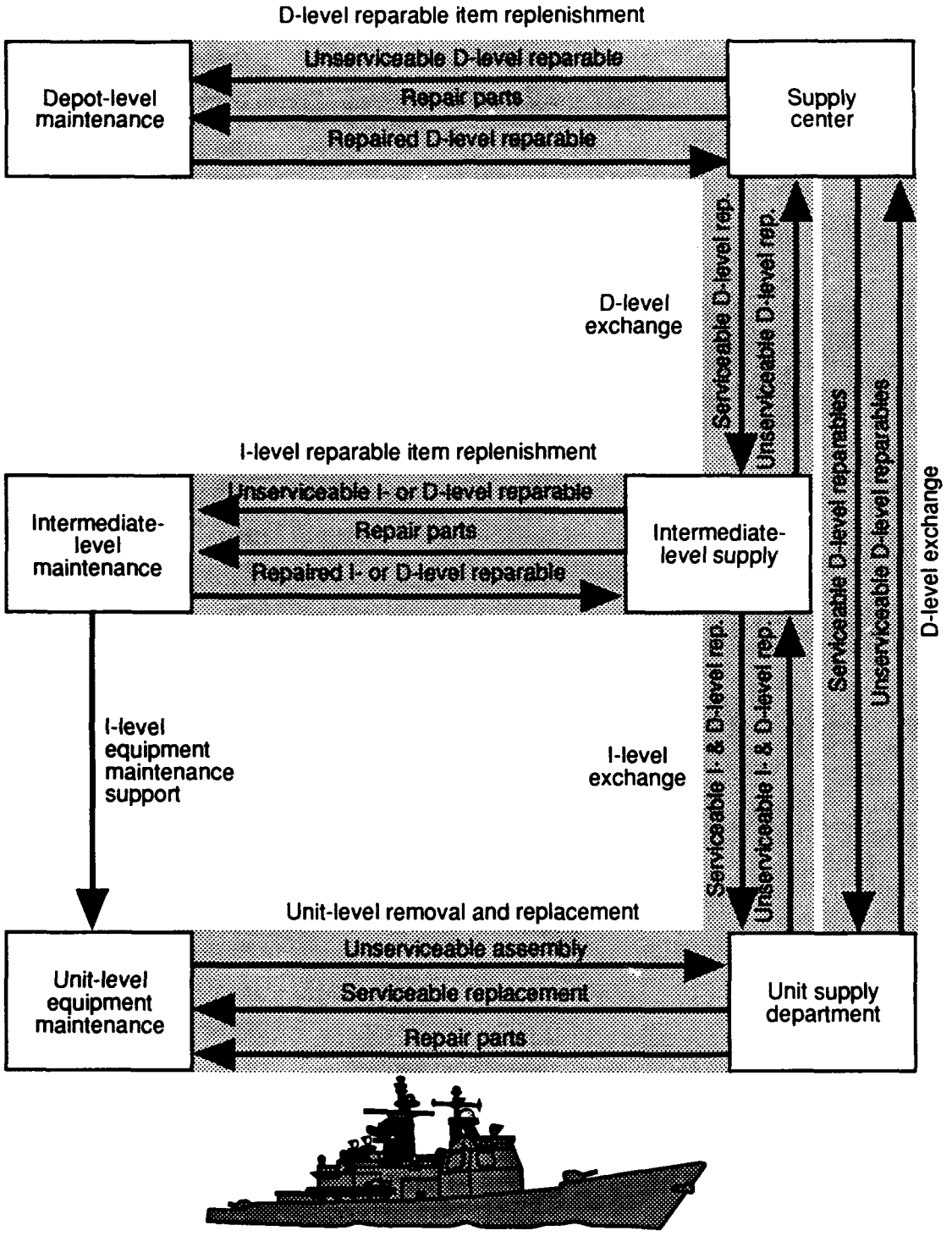
repair-cycle-time spares could be stocked at the intermediate level while depot-repair-cycle-time and procurement lead time spares could be stocked at the depot level). The supply centers could procure spares for initial stock and to replenish items that are condemned. Figure 1-1 illustrates the flow of reparable items between supply and maintenance activities. The figure depicts a type organization structure with three levels and the supply-maintenance relationships at each level. The actual organization structure for reparables support should be one that provides the alignment of responsibilities and investment in resources that most efficiently and effectively achieves responsiveness goals.

To account for the fact that demand and repair cycle time are not easily forecast, system-level spares also include a quantity referred to as a safety level. A variable safety-level formula should be used to compute the quantity based on the desirable level of protection against errors in demand and cycle time forecasts. The level of protection could be the same for all or it could reflect the criticality of the item in the form of a safety level that accommodates more responsive support. It could be expressed as a fill rate or a response time goal. The computed safety-level quantity should be stocked at either the intermediate or depot level, not both.

The amount of stock available to protect against stock outs at the unit level and the system level determines the number of times a requirement is filled by the unit level (shortest response time), the system level, and depot repair or procurement (longest response time). The average system response time (ASRT) is a composite of the amount of time it takes to satisfy every requirement for an item. Unit- and system-level stockage objectives can be set to achieve an ASRT that satisfies system- or equipment-level operational availability goals (i.e., the percentage of time that the system or equipment operates when required). Thus, ASRT becomes the link that ties logistics responsiveness to operational requirements. Figure 1-2 illustrates that link.

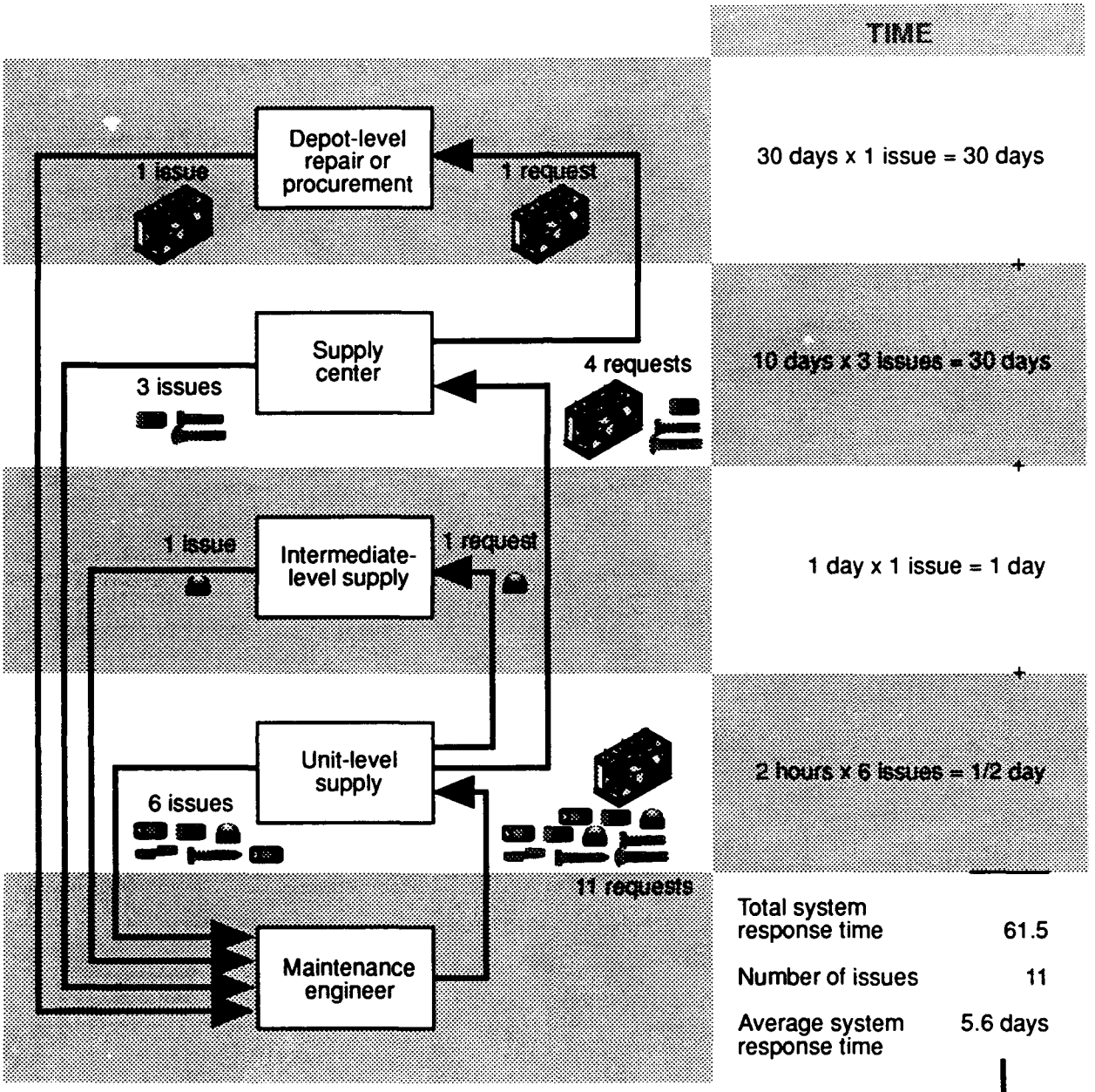
AREAS OF ANALYSIS

This study examines the existing support program for Coast Guard-managed nonaviation reparable items. We consider as reparables those secondary items that have been designated for repair at the depot level, intermediate level, or organizational level. For those secondary items, we are concerned with reparable materiel maintenance planning tasks including the designation of reparable items and the



Note: Assume all reparables are repaired (i.e., no condemnations); D-level = depot level; I-level = intermediate level.

FIG. 1-1. SUPPLY AND MAINTENANCE FLOW OF REPARABLE ITEMS IN A TYPE SUPPORT STRUCTURE



$$\text{Equipment operational availability } (A_o) = \frac{\text{Mean time between failure (MTBF)}}{\text{Mean time to repair} + \text{MTBF} + \text{Mean logistics delay time (MLDT)}}$$

$$\text{Assume } A_o \text{ goal of 80\%} = \frac{45 \text{ days}}{6 + 45 + 5.6}$$

Note: Assume requests are not filled concurrently. ASRT is the only component of MLDT.

FIG. 1-2. ASRT: LINK BETWEEN LOGISTICS RESPONSIVENESS AND OPERATIONAL REQUIREMENTS

allocation of maintenance responsibility by maintenance level. We also consider supply support planning and execution, including forecasting and procuring the initial and sustaining supply of spares and the repair parts, tools, support equipment, and test equipment needed to perform organic maintenance of reparables. Under supply support, we include planning for the use of commercial maintenance support for reparables that are not designated t › be repaired organically.

Major Issues

We considered the following major issues in assessing the Coast Guard's reparable management program:

- The policies and procedures that govern the reparable management program
- Investment in initial and sustaining inventory and maintenance support resources
- The planning, programming, budgeting, and funding methods used to finance reparables.

Study Objectives

The objective of this study is to improve the following processes:

- Identifying reparable items, determining and communicating maintenance-level responsibility, deciding the supply support methodology, and provisioning reparable item spares and support resources. We examine methods for determining and acquiring reparable item spares and support resources including repair parts, tools, test equipment, and support equipment during the acquisition phase.
- Planning for the support of reparable items during the acquisition phase. We consider the adequacy of planning in terms of specifying tasks and due dates, assigning responsible activities and supporting roles, and monitoring and enforcing planned performance of tasks required to identify and acquire spares and support resources pursuant to established policies.
- Administering the sustaining supply and maintenance system. This process includes the administration of policies and programs that define organizational responsibilities, set performance standards, and outline funding and investment strategy.
- Acquisition programming and budgeting for reparable materiel supply support. We review policy and procedures for developing resource change

proposals (RCPs) and estimating costs to develop supply support capability and capacity.

SUMMARY OF FINDINGS AND CONCLUSIONS

We found that traditionally during the acquisition phase, maintenance planning is based on experience and past decisions made with similar equipment that has been previously fielded. Maintenance planning is applied to a generic decomposition of equipment to the major-component level using a standard work breakdown structure. Also during the acquisition phase, supply support requirements are determined independently of maintenance planning, largely on the basis of a document that identifies spare and repair part allowance quantities for a generic breakdown of equipment. Quantities are based on the manufacturer's experience and judgment.

In the sustainment system, we saw evidence that maintenance and supply support planning based on generic descriptions of equipment resulted in incomplete support plans. In many cases, adequate support is neither identified nor established before the equipment is fielded; that oversight forces the supply centers, maintenance and logistics commands (MLCs), and operating units to develop support after equipment failure. The sustainment system also lacks a formal feedback mechanism to communicate actual maintenance and supply experience to support planners so that past plans can be evaluated and future plans can be improved.

We found that detailed analysis of reparable materiel logistics support funding requirements is seldom performed. Instead, estimates of funding requirements are based on the amount requested in previous acquisitions. We also found that many organizational-level and intermediate-level reparables are funded by the appropriations purchase account.

As a result of analyzing current Coast Guard policies and practices related to reparable item management, we have arrived at the following conclusions:

- Reparable item maintenance planning does not provide the necessary foundation for determining and acquiring reparable item spares and support resources during the equipment acquisition phase.
- Policy on supply support methodology is inconsistent and confusing, and, in practice, the process by which such methodology is decided does not promote efficiency or effectiveness.

- The amounts of spares, repair parts, tools, support equipment, and test equipment needed to perform organic, reparable item maintenance cannot be determined with any certainty during the acquisition phase.
- Contracts for reparable item maintenance cannot be prepared with certainty in advance of requirements for commercial maintenance support.
- Current policy and practice governing reparable item maintenance planning and development of supply support capability are imprecise in terms of specifying tasks and due dates, assigning responsible activities and supporting roles, and monitoring and enforcing planned performance of tasks.
- Planning for maintenance support after equipment is fielded is handicapped by the absence of procedures for providing feedback to maintenance support planners and for re-evaluating maintenance support decisions.
- Current procedures for assigning responsibilities for intermediate-level repair decisions are inconsistent.
- Existing practices for determining what materiel is required for scheduled maintenance availabilities do not provide sufficient coordination between MLCs and Coast Guard supply centers.
- Depot repair contracting for Coast Guard-managed naval engineering reparable components requires long delays, and those delays adversely affect the ability of the supply system to respond to customer needs and increase investment in inventories of depot-level reparables (DLRs).
- Current policy and procedures used to calculate depot-level requirements make it difficult to forecast repairs and create a mismatch between depot-level reparable assets and requirements.
- Supply management data currently maintained by both Coast Guard nonaviation supply centers are insufficient to support requirements determination; to evaluate maintenance-level decisions; and to track, control, and manage Coast Guard-managed depot-level reparables DLRs.
- Program and budget requests do not substantiate funding to develop supply support capability because those costs are not itemized.
- Current policies and procedures outlining funding methods for reparable items do not provide incentive to repair all organizational- and intermediate-level reparables that could be economically repaired.

MAJOR RECOMMENDATIONS

To provide for more effective management of reparable materiel in the Coast Guard, additional policy needs to be developed and existing policy needs to be

enhanced. We recommend that Commandant Instruction (COMDTINST) 4105.2, *Acquisition and Management of Integrated Logistics Support (ILS) for Coast Guard Systems and Equipment*, accommodate the following major policy recommendations to achieve that objective in the acquisition phase:

- Reparability and the allocation of maintenance-level responsibility should be determined on the basis of responsiveness and economics, considering both organic and commercial maintenance support and each maintenance level envisioned by maintenance philosophy. The decisions should be made for specific configuration items to the lowest level reparable item breakdown and communicated using two-position maintenance codes and one-position recoverability codes according to the *Joint Regulation Governing the Use and Application of Uniform Source, Maintenance, and Recoverability Codes*. Codes should be redefined and tailored to support the Coast Guard's plans for changes in maintenance and support concepts.

- Supply support methodology for an item should be chosen on the basis of its essentiality to mission accomplishment, the economics of stocking it, and its local availability to the customers.

- Provisioning policy should be expanded to provide guidance on how and when reparable item spares, repair parts, and support and test equipment provisioning quantities should be calculated.

- For reparable items that are to be repaired commercially, repair specifications should be developed to enable the solicitation of qualified repair contractors.

- A program should be tailored to meet the Coast Guard's needs for analysis and data to assist in maintenance planning and supply support requirements determination.

- Major acquisition planning policy for reparable item support should provide reference to policy that describes the specific tasks to be accomplished, explicit assignment of primary responsibility for tasks and supporting roles, and a reporting system to better monitor progress and enforce performance against the integrated logistics support plan (ILSP).

- Minor acquisition planning policy for reparable item support should equally ensure that required tasks are adequately described, assigned responsibility for, and accomplished. While full-scale ILS may not be appropriate for a minor acquisition, policy should ensure that support managers are fully involved in support planning.

To improve its management of reparable items after equipment has been fielded, the Coast Guard should undertake the following changes to policy and procedures:

- Create a feedback system under which all maintenance support plans can be formally compared against actual experience to evaluate the validity of maintenance support decisions and incorporate actual field maintenance experience into future maintenance support plans.
- Develop procedure for the MLCs to identify program materiel in sufficient time for supply centers to procure the materiel necessary for the support of maintenance availabilities.
- Develop a separate requirements determination process for depot-level reparables that considers repair as a source of supply as well as procurement of new reparables.
- Improve operating procedures and automated information systems to ensure that supply-related information such as current carcass return rate, condemnation rate, repair cost, and repair lead time is complete, current, and accurate.
- Itemize funding requirements in programming and budget requests for developing reparable item supply support capability.
- Modify funding policy to require use of the supply fund method for all reparable items and transfer allotment fund code (AFC) funds from the supply centers to the field.

REPORT ORGANIZATION

In Chapter 2, we address in more detail our findings, conclusions, and recommendations related to the acquisition phase. Chapter 3 addresses the sustainment phase, and Chapter 4 covers programming, budgeting, and funding methods.

CHAPTER 2

ACQUISITION

INTRODUCTION

Acquisition is a process designed to procure equipment and initial support resources that are required to establish or maintain the capability to perform designated Coast Guard missions. The initial support resources we considered in this analysis include the tools, support and test equipment, spares, and repair parts or commercial support to maintain the equipment and its reparable item components when it is first fielded.

Reparable materiel consists of any secondary item that is not immediately discarded when it fails to perform properly. By definition, organizational and intermediate-level reparables are repaired or disposed of by the unit or by an intermediate activity with greater maintenance capability. Depot-level reparables, on the other hand, are items that, when not repairable below the depot level, are inducted into the depot-level maintenance system for repair or disposition if they cannot be repaired economically.

From the customer's perspective, the reparable management program is the logistics support system that provides a serviceable reparable spare when it is needed. From the logistics management perspective, the reparable management program involves designating reparable items, determining the correct level of maintenance at which an unserviceable reparable item should be repaired, determining and providing the support resources or establishing repair contracts to accommodate those maintenance-level decisions, and forecasting and procuring the correct number of spare reparable items to fill unit-level allowances and system-level stockage requirements. A reparable item repaired at the correct level of maintenance is generally the most immediate and economic source of resupply of that item.

In this chapter, we analyze the policies and procedures that define the methods the Coast Guard uses during the acquisition phase for computing and acquiring spares and support resources to accommodate reparable item repair and the planning process and organizational considerations associated with the execution of those

methods. We found that many of the deficiencies attributed to the reparable materiel program stem from the failure to provide adequate policy and procedures for the development of logistics support capability during the acquisition phase.

We recommend that COMDTINST 4105.2 accommodate policy enhancements that we describe in this chapter since they are necessary to ensure the timely development of reparable item logistics support. The Logistics Management Division (G-ELM), the policy developer for integrated logistics management, should administer this effort. At a minimum, the following activities should review and comment on all proposed policy revisions that affect naval and electronic reparable item maintenance and supply support:

- Naval Engineering Division (G-ENE)
- Electronic Services Division (G-TEO)
- Supply Center Brooklyn (SCB)
- Supply Center Curtis Bay (SCCB)
- MLC Naval Engineering Division (v)
- MLC Command, Control and Communications Division (t)
- MLC Pacific Logistics Office (ml).

COMPUTING AND ACQUIRING SPARES AND REPARABLE ITEM SUPPORT RESOURCES

This section addresses the computation and acquisition of the initial supply of reparable items and the repair parts, tools, test equipment, and support equipment needed to replenish that supply through organic maintenance. It also addresses the planning for commercial maintenance support of reparables that are not intended to be repaired organically.

Determining Reparable Items and Maintenance Responsibility by Maintenance Levels

The first step in computing reparable item spares and support resources and acquiring them is to decide which items are going to be designated as reparable and what maintenance is to be done at each maintenance level. The designation of an item as reparable rather than consumable establishes the need to provide repair

support for it. The decision on what maintenance is to be done at each level determines where the support resources are required.

A generally accepted method[1] for determining whether an item should be repaired and what maintenance will be performed at each level is economic analysis of repair at each maintenance level. The concept of most economical repair involves a comparison of the cost of repair at each maintenance level with the cost of providing a replacement to each maintenance level.

If the average cost of repair, organic or commercial, at each level exceeds a specified percentage of providing a replacement, the item is classified as consumable for economic reasons. Otherwise, it is designated as a reparable for repair by the maintenance level at which the average organic or commercial cost to perform repair is the lowest.

Some noneconomic factors may also be relevant when making the maintenance-level determination. Those factors predetermine whether an item should be reparable or consumable. They include the following:

- No source exists for procuring a replacement item. This situation often occurs with equipment/spares obtained from foreign sources. In such cases, repair is the sole source of resupply and the economic repair decision need only consider the cost at each maintenance level without considering replacement as an option.

- For newly designed or acquired equipment, it is often prudent to defer the maintenance-level determination and initial investment in spares and repair parts until the engineering design and configuration become relatively fixed. In those cases, the project manager usually contracts with the equipment manufacturer to provide necessary support until sufficient analysis can be performed and the system/equipment is converted to Coast Guard support.

The *Joint Regulation Governing the Use and Application of Uniform Source, Maintenance and Recoverability Codes*[2] (referred to as the *Joint Regulation* hereafter) provides a coding structure for precisely communicating authorized maintenance at all levels. The maintenance code is a two-position code. The first position identifies the lowest level of maintenance authorized to remove, replace, and use each item, and

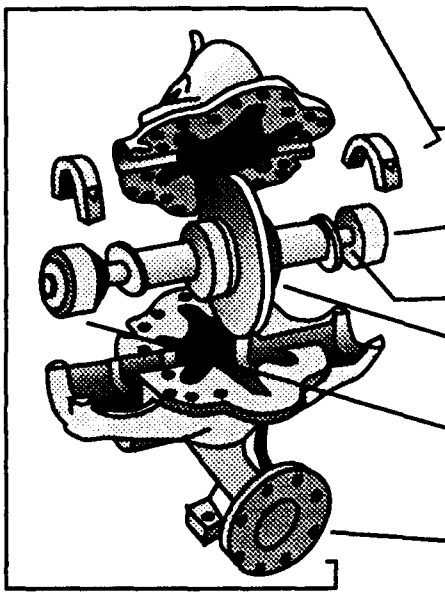
[1] Military Standard 1390C, *Level of Repair*, 8 July 1988.

[2] *Joint Regulation Governing the Use and Application of Uniform Source, Maintenance and Recoverability Codes*, 22 June 1971.

the second position identifies whether the item is to be repaired and the lowest maintenance level capable of performing complete repair. If economic factors favor removal and replacement of a reparable item by the operating unit, that item would be coded for removal and replacement at the unit level, assuming the absence of noneconomic factors. The maintenance level that is assigned to repair the item would be given the capability to completely repair it. If economic factors favor the total repair of the item by a depot, it would be coded for repair at the depot level, assuming the absence of noneconomic factors. Unless specified, it does not preclude maintenance of the assembly at lower levels (i.e., removing and replacing a component if authorized by the first position of the maintenance code of that component). The recoverability code identifies the level of maintenance that is authorized to condemn and dispose of an item that cannot be economically repaired. The level authorized to dispose of an item would normally not be lower than the level capable of complete repair.

Figure 2-1 illustrates the application of maintenance and recoverability coding for an engine cooling pump. If the pump fails, the maintenance engineer could possibly repair it by removing and replacing component parts as authorized (e.g., rotor or bearing). If neither the rotor nor the bearing is faulty or if the unit supply department does not have the replacement parts, the pump would be removed and replaced. It is coded for removal and replacement at the unit level. Therefore, the unit maintenance engineer can correct the resulting engine malfunction by removing the unserviceable pump and replacing it with a serviceable one from the unit supply department inventory. If the unit supply department cannot satisfy the maintenance engineer's requirement for a replacement pump, it could requisition a replacement from system stock. If the system cannot fill the requisition, the maintenance coding suggests two alternatives. Intermediate-level maintenance could possibly repair it by removing and replacing a component part as authorized (e.g., the impeller). If that alternative is not feasible, the maintenance engineer's requirement must be satisfied through depot-level repair (i.e., replacement of the shaft or repair of the casing) or procurement. Because the depot is the level authorized to condemn and dispose of the pump, the unserviceable pump must be returned to the depot for repair or disposition if it cannot be repaired below the depot level.

We analyzed the Coast Guard's policy and practice on determining reparability, maintenance-level responsibility, and codes to communicate them. We found that



Name of part	Remove and replace	Repair	Condemn/ dispose
Pump	Unit	Depot	Depot
Rotor	Unit	Intermediate	Intermediate
Shaft	Depot	No	Depot
Impeller	Depot	No	Depot
Bearing	Unit	No	Unit
Casing	Intermediate	Depot	Depot

FIG. 2-1. MAINTENANCE AND RECOVERABILITY CODING

neither policy nor practice satisfies essential information requirements for planning supply support of reparable items (see Table 1-1).

The policy (COMDTINST M4400.19[3] and COMDTINST M4121.24) generally describes methods for deciding reparability on the basis of economics. It also acknowledges three levels of maintenance but only stipulates that repair maintenance capability be considered in determining the levels of repair. The instructions do not define restoration in the context of a three-level maintenance system that encompasses both organic and contract maintenance capability.

Both COMDTINST M4400.19[5] and COMDTINST M4121.26 require that a one-position repair code be assigned to indicate the level of repair. COMDTINST M4423.27 however, provides for a two-position maintenance code and a one-position

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[3]U.S. Coast Guard, COMDTINST M4400.19, *Supply Policy and Procedures*, 25 September 1980 with changes 1 through 15, p. V-4-12.

[4]U.S. Coast Guard, COMDTINST M4121.2, *Uniform Supply Operations (USO) for Coast Guard Inventory Control Points (ICPs)*, 17 December 1980, pp. 4-2 and 4-3.

[5]See Note 3, this chapter, p. V-4-13.

[6]See Note 4, this chapter, p. 4-4.

[7]U.S. Coast Guard, COMDTINST M4423.2, *Provisioning Manual*, 15 May 1991, Enclosure (1), p. 48.

recoverability code similar to the requirements of the *Joint Regulation*. Although some reparable items may only be authorized for repair at one maintenance level (e.g., warranty repairs, or items whose repair requires expensive test equipment), the majority of reparable items will experience a range of failures that economically mandates repair at more than one level. The one-position repair code as prescribed by COMDTINST M4400.19 and COMDTINST M4121.2 does not acknowledge that repair of a reparable item could be performed below the level indicated by the one-position repair code, nor does it identify those repair actions that could be accomplished. As illustrated by Figure 2-1, a two-position maintenance code and a one-position recoverability code identify repair actions that can be accomplished at all levels. The pump in Figure 2-1 would be referred to as a depot-level reparable because it must be returned to the depot for condemnation, but the unit level could repair a failed pump if the failure was caused by the bearing, for example, by removing and replacing it with a serviceable one.

In COMDTINST M4400.19[8] the responsibility for deciding the repair and maintenance level is assigned to the Commandant and the ICPs without identifying who on the Commandant's staff is specifically responsible. While the ICPs are the logical choice to estimate the supply-related costs (e.g., the cost of collecting failed units) necessary to make an economic decision according to current policy, the engineering divisions of the Commandant's staff are most qualified to determine the feasibility and cost of repair, which are the dominant factors in making the repair-versus-replace decision on an economic basis. Consistency with policy would therefore dictate that G-ENE or G-TEO, as appropriate, assume primary responsibility for the repair- and maintenance-level decisions with support provided by the ICPs. (Although not assigned responsibility, in practice G-ENE and G-TEO are called on to make those decisions.)

Our review of several project support plans indicates that project managers disregard the policy requirement to decide reparability on the basis of economics, using instead the *Maintenance Support Guide* that identifies items for which reparability and maintenance-level responsibility decisions are made and communicated (see Figure 2-2). The *Maintenance Support Guide* identifies by work breakdown

[8]See Note 3, this chapter, p. V-4-12.

category the maintenance level responsible for removing or replacing, repairing, and condemning, or disposing of an item.

Section	Equipment/ component	Model/ reference number	Qty.	S	M	R	Mec	LSSC
310-2	Generator set, auxiliary		1	PF	L2	L	V	CA
	Generator		1	PB	22	L	V	CA
	Bearing, generator		1	PB	2Z	Z	V	CA
	Cooler, air		1	PB	22	L	V	CA
	Heater		1	PB	2Z	Z	V	CA
310-4	Engine		1	PB	L2	L	V	CA
	Blower		1	PB	2L	L	V	CA
	Heat exchanger		1	PF	22	H	V	CA
	Aftercooler		1	PF	22	H	V	CA
	Pump, lube oil		1	PB	22	H	V	CA
	Pump, jacket water		1	PB	22	H	V	CA
	Pump, pre-lube		1	PB	22	H	V	CA
	Cooler, lube oil		1	PF	22	H	V	CA
	Strainer, lube oil		1	PF	22	H	V	CA
	Filter, lube oil		1	PF	22	H	V	CA
	Pump, fuel oil priming		1	PB	22	H	V	CA
	Strainer, fuel oil		1	PF	22	H	V	CA

FIG. 2-2. SAMPLE FROM *MAINTENANCE SUPPORT GUIDE*

The work breakdown structure used in the *Maintenance Support Guide* is a generic decomposition of equipment into its major component parts. Because it is generic and it does not decompose equipment below the major component level, it cannot be translated to the approved configuration breakdown of new or modified equipment, nor can it identify detailed support item requirements and costs to establish maintenance capability of new reparable items. Therefore, it cannot facilitate the determination of reparability and the allocation of maintenance-level responsibility on the basis of economics as supply management policy requires.

Further, it is neither suitable for nor used for communicating decisions about reparability and maintenance-level responsibility that need to be known for provisioning.

We conclude that existing Coast Guard policy on the designation of reparable items and the allocation of maintenance-level responsibility is insufficiently precise to achieve its desired results. Consequently, project managers do not require that reparability and maintenance-level responsibility be decided on an economic basis for specific configuration items.

We recommend that the repair-versus-replace decision and the allocation of maintenance responsibility for reparable items be determined on the basis of responsiveness and economics in the context of the maintenance philosophy selected for the equipment unless predetermined by other considerations such as the lack of a repair or procurement source or configuration instability. We recommend that the Coast Guard orient its maintenance philosophy toward unit-level repair of equipment through removal and replacement of the highest indenture level reparable items that are practical and affordable. Reparables should be repaired at higher levels of maintenance, unless repair at the unit level accommodates more responsive equipment support at a reasonable cost. The Coast Guard should perform an economic analysis to determine how much it costs to repair each item at each maintenance level using organic or contract maintenance. Those costs should then be compared with the item's estimated replacement cost. Policy should stipulate that at each level if the organic or commercial cost to repair an item exceeds a specified percentage of the cost to replace that item, the item should be coded as consumable for economic reasons. Otherwise, subject to requirements for responsive equipment support, the Coast Guard should code the item as a reparable for repair by the maintenance level at which the economic analysis reveals repair cost is the lowest. Policy should further stipulate the consideration of noneconomic factors that could predetermine whether an item should be designated as a reparable or consumable item.

The MLCs possess key information on existing capability and capacity at the intermediate and organizational (field) level. They should be consulted to determine additional support requirements to accommodate new items. To determine what it costs to provide the resources needed to achieve additional capability and capacity to handle new reparable items, the economic analysis should assume that over an item's

life cycle any component part that could require replacement will fail. The manufacturers should provide maintenance replacement factors (failure factors) for component parts, or equipment experts/technical specialists should estimate those factors. The life cycle of the item should be estimated on the basis of operational plans and manufacturer's input.

Coast Guard policy should require that an economic analysis be provided for each specific configuration item down to the potentially lowest indenture level reparable. The following decisions should be made for each item:

- The lowest maintenance levels authorized to remove and replace the item and each of its component parts
- Whether the item is reparable or consumable
- If reparable, the lowest maintenance levels with the capability to completely repair the item and each of its component parts
- The lowest level authorized to condemn and dispose of the item.

Current practice employs *Maintenance Support Guides* that use a generic work breakdown structure to the major component level to decide and communicate maintenance plan decisions. Using the specific configuration breakdown to the lowest indenture level in *Maintenance Support Guides* will facilitate the following:

- Analysis of specific support item requirements and costs to establish maintenance capability of a reparable item candidate
- Explicit communication of maintenance plan decisions for every assembly, component, and piece part of new or modified equipment.

At a minimum, the analysis should consider the following costs associated with the repair actions at each maintenance level:

- Repair part inventories
- Tools and support and test equipment
- Facility requirements
- Personnel and training
- Technical documentation

- Retrograde (packing and shipping)
- Commercial repair and contract administration.

Experience with similar items should be used to determine the cost of commercial repair, or specifications should be prepared and circulated to vendors as requests for proposals and price and term estimates. An incentive for vendors to respond is that it would place them on the bidders list or prequalify them for negotiations on requirements contracts.

We recommend that *Maintenance Support Guides* communicate maintenance-level determinations for specific configuration items using two-position maintenance codes and recoverability codes as specified in the *Joint Regulation*, rather than the one-position reparability code in COMDTINST M4400.19 and COMDTINST M4121.2. Codes should be redefined and tailored to support the Coast Guard's plans for changes in maintenance and supply concepts. As those concepts evolve, the Coast Guard may have to establish (or re-establish) a separate code to clearly indicate those reparables that must be returned to the depot for repair or condemnation and disposal. The maintenance support plan should indicate, to the lowest level reparable item indenture, whether repair actions (remove and replace, repair, and condemn and dispose) will be performed with organic maintenance or commercial maintenance support.

Deciding Supply Support Methodology

The supply support methodology determines whether initial reparable item spares and support resources will be centrally managed by supply centers or locally procured by operating units. If centrally managed, the methodology dictates whether an item will be stocked or procured on demand.

A logical approach to determine whether to centrally manage spares and support resources involves an assessment of the subject item's essentiality to mission performance. If the item is critical to the operation or maintenance of mission-essential equipment, it should logically be centrally managed to ensure that it is available when needed. If it is either not essential or of low essentiality, can be readily procured locally (i.e., obtained directly from local vendors), and falls within the procurement thresholds of unit contracting authority, central management would seem ill advised.

If the decision is made to centrally manage an item, the decision about whether the item will be stocked or procured on demand should be based on economics. Economic factors include inventory holding costs and procurement costs keyed to expected demands and should be compared to the estimated cost associated with the delay in procuring materiel on demand. Generally, if recurring demands are expected to exceed some minimal quantity, procurement costs probably make it more economical to stock the item. However, an arrangement known as direct vendor delivery may obviate the need for the supply centers to stock an item even when it is economical to do so. Under this arrangement, vendors obligated by an indefinite-delivery-type contract maintain stockage and fill requisitions by providing assets directly to the customers.

If expected recurring demands are too low to justify the costs of stocking an item, but the item is essential to mission performance, it is logically stocked as insurance. Items that do not qualify as essential and are expected to generate insufficient demands would not be stocked but, rather, procured on demand.

Coast Guard policy for deciding the supply support methodology is contained in several supply management instructions. We reviewed that policy to determine the extent to which it requires consideration of essentiality, economics, and local availability in deciding supply support methodology. We observed that the policy is neither clearly nor consistently presented.

In setting forth inventory management policies, Chapter 2 of COMDTINST M4121.2[9] in referring to stockage policy directs the ICPs to centrally stock materiel as recurring solely on the basis of a minimum number of demands. It permits stockage of items not meeting those demand criteria as insurance on the basis of such factors as procurement or repair lead time, mission essentiality, criticality of application, and other factors beyond ICP control. It does not address noncentralized management of items that meet the specified demand criteria but are not essential to mission performance. Further, it does not clearly specify how essentiality or economics should be factored into the stockage-versus-nonstockage decision.

[9]See Note 4, this chapter, p. 2-9.

Later in COMDTINST M4121.2[10] the following options pertaining to repairing or replacing items are presented as supply support alternatives:

- Recalling unserviceable reparable items for depot-level repair
- Providing repair parts to field activities for in-house repair at field level
- Discarding reparable items when unserviceable and issuing complete replacement
- Using commercial or other Government agency repair services.

The actions identified are actually steps that facilitate the maintenance support of reparable items and are determined as a result of maintenance-level decisions that are made for each item.

In COMDTINST M4400.19[11] the Coast Guard takes a completely different approach for determining supply support methods from that identified in COMDTINST M4121.2. That M4400.19 policy provides a list of factors for consideration, such as item criticality and availability of commercial sources to the customer, without explaining how those factors should be determined or applied. The policy also identifies the following five supply techniques without suggesting a logical approach to selecting one:

- Local purchase by the using unit
- Term contracts issued centrally
- Consolidated central procurements by the ICP with direct delivery of materiel to the user
- Central stocking and distribution by the ICP with issues on a reimbursable or nonreimbursable basis
- Procurement by the ICP on an "as required" basis.

Responsibility for deciding the supply support methodology is assigned to the ICPs. Current policy does not require the MLC to provide information about the local availability of the item or G-ENE and G-TEO to determine essentiality of the item or review the ICP decision.

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[10] See Note 4, this chapter, p. 4-1.

[11] See Note 3, this chapter, pp. I-3-7 and V-2-1.

Our research indicates that the ICPs generally practice the policy contained in Chapter 2 of COMDTINST M4121.2 that directs them to centrally stock materiel as recurring based on the number of demands or insurance, if warranted. We did not observe evidence that the essentiality of the item to mission performance, availability of an item to its customers, or the economics of stocking it are known or considered in determining the supply support methodology.

We conclude that the policy on supply support methodology is inconsistent and confusing. In practice, the process for deciding supply support methodology does not ensure that centrally stocked items are not more efficiently and effectively procured locally or procured by the supply center on demand.

We recommend that the Coast Guard choose supply support methodology on the basis of an item's essentiality to mission performance or operational safety, its local availability to the customers, and the economics of stocking it.

We recommend that the Coast Guard should centrally manage any item that is critical to the operation, maintenance, or safe use of mission-essential equipment that is to be supported by the ICPs; it should not centrally manage items that are available from other Government agencies (OGAs) or are not critical to essential equipment, are locally procurable (i.e., can be obtained directly from local vendors), and fall within the procurement thresholds of unit contracting authority. For those non-centrally managed items, we recommend the ICPs develop and provide the information needed to order from OGAs or to procure locally.

For items that are centrally managed, the decision of whether to stock an item or procure it on demand should be determined on the basis of economics unless it is a critical component of mission-essential equipment. The Coast Guard should determine the minimal number of demands needed to justify stockage of an item as a recurring-demand item based on economic factors using average inventory holding and procurement costs. Direct vendor delivery arrangements should be pursued for all items as long as responsiveness is not compromised.

If an item is not expected to generate the established minimal demand but is essential to mission performance, it should be stocked as an insurance item. If it is not expected to generate the minimal demand and is not essential to mission performance, it should be procured on demand.

The *Maintenance Support Guide* should document the supply support methodology chosen for each support item. The two-position uniform source code as described in the *Joint Regulation* should be used for that purpose.

Provisioning for Reparable Item Support

The objective of provisioning is to identify and provide initial spares and support resources to operating units and maintenance and supply activities in time to sustain the initial operation of end items until the mechanisms of the sustaining system are in place. The sustaining system is in place when pipeline and unit allowances are filled, organic maintenance capability or initial contract support are established at each maintenance level, and operating units are positioned to requisition or locally procure reparable item and repair part replenishment stock. The provisioning process calculates the initial quantities of spares and support items needed for organic maintenance of reparable items consistent with the allocation of maintenance responsibility at each maintenance level. With respect to contract maintenance support, the provisioning process projects the quantity of reparable items for which support contracts need to be awarded.

Requirements determination models use maintenance coding, estimated maintenance replacement factors, and repair and procurement lead times to compute initial provisioning quantities of spares and repair parts that are to be centrally stocked. Maintenance coding identifies the maintenance level that is authorized to remove and replace an item and, therefore, qualified to have an allowance for it. Maintenance coding also identifies the level authorized to completely repair a reparable item and is thus qualified to have a repair part allowance for maintenance if the repair is to be done organically. Estimated maintenance and supply factors are provided by the manufacturer through provisioning technical documentation or estimated by equipment experts/technical specialists. Failure factors indicate the frequency that the item will be demanded. Repair and procurement lead times determine the length of the pipeline. (Chapter 1 treats the computation of unit-level and system-level stockage.)

Provisioning is typically accomplished at different intervals of time to allow for adjustments of estimated factors based on actual experience after equipment has been fielded. Provisioning management intensity is normally scaled on the basis of reparable item dollar value and criticality to mission performance.

Tools, test equipment, and support equipment requirements are identified through provisioning technical documentation and allocated to support maintenance-level decisions. The tools, test equipment, and support equipment to completely repair each reparable item are provided to the maintenance level coded for repair unless the repair is to be performed on a contract basis. For each reparable item component, the tools, test equipment, and support equipment necessary to remove and replace the component are provided to the maintenance level indicated by the maintenance code.

The COMDTINST M4423.2, *Provisioning Manual*, provides detailed management and contracting procedures for performing the provisioning process. However, it does not discuss the method, factors, objectives, and timeframes that should be used to compute initial unit- and system-level stockage requirements, tools, test equipment, and support equipment needed to support maintenance-level decisions.

In practice, the supply centers procure several months of estimated demand for unit-level stock and an additional quantity for system-level stock. Several inputs are considered in computing the procurement quantities. Provisioning technical documentation (PTD) provided by the manufacturer furnishes detailed identification data about the new or modified equipment and its component reparable items and parts. Lead allowance parts lists (LAPLs) provide a generic breakdown of equipment and recommend the number of onboard repair parts and spares to provide an operating unit and the number to be procured for system stock. LAPLs are based on similar, previously fielded equipment. Our interviews with ICP provisioners revealed that they are not validated or updated to reflect the most current experience on failure rates and repairability of reparable items. In addition to PTD and the LAPL, direction provided by Coast Guard Headquarters, information contained in the logistics support plan and preventive maintenance plans, and budget constraints are all considered in computing the provisioning quantity.

We conclude that inadequacies in the process of designating reparable items and in the process of assigning maintenance responsibility affect the quality of provisioning decisions. Supply center provisioning personnel cannot be certain – nor do they have the time or technical capability to independently determine – whether an item should be designated as reparable, at what maintenance level support items should be provisioned, or whether a reparable item should be repaired through contract maintenance (and therefore does not require repair parts, tools, and test and

support equipment). LAPLs do not eliminate the need for those decisions to be made for the following reasons:

- Configuration differences may preclude or invalidate the use of the LAPL.
- LAPLs that are not validated or updated may not reflect the best maintenance practice for the equipment on which they were based.
- The LAPL may not reflect the best maintenance practice for new or modified equipment because of differences in support item requirements and costs.

We also found that development of most maintenance capability and capacity at all levels is normally deferred until after equipment is fielded and its failures highlight the need for reparable item maintenance support. Then tools, test equipment, and support equipment are procured by the MLCs and operating units to establish organic maintenance capability and capacity. Contracts are set up by operating units, the MLCs, and supply centers to establish commercial maintenance support. During the time it takes to establish maintenance capability, equipment readiness suffers and higher cost alternatives are implemented.

We recommend that provisioning policy be expanded to provide guidance as to how and when reparable item, repair part, and support and test equipment provisioning quantities should be calculated.

Provisioning quantities must be consistent with decisions on the allocation of maintenance responsibility and supply support methodology. Provisioning should be completed in time to field support items along with new or modified equipment or upon expiration of interim contractor support. The LAPL may be used as a guide for determining allowance quantities but should not be used to determine allowance item candidates. A fixed allowance quantity should be established for each item according to the factors described in Table 1-1. An allowance quantity for repair parts should be established for the lowest level authorized to completely repair a reparable item, assuming the item is to be repaired organically. System stock should be procured to support expected demands of items that supply support methodology dictates to be centrally stocked. Quantities should be calculated using a requirements determination model that considers estimated demand and lead-time factors and computes variable safety levels as described in Chapter 1. Provisioning technical documentation should provide the basis for estimating demand and lead-time factors to be used in the model.

We recommend that repair specifications for those items to be repaired by commercial sources be developed early to enable the Coast Guard to award the contract at the time it fields new or modified equipment. After equipment is fielded, contracts should be administered by the maintenance level that is indicated by the maintenance code.

Tools and support and test equipment should be provisioned to accommodate organic maintenance task responsibility allocated to each maintenance level. Provisioning technical documentation should identify the tools and equipment required to remove and replace, repair, and condemn and dispose of every item using organic maintenance capability. The *Maintenance Support Guide* should document that information by item for each maintenance and recoverability action.

Analyzing Logistics Support Requirements

Analysis of logistics support requirements is essential if the Coast Guard is to make the proper decision on whether an item should be designated as economically repairable, which level of maintenance should be responsible, what supply support methodology should be followed, and what initial provisioning quantities should be made available. Throughout our foregoing discussion, we have referred to certain information that is generally ascertained in order to make those logistics support decisions. For example, to decide supply support methodology for a particular item, ICPs need to know whether the item is essential to mission performance.

Coast Guard policy does not address analysis requirements in a formal sense but it does allude to the need for some analysis. For example, COMDTINST M4121.21[12] requires that supply management analyses be conducted to determine the average costs to recall unserviceable reparables, to repair them, and return them to serviceable ready-for-issue inventory. In discussing the supply support method, COMDTINST M4400.19[13] provides a list of factors to be considered such as item criticality and availability of commercial sources to the customer. In practice, however, we did not observe evidence that analysis of this nature is being performed but rather noted that decisions are being made on the basis of best judgment and unvalidated decisions about previously fielded equipment.

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[12]See Note 4, this chapter, p. 4-3.

[13]See Note 3, this chapter, p. V-3-2.

We conclude that current reparable item logistics support decisions do not rely on item analysis of logistics support requirements because current policy and practice do not clearly define the requirements and objectives for it relative to determining and acquiring logistics support resources. The policy for deciding whether an item should be designated as economically reparable, allocating maintenance-level responsibility, deciding supply support methodology, and determining initial provisioning quantities is inseparable from the policy that specifies the analysis and information required to make those decisions. Consequently, policy regarding analysis of logistics support requirements cannot be developed independently of the policy for determining and acquiring reparable item logistics support resources. Table 2-1 recapitulates the foregoing discussion about determining and acquiring logistics support resources and the analysis that supports that process.

We recommend that the Coast Guard develop a program of analysis tailored to its needs. That program should provide the data to resolve the factors and issues identified in Table 2-1. COMDTINST 4105.2[14] should describe the analysis to be performed, the information to be obtained, the activity responsible for performing it, and the acquisition phases in which it should be initiated/updated, and that information should be available to appropriate decision makers. The program should be fully consistent with the methods prescribed by policy for determining reparability, allocating maintenance-level responsibility, deciding the supply support methodology, and provisioning reparable item support.

PLANNING THE DEVELOPMENT OF REPARABLE ITEM SUPPORT CAPABILITY

In the development of a reparable item support capability, the role of planning is to define tasks, identify responsible activities, and specify due dates for determining and acquiring the needed logistics support resources pursuant to established policies. This section addresses the effectiveness of planning methods for fulfilling that role without regard to the adequacy of existing policy for computing and acquiring support resources, discussed previously.

The ILS planning concept establishes several major milestones and various requirements that must be completed and validated to proceed to each milestone.

[14]U.S. Coast Guard, COMDTINST 4105.2, *Acquisition and Management of Integrated Logistics Support (ILS) for Coast Guard Systems and Equipment*, 5 June 1991.

TABLE 2-1

ANALYSIS TO DETERMINE AND ACQUIRE LOGISTICS SUPPORT RESOURCES

Process	Analysis to identify
Determining reparable items and maintenance responsibility by maintenance levels	Economic repair factors Noneconomic repair factors
Deciding supply support methodology	Item essentiality Local availability Economics of stocking
Provisioning for reparable item support	Estimated failure rates Estimated repair cycle time Tools and test/support equipment requirement

Before reaching the production milestone, it requires a detailed identification of logistics support requirements and a delivery schedule for logistics resources.

An ILSP must be developed and kept current throughout the acquisition. It is used to integrate logistics aspects of the acquisition project. ILS reviews are performed at each acquisition milestone and periodically throughout the acquisition phase to assess the adequacy of support planning, resources, and support-related parameters to meet readiness objectives. The operational logistics support plan (OLSP) builds upon the ILSP to provide both using and supporting activities with information and guidance on the application of logistics support resources to sustain equipment after it has been fielded. The OLSP facilitates a transition of logistics support from the project manager to the program and support managers. If, through well-planned ILS, the ability to provide logistics support for reparable items is firmly established, operational logistics support planning is straightforward, requiring only the introduction of reparable items and their support methodology. If, however, the ability to provide logistics support for reparable items has not been established through ILS planning, operational logistics support tends to be performed in an ad hoc and hurried fashion.

Commandant Instruction M4150.2[15] provides instructions for developing ILSPs

[15]U.S. Coast Guard, COMDTINST M4150.2, *Systems Acquisition Manual*, 22 August 1991.

for major acquisitions. Headquarters Instruction (HQINST) 4081.2[16] provides instructions for developing OLSPs.

The Coast Guard *Systems Acquisition Manual* requires that ILSP development begin during concept exploration and that the project manager ensure that it is updated as each key decision point is reached. A requirement that the ILSP be updated before proceeding to the next key decision point would be a strong incentive for ensuring that updates are incorporated; however, the *Systems Acquisition Manual* does not impose such a requirement. The manual also fails to address the evaluation of progress or enforcement of performance against the plan.

The *Systems Acquisition Manual* describes the concurrent clearance process as the method for coordinating review of the ILSP. Initial concurrent clearance consists of circulating the ILSP to all program managers and support managers represented on the ILS management team (ILSMT). Upon resolution of issues raised during the initial concurrent clearance, the ILSP is circulated among Coast Guard Acquisition Review Council (CGARC) members. The manual states that any CGARC member may request a formal meeting of the CGARC to resolve outstanding issues, but it does not address the method for resolving issues that are raised during either the initial or final concurrent clearance process. Additionally, the manual does not establish timeframes for completing the concurrent clearance process.

The *Systems Acquisition Manual* provides milestone charts for each acquisition phase that identify logistics support tasks for consideration in determining applicable requirements to be included when developing ILSPs. It does not provide a reference to policy that prescribes which tasks should be done or how to perform them.

With regard to acquisitions of nonmajor systems/equipment, COMDTINST 4105.2[17] requires that the same basic ILS standard procedures and requirements for major acquisitions be tailored to fulfill individual project requirements for logistics support. COMDTINST M2830.1[18] provides an outline and general instruction of the information to be included in Acquisition and Support Plans (ASPs) for nonmajor

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[16]HQINST 4081.2, *Operational Logistics Support Plan (OLSP) Development and Management Responsibility*, 24 July 1991.

[17]See Footnote 14, this chapter.

[18]U.S. Coast Guard, COMDTINST M2830.1, *Office of Command, Control, and Communications Management Manual*, 8 February 1989.

projects managed by the Office of Command, Control, and Communications (G-T). It also describes a review process for ASP approval. We found that, like that for major acquisition projects, policy for nonmajor acquisition projects does not provide references that prescribe tasks that need to be done or how to perform them. Nor does it address evaluation of progress or enforcement of performance against the ASP.

Our review of several Coast Guard acquisition projects revealed that the ILSPs for major projects generally followed the format prescribed in the *Systems Acquisition Manual*, but we observed the following:

- In one project that had entered the production phase, the plan was delayed by the concurrent clearance process.
- We saw no evidence that ILSP progress was being evaluated or performance of assigned tasks was being enforced.
- ILSPs were generally completed in a perfunctory manner and contributed little to the coordination of logistics support of reparable items.

We conclude that while the current planning policy represents a good framework for planning reparable item logistics support for both major and nonmajor acquisitions, it cannot accomplish its intended results without prescribing the following:

- Specific reference to policy that describes and requires actions that must be taken during the acquisition phase for each type of acquisition, recognizing the differences between major and nonmajor acquisitions and between commercial item acquisitions and Coast Guard-developed system and equipment acquisitions.
- A method for evaluating progress, enforcing performance of assigned tasks, and resolving issues associated with the conduct of the plan.

The impact of inadequate planning for reparable item logistics support is felt throughout the remaining equipment life cycle, and the cost of compensating for inadequate planning is significantly greater than the cost of plans carefully developed and executed prior to fielding new or modified equipment.

We recommend that milestone plans for all system and equipment acquisitions and modifications include the requirements to determine reparability; allocate maintenance-level responsibility; decide supply support methodology; provide spares, repair parts, tools, test equipment and support equipment; and develop repair

specifications for commercially supported reparables. Milestone plans could use the format currently provided in the *Systems Acquisition Manual* with an additional column to indicate the reference to policy that prescribes the task and the method for accomplishing it. Scheduling of tasks should ensure that provisioning decisions are finalized for each item at least one procurement lead time before new or modified equipment is fielded. Reparability, allocation of maintenance-level responsibility, and development of supply support methodology need to be decided early to support the provisioning process and allow sufficient time to decide provisioning quantities and develop repair specifications.

The Coast Guard should establish a reporting system to monitor progress and enable the ILS manager to enforce planned performance. Support managers should be required to report any changes in task status to the ILS manager when they occur. They should also be required to provide explanations for not meeting task due dates and to negotiate new deadlines with the ILS manager and project manager.

The *Systems Acquisition Manual* requires that the ILSP be updated as each key decision point is reached. It also describes the concurrent clearance process as the method for coordinating the review of ILSPs. Support plans for nonmajor acquisition projects are similarly updated and reviewed. We recommend that those updates and the review of the updated plans be a requirement for proceeding to the next key decision point. The Chief of Acquisition (G-A) in conjunction with the Chief of Engineering, Logistics and Development (G-E) should have final authority in resolving all logistics support issues raised during the review of major acquisition project logistics support plans. For nonmajor acquisitions of electronics equipment, the G-T *Management Manual* assigns that responsibility to the project manager, subject to the Acquisition Review Board (ARB) Chairman's approval.

The *Maintenance Support Guide*, revised as we have recommended, should serve as the master record that documents logistics support decisions for major and nonmajor acquisition projects. In summary, we recommend the Coast Guard make the following changes to the *Maintenance Support Guide* format and content:

- Use a specific configuration breakdown structure instead of a generic work breakdown structure.

- Use a two-position maintenance code and a one-position recoverability code to communicate reparability and allocation of maintenance-level responsibility for each item.
- Indicate whether organic or commercial maintenance support will be provided for each item and each maintenance and recoverability action.
- Use a two-position source code to communicate supply support methodology for each item.
- Identify tools and test and support equipment required to perform each task for each item with organic maintenance and recoverability tasks.

ALLOCATING AUTHORITY AND RESPONSIBILITY FOR PLANNING AND DEVELOPING REPARABLE ITEM SUPPORT CAPABILITY

The planning and development of reparable materiel logistics support involves the active participation of many vertically organized activities representing the functions of supply, maintenance, procurement, personnel, training, and facilities. With a well-defined organizational structure, involved parties can operate under clearly defined responsibilities and authority while ensuring full coordination. This section addresses the organizational aspects of planning for reparable item support capability during the acquisition phase and developing it.

For major systems, the ILS concept entails an organizational structure that places involved parties under operational control of a single activity designated by the Coast Guard as the project manager. The project manager usually has an ILS manager who is responsible for coordinating the logistics aspects of the program, including reparable materiel support. The ILS manager usually has a team of support managers who are responsible for the individual elements of logistics support such as supply and maintenance. The ILS manager and the support managers participate as members of the ILSMT. Each support manager is responsible for performing tasks that are clearly assigned and described to ensure that they are correctly performed and coordinated. The ILSMT meets frequently to discuss and resolve logistics issues, especially those that involve more than one logistic element, necessitating careful coordination.

The *Systems Acquisition Manual* describes a matrix organization in which the project manager does not have control of all the personnel involved in planning and executing the project. The project manager must obtain commitments from support managers who are required to assign a task leader to perform required activities.

The ILSMT is the organization responsible for logistics support planning functions and normally includes the following:

- ILS manager
- Program manager/sponsor
- Project manager
- Support managers
- ICPs
- Resident Inspector's Office (RIO) or Project Resident Office (PRO)
- MLC (Atlantic) (MLCLANT) or MLC (Pacific) (MLCPAC).

The ILS manager is the chairman of the ILSMT and is normally permanently assigned to the project, presumably from within the project management staff. Generally, the manual assigns the roles of planning and acquiring "materiel, facilities, personnel, and services for assigned elements of logistics support" to the support managers. The Coast Guard supply centers are responsible for provisioning. According to the manual, MLCs may assist the project manager in developing system maintenance concepts and plans, preventive maintenance systems, and special tools and test equipment allowances.

Our review of several major acquisition projects indicates general compliance with the *Systems Acquisition Manual.* With regard to the assignment of responsibility in each of those projects, we observed the following:

- The MLCs were not involved in the development of the maintenance plan.
- Responsibility was not consistently assigned. For example, in one project, supply centers were responsible for determining reparable items and allocating maintenance-level responsibility; in another project, that responsibility was assigned to the Naval Engineering Division.
- Supply and maintenance planners, for the most part, do not coordinate maintenance planning and provisioning for naval engineering reparables.

We conclude that current planning policy does not adequately define the primary and supporting roles of each of the acquisition participants. This inadequacy is exacerbated by the fact that acquisition management employs a matrix organization approach in which the project manager does not control most of the

individuals that work on the project. As a result, successful development of reparable item logistics support is too highly dependent on the project manager knowing what tasks each support manager, supply center, and MLC are capable of and being able to negotiate with them to perform those tasks.

We recommend that the ILS management organization described in the *Systems Acquisition Manual* be more explicitly defined in terms of responsibility and tasks. The logistics support manager, a dedicated acquisition project staff member, should be designated as the project management task group leader (TGL) for ILS. The TGL for ILS should be assigned as the ILS manager for the ILSMT described in the *Systems Acquisition Manual.* In addition to the responsibilities currently assigned, the ILS manager should be responsible for ensuring that milestone plans for all acquisitions and equipment modifications properly schedule the tasks required by the policy enhancements described in this chapter and that *Maintenance Support Guides* document logistics support decisions in a timely fashion. In order to accomplish its responsibility for conducting oversight and review of the Coast Guard logistics process, G-ELM should review those plans and documentation to ensure that no required task has been omitted and that documentation is complete. G-ELM should also assist the ILS manager as necessary to fulfill his/her responsibility.

Responsibility for determining reparability, allocating reparable item maintenance responsibility, and recording those decisions in the *Maintenance Support Guide* should be assigned to the appropriate maintenance/engineering division in G-T or G-E and supported by the MLCs and supply centers. The MLCs should support G-E and G-T in fulfilling their responsibilities by providing necessary information as to existing maintenance capability and capacity at the intermediate and organizational levels to accommodate the support of new reparable items. The supply centers should support G-E and G-T by estimating supply-related costs of reparable item support, including repair part inventories, retrograde costs, commercial repair price, and contract administration.

Responsibility for determining supply support methodology and assigning source codes should be retained by the supply centers with support provided by the appropriate maintenance/engineering division in G-T or G-E and the MLCs. G-T and G-E should establish whether each support item is essential to mission-critical equipment or operational safety prior to supply center consideration as to whether

the item should be centrally managed. The MLCs should support the supply centers by evaluating the availability for local procurement of support items.

The supply centers should retain responsibility for calculating provisioning requirements, and they should be supported by the appropriate maintenance/engineering division in G-T or G-E. G-T and G-E should support the supply centers in interpreting and validating maintenance replacement data and tools, and test equipment and support equipment requirements.

The MLCs, supply centers, and support managers should be responsible for developing the methods for performing the specific analyses necessary to accomplish the tasks for which they are responsible. Analyses should be performed by those activities or the manufacturer as necessary to enable them to fulfill their assigned responsibilities.

While our discussion on acquisition management has focused primarily on major systems, the conceptual basis for the recommendations we provide also applies to nonmajor system acquisitions. It may be neither feasible nor practical to apply full-scale ILS management to a nonmajor system. Selected application of ILS, with the ILS elements tailored to the nonmajor system acquisition project, is appropriate. Policy should ensure that support managers are involved early in the nonmajor system project planning process to assess support considerations associated with operational requirements and to arrange for support by the time equipment is fielded.

BENEFITS

Implementation of our recommendations will give the Coast Guard a clear and logical process for determining and communicating reparability and maintenance-level responsibility during the acquisition phase. Furthermore, initial investment in spares and support items will better reflect reparable item maintenance strategy. Consequently, the reparable management program will be more responsive to requirements for reparable item support and replacements after equipment is fielded by anticipating them during the acquisition phase.

CHAPTER 3

SUSTAINMENT

INTRODUCTION

The Coast Guard's sustainment system carries out the maintenance and supply support plans developed during the acquisition process. A well-functioning sustainment system has a maintenance organization with trained personnel, facilities, and materiel to accomplish the preventive maintenance program and to repair items when they fail. It has a supply support organization to provide the spare parts for maintenance and the replacement reparable items when repair is not practical. In this chapter, we examine the Coast Guard's sustaining maintenance and supply systems that support reparable materiel.

TRANSITION FROM ACQUISITION TO SUSTAINMENT

We emphasized earlier the need to give full consideration to the support of reparable items. At some point, responsibility for all reparable items is transferred from the acquisition organization to the sustainment system. The hand-off from acquisition to sustainment for a reparable item should ideally occur only after support has been planned and funded – when all funding and procurement actions to secure all initial unit and system repair part inventories and spares, tools, and test equipment have been completed and all decisions related to determining repairability, at what level and by whom, have been made. It is important that no "support gap" develop between the acquisition and sustainment phases.

In our study of the sustainment system for reparable items, we found that many of the problems that occurred were the result of a poorly executed hand-off between acquisition and sustainment organizations. We found support gaps developed when either logistics support plans were not clear enough or complete enough to communicate repair responsibilities or repair capability was not established prior to fielding reparable items.

MAINTENANCE OF REPARABLES

Maintenance is generally defined as the actions necessary to keep reparable items in an efficient operating condition. It can take the form of either the preservation of those items that are in working order or the repair of those that are unserviceable. Maintenance includes servicing, repairing, modifying, modernizing, and rebuilding.

Since an item can be returned to service by repairing it rather than procuring a new item, maintenance is also a source of supply. How and where a reparable is maintained depends on a maintenance-level determination – made during acquisition – that designates repair responsibilities. An item is assigned to a maintenance level for economic and effectiveness reasons. The maintenance level dictates where a reparable item will be repaired and who has authority to condemn it. Sufficient skills and facilities should be available at each level to efficiently repair items assigned to that level.

Coast Guard Policy Regarding Reparable Maintenance Organization

Coast Guard policy specifies three levels of maintenance for reparable materiel – organizational, intermediate, and depot.

Organizational-Level Maintenance

Organizational-level (O-level) maintenance is maintenance that is generally performed by the operating unit. COMDTINST M4400.19[1] defines O-level maintenance as the maintenance that is the responsibility of, and performed by, a using organization on the reparable item. It consists of inspecting; servicing; lubricating; adjusting; and replacing parts, minor assemblies, and subassemblies.

Intermediate-Level Maintenance

Intermediate-level (I-level) maintenance consists of those preventive and corrective maintenance actions that are performed in the field but beyond the capability of the operating unit. COMDTINST M4400.19 defines I-level maintenance as the maintenance that is the responsibility of, and performed by, designated maintenance activities for the direct support of using activities. These maintenance actions consist of calibration, repair, or replacement of damaged or unserviceable

[1]See Note 3, Chapter 2, p. V-4-13.

parts, components, or assemblies; the emergency manufacture of unavailable parts; and the provision of technical assistance to user organizations.

Depot-Level Maintenance

Depot-level maintenance, the highest level of maintenance, consists of tasks that are beyond the capability of organizational-level and intermediate-level repair organizations. COMDTINST M4400.19 describes it as the repair that is performed at maintenance activities designated by support managers. These activities have extensive shop facilities or personnel with higher technical skills than those available at lower levels of repair. Repair at this level would be performed by Coast Guard overhaul/repair activities, commercial sources, or OGAs under inter-Service agreements and would include all repairs beyond the capability of the intermediate and organizational levels.

Coast Guard Organizational-Level and Intermediate-Level Maintenance

Our visits to Coast Guard operating units confirmed that they are responsible for the planning and completion of their organizational-level maintenance. In the case of cutters, the ship's maintenance personnel are responsible for organizational-level maintenance. Boat stations and units with small boats are responsible for the completion of organizational-level maintenance on their small boats.

Although COMDTINST M4400.19 states that organizational-level maintenance is performed by the using organization, items designated as organizational-level reparables are sometimes maintained by personnel external to the unit. We found that in addition to those at the unit, personnel at Coast Guard facilities such as naval engineering support units (NESUs) and electronics maintenance detachments (EMDs) and commercial contractors assist in performing organizational-level maintenance. The extent to which organizational maintenance is performed by any one of these organizations depends on the size and location of the unit.

Large units, such as cutters, with assigned maintenance personnel do most of their own organizational-level maintenance. In our visits to Coast Guard NESUs, we found that they have maintenance augmentation teams to assist cutters in maintaining naval engineering reparable items. NESU Alameda, Cal., for example, provides maintenance augmentation for cutters, primarily 378-foot cutters. Work for

other ships is on an "as available basis." NESU Alameda primarily assists with preventive maintenance but also supports casualty and noncasualty repairs when resources are available. The NESUs provide preventative maintenance system (PMS) augmentation for cutters through their maintenance augmentation teams (MATs). Each MAT supports the vessels at its home port. The MAT attached to NESU Portsmouth, Va. for example, provides PMS augmentation for six 270-foot cutters home ported in Portsmouth.

Small boats without assigned maintenance personnel rely on boat station maintenance personnel. Shore maintenance facilities such as NESUs, EMDs, and group engineering shops provide manpower to complete tasks designated as organizational-level maintenance. In the Pacific area, for example, the EMDs have hired a maintenance contractor to do all shipboard electronics maintenance, including organizational-level maintenance, for units without electronics technicians.

Technical and financial assistance for the completion of intermediate maintenance is provided by MLCs. In this role, they receive work requests from units and schedule maintenance availabilities, write technical requirements for contracted repairs, and fund intermediate-level repairs. Intermediate-level maintenance is identified by various sources: the unit, through the submission of a work request referred to as a current ship's maintenance project (CSMP); the Naval Engineering Project Listing (NEPL), for periodic maintenance; and the support managers at headquarters.

The actual intermediate-level maintenance, typically beyond the capability of the unit, is coordinated and completed, when capability exists, by NESUs and EMDs, under the direction of the MLCs. NESUs coordinate commercial and Coast Guard resources to handle emergent repair requests. Since Coast Guard organic maintenance capability is limited, most of the intermediate-level repairs are performed by commercial contractors. Each NESU that we visited had staff officers to serve as contracting officers' technical representatives (COTRs) to monitor repair contracts. They act as the eyes and ears for the MLC and provide technical assistance in accomplishing repairs.

The MLCs oversee planning for periodic maintenance availabilities. The work is split into recurring items, project items, and CSMP items. Recurring items are

identified by the NEPL and include tasks such as drydocking and bottom painting. The ship does not request this maintenance. Project items include ship alterations (shipalts) and modifications that are directed by the MLC, headquarters support managers, or are requested by the unit. CSMP items are those corrective maintenance actions requested by the ship through the NESU or EMD that have been deferred until the maintenance availability.

We did not find a clear distinction between the maintenance structures devoted to performing organizational-level and intermediate-level maintenance. We found a maintenance organization in the field that consisted of unit maintenance personnel, shore support activities, and commercial contractors performing both organizational-level and intermediate-level maintenance.

We found the following deficiencies in the organizational and intermediate level maintenance:

- No formal procedure exists for updating organizational-level and intermediate-level maintenance decisions.
- No formal procedure exists for re-evaluating organizational-level and intermediate-level maintenance determination.
- Intermediate-level support for Coast Guard-managed reparables is not clearly identified.
- Maintenance availabilities are often delayed by lack of materiel.

No Formal Procedure for Updating Organizational- and Intermediate-Level Maintenance Decisions

In Chapter 2, we describe how support managers plan for reparable item maintenance during the acquisition phase. Their maintenance decisions are based on generic descriptions of reparable items and typical responsibilities described in a *Maintenance Support Guide*. We found that the work breakdown structures in the *Maintenance Support Guide* were not detailed or specific enough to determine reparability and assign maintenance responsibilities.

From our interviews at Coast Guard supply centers, MLCs, and NESUs, we found that maintenance plans were not, in many cases, used to make reparability or maintenance responsibility decisions. We found that after reparable items are fielded, many of those decisions are made in the field by the supply centers and

MLCs. If the maintenance plan is used at all, it merely serves as a guide, and actual maintenance decisions are made on the basis of the characteristics of the reparable item.

To effectively plan future maintenance, support managers need information on actual experience to judge whether initial maintenance decisions were appropriate. Reviewing the maintenance plans after a new reparable item is fielded will enable the project manager to properly plan for future maintenance. We did not find any policies that required field personnel to provide information on actual experience to the support managers, nor did we discover any procedures for doing so. Furthermore, we found little evidence that maintenance plans were routinely reviewed after a reparable item was fielded.[2]

No Formal Procedure for Re-evaluating Organizational- and Intermediate-Maintenance-Level Determination

In COMDTINST M4400.19, the Commandant (Headquarters program or support manager) and supply centers are required to review all reparables periodically to ensure actual experience justifies maintenance-level determinations.[3] That is, based on actual data from the field, the supply centers are required to reevaluate whether an item should be designated as a reparable or consumable, and whether it should be repaired in the field (organizational or intermediate level) or at the depot. We did not find a procedure that outlined how the actual maintenance feedback would be communicated to the supply center from the field. Additionally, we found that naval engineering maintenance personnel at operating units, NESUs, and MLCs were not required to provide any maintenance information to assist in the evaluation of the maintenance level.

Intermediate-Level Support for Coast Guard-Managed Reparables Not Clearly Identified

We found that the Coast Guard does not clearly identify, in advance, responsibilities for scheduling repairs, coordinating supply support, and providing guidance on the use and disposition of all intermediate-level reparables. Although

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[2]We found two exceptional maintenance planning efforts undertaken by the MLCs: (1) MLCLANT's update of the 270-foot medium endurance cutter class maintenance plan to provide essential information not available in the original plan and (2) MLCPAC's logistics improvement plan for the FT4 gas turbine engine to provide maintenance support for the engine into the 21st century.

[3]See Note 3, Chapter 2, p. V-4-12.

maintenance support plans exist, they do not clearly identify intermediate maintenance responsibilities. In our interviews with operating units, we found that the repair and disposition of some Coast Guard-managed intermediate-level reparables was a problem. For those naval engineering items, neither a repair capability nor a procedure for disposition of unserviceables existed. At the time one of those reparables fails, it is left to the unit to decide to contract for repair or to request assistance from a shore maintenance support facility.

Maintenance Availabilities Are Often Delayed by Lack of Materiel

From our interviews at the MLCs, we found that lack of materiel often delays the completion of scheduled maintenance availabilities for naval engineering. Government-furnished equipment required to perform scheduled maintenance is requisitioned from Coast Guard supply centers, OGAs, and commercial sources prior to the beginning of the maintenance availability. Delays in the receipt of this materiel are frequently the cause of delays in completing maintenance availabilities.

The absence of procedures for providing feedback to maintenance support planners and for re-evaluating maintenance support decisions hinders future maintenance support planning. In many cases, actual experience will show that a particular item should be repaired, for example, at the depot level rather than at the field level. Repairs may be too costly, complex, or time consuming to be done at either the organizational or intermediate level. Without a feedback system, the maintenance planner has no way of knowing whether the initial support decisions are correct. Thus, future maintenance plans will not benefit from this experience.

The practice of not clearly assigning responsibilities for intermediate-level repair decisions for each item results in inconsistent support. Without explicitly identified intermediate support responsibilities, an item receives inconsistent support and operating units are burdened with intermediate level maintenance responsibilities. After the reparable items fail, ambiguous maintenance assignments force operators to create inefficient maintenance support structures that are less cost effective and responsive.

Delays in scheduled maintenance availabilities could be reduced by improved coordination between the MLCs and the supply centers. The supply centers, who are responsible for providing the Coast Guard-managed, Government-furnished

equipment cannot provide proper materiel support for these availabilities unless they are part of the availability maintenance planning process.

To improve organizational and intermediate level maintenance, we recommend:

- The Coast Guard establish a policy that requires a formal review of maintenance support decisions after reparable equipment is fielded. Support managers should review all maintenance support plans against actual experience to validate the initial maintenance support decisions. This review will either verify or invalidate past maintenance decisions and will allow field maintenance experience to be incorporated into future maintenance support decisions.

- The Coast Guard implement procedures to establish a feedback system to support the review of maintenance support plans. The feedback system should establish a link that communicates field maintenance experience to maintenance planners. It should facilitate the transmission of both quantitative and descriptive information used to assess existing maintenance plans. It should also capture quantitative information such as repair cost and maintenance hours for use in evaluating maintenance support decisions. Descriptive information, such as the type of skills or facilities that are available to perform maintenance at a particular level, should be provided to complement the quantitative data.

- The Coast Guard establish a policy that requires clear identification of maintenance responsibilities for each item designated for intermediate-level repair. The policy should also require that the intermediate-level maintenance manager be identified and advised of those responsibilities prior to the introduction of each intermediate-level reparable.

- The Coast Guard establish a policy that requires the MLC and supply centers to coordinate support for maintenance availabilities. The policy should outline a process that brings the MLCs and the supply centers together to identify the materiel requirements (program materiel) for maintenance availabilities. It should also address procedures the supply centers should follow to maintain these inventories. A separate requirements category should be established to account for the program materiel required to support planned maintenance. Procedures should be established for identifying what materiel is required at least a procurement lead time before the maintenance requirement, stocking sufficient quantities to satisfy the maintenance requirement, and ensuring that the program materiel is reserved for its specific maintenance requirement.

Implementation of these recommendations will improve the quality of maintenance in the field by strengthening communications between organizational and

intermediate-level maintenance personnel and maintenance planners. These recommendations should produce the following benefits:

- Improved readiness because repair capability is in place before equipment failures
- More efficient utilization of resources because organizational-level and intermediate-level reparables are repaired at the most efficient level
- More credible maintenance plans because maintenance planners have information and views of field maintenance personnel
- Fewer delays in maintenance availabilities occasioned by the absence of required materiel because supply centers take an active role in planning availabilities.

Coast Guard Depot-Level Maintenance

In the Coast Guard, SCB and SCCB are responsible for management of the non-aviation depot reparable program with the technical and financial assistance of G-ENE and G-TEO. As designated overhaul points for Coast Guard-managed mandatory turn-in reparables, the supply centers are administrators of the Coast Guard's repair and return program. G-ENE and G-TEO support the depot repair and return program by preparing technical repair specifications for depot-level reparables and are responsible for funding depot-level repairs.

Coast Guard depot repair relies primarily on commercial contractors rather than in-house facilities to perform most of the depot maintenance. Some depot repairs, however, are performed at in-house facilities, such as the Electronics Engineering Center, Wildwood, N.J., and the Coast Guard Yard, Curtis Bay, Md.

Reparable item managers depend on a well-functioning depot-maintenance capability to satisfy supply requirements. Repairing depot-reparable items at the depot level should, in general, take less time, cost less, and more flexibly meet changing needs than procuring new items. Our examination of the depot-level repair process for naval engineering reparable items revealed that in most cases sources of repair were not established before the item had to be repaired. We found contracting time – the time spent defining and negotiating repairs with commercial contractors – can take 6 months to a year. Most electronics items managed at SCB, however, have established repair contracts and experience much shorter contracting lead times.

In many cases, adequate repair specifications had not been developed. In the majority of cases, the Coast Guard must first request the repair contractor to open and inspect the reparable item and report what repairs need to be done. If the repair cost is less than $25,000, the item can be repaired under the same contract. If the repair cost is over $25,000, then the repair must be competitively bid under a separate contract.

For a small number of items, SCCB has indefinite-quantity-requirements-type contracts for repairs. Such contracts are negotiated in advance of reparable item failures, but they are difficult to award because they require a well-defined repair specification and estimates for the expected quantity of repairs. Neither the repair specification nor the workload estimates are available for most depot-level reparables. Consequently, most repair contracts are the "open and inspect" type.

In Chapter 2, we discussed the need to establish repair specifications and potential sources of repair services during the acquisition process. We found that, for most depot reparables, no repair source was established before the repair requirement. That failure extended repair lead time several months while repair contracts were negotiated. Long delays in repair contracting diminish the support that the Coast Guard's depot maintenance program can provide. Since most depot-level repairs are performed by commercial contractors, the efficiency of the contracting process adversely affects the ability of the supply system to respond to customer needs and increases investment in inventories of depot-level reparables.

To improve depot-level maintenance, we recommend:

- The acquisition project manager identify repair capability and repair specifications and estimate expected repair quantities during the acquisition phase. This procedure will place greater emphasis on early planning for repair of depot-level reparables.
- The supply centers expand their use of indefinite-delivery-requirements-type contracts for depot-level repairs.

Implementation of our recommendations will have the following effects:

- It will reduce depot repair time by decreasing the time needed to identify sources of supply, define repair specifications, and negotiate repair contracts.

- It will reduce inventory investment in depot-level reparables by shortening the repair lead time.
- It will make the depot-level repair system more responsive. The shorter the repair lead time, the more flexible it can be in meeting changing demands.

Requirements Determination Process

The requirements determination process is a systematic method of computing the number of spare items to stock. For reparables, it is used to calculate how many spare items to stock at the depot- and intermediate-level activities to estimate quantities for repair and for replacement, and to forecast ordering lead times to accommodate administrative, procurement, manufacturing, and delivery delays. An effective requirements determination process makes the supply system more responsive to customer needs and a more efficient investor of limited resources in spares. It becomes more responsive by reducing the number of stock outs, thus improving ASRT and reducing the equipment downtime. It becomes a more efficient investor because orders are placed at the right time and the system stocks only the number of spares to support valid needs.

In Chapter 1 we describe a type organization structure that contains three levels of supply and maintenance – organizational, intermediate, and depot. We also stated that the actual organization structure for reparables support should be one that aligns responsibilities and investment in resources that most effectively achieves responsiveness goals. The spare reparables are stocked throughout the supply system to support operations. System spares, those stocked at intermediate-level and depot-level supply, are used to replace unit-level items. Intermediate-level and depot-level repair are the primary sources of replenishment for system spares, with these repairs made at the most economical level possible. Procurement is used to replace those reparables that cannot be repaired. The requirements determination process contributes to the efficiency and effectiveness of the organization structure by facilitating investment and distribution decisions on placing spare items at the right support level and in the right quantity to respond to unscheduled as well as planned maintenance needs.

During the provisioning process described in Chapter 2, the spares necessary to sustain initial operation of end items are identified and provided to supply activities. The quantity of spares is based on a model that considers estimated demand and lead-time factors (both repair and procurement) provided by the end-item manufacturer or

by provisioning equipment experts/technical specialists. The sustaining requirements determination process for system-reparable spares differs from the provisioning model because it uses actual data generated by the supply system – demand, costs, and lead time – to determine the quantities of spare reparables to stock rather than engineering estimates. (Later in this chapter we discuss how repair program data are collected.)

For each level of supply, the requirements determination process should be capable of considering two conditions: one for those reparables that rely on repair as the source of supply at that level and the second for those reparable items that rely on procurement of a new item as the source of supply. Accommodating those two conditions usually requires that separate requirements determination processes be established. One process supports requirements for reparables that are "consumed," i.e., repaired or disposed of at a lower level and replaced via procurement at the level stocked. The other process supports requirements for reparables that are repaired or disposed of at the level stocked, and replacement is from either maintenance or procurement. For example, in the organization structure described in Chapter 1, the requirements determination process for an intermediate-level supply activity would calculate sufficient quantities of reparables coded for intermediate-level repair to cover demand over both repair cycle time and during procurement lead time for replacing those condemned or disposed of. For consumables, i.e., any reparables coded for organizational-level repair and stocked at the intermediate level, the second process should calculate a quantity that satisfies demand occurring during procurement lead time. The supply centers, as the depot supply level, could likewise have two requirements determination processes: one for items coded for depot-level repair and another for those items coded as consumable, i.e., the reparables coded for organizational- or intermediate-level repair.

Our review of Coast Guard policy and practices found that a formal reparable requirements determination process only exists at the supply centers. Our review of the COMDTINST M4121.2 also revealed that policy does not provide specific guidance for the determination of reparable requirements when repair is the primary source of supply. The policy identifies the data elements and process necessary to compute requirements as though all items were consumable but addresses the need to collect or estimate reparable-specific data elements such as repair cost, repair lead time, and condemnation rates. The policy does not, however, provide guidance on

how those data elements should be used in calculating requirements for items that could be repaired or disposed of at the depot level.

We found that neither SCCB nor SCB has an automated requirements determination algorithm specifically designed for depot-level reparable items. Replenishment action is initiated for depot-level reparables in the same way as consumable items, i.e., when net serviceable assets[4] are below the reorder point, the item manager is signaled to procure additional serviceable assets. At this point, the item manager then decides, based on experience, to either send unserviceable assets to repair or buy new items.[5]

We do not believe the current policy and procedures for calculating reparable requirements are effective. Since the procedure used to calculate a reorder point is the same for depot-level reparables and for consumables, the repair alternative is ignored in the process unless the item manager makes a decision to use it. The lack of a specific procedure for items repaired and returned to stock may cause unnecessary procurements and excesses in some items while experiencing shortages in others. Both of these situations eventually decrease supply system responsiveness and degrade operational readiness at the unit level.

The process currently used at the supply centers to calculate requirements for consumables and nondepot-level reparables is logically correct. The process uses the Wilson economic order quantity (EOQ) model which is appropriate for those items having procurement as the only source of supply.

To improve the requirements determination process and reparables management, we recommend that the Coast Guard develop a separate requirements determination process for those reparables having repair as the primary source of supply. The process should consider demands during repair cycle time; attrition during

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[4]Net serviceable assets are equal to serviceable assets on hand plus serviceable assets due-in (from both repair and procurement) minus serviceable assets due-out.

[5]This paragraph describes the situation at the time of our field research. Since then, we have reviewed and evaluated SCCB's proposed requirements determination model for depot-level reparables. We believe that model, programmed into the existing automated system, provides an interim improved process while SCCB's automated system undergoes complete analysis and redesign. In the redesign, we believe a more sophisticated and robust requirements determination model will provide even more improvement in reparables management.

procurement lead time; and lead times for administration, manufacturing, and distribution delays.

The new requirements determination process should be used to calculate requirements for depot-level reparables. It should also be used at any intermediate-level supply activity for intermediate-level reparables. Additionally, the supply centers should continue to use the current consumable model to calculate requirements for organizational-level and intermediate-level reparables. A similar consumable model is appropriate for any intermediate-level supply activity stocking organizational-level reparables.

Repair Program Data Collection

Collection of supply-related repair program data is essential for the management of the reparables program. The data need to be collected in a usable format and be easily accessible by reparables program managers in maintenance and supply who use this information to evaluate management decisions and monitor performance relative to plans. Ideally, the information is generated automatically by the system that collects the data and uses it for status reports, calculating requirements, and analyzing support decisions.

Coast Guard policy[6] states that all depot-level reparable items should be periodically reviewed to decide if they are still most economically repaired at the depot level. Just as we could not find a policy or procedure that clearly stated the criteria for identifying reparables and determining their maintenance level, we did not find a Coast Guard policy that specifically states how this review should be conducted.

In practice, we did not find evidence that this review was being conducted on a regular basis. COMDTINST M4121.2 comprehensively identifies the data elements required to manage the reparables program. The information systems used at the supply centers, however, do not collect data meaningful to conduct this review. The following data elements are required by policy:

- Carcass return rates
- Reparable condemnation rates

[6]See Note 3, Chapter 2, p. V-4-12.

- Repair lead time
- Repair cost.

Carcass return rates are an important measure of the efficiency of, and compliance with, the mandatory reparable turn-in program. If failed carcasses are not returned from the field in a timely manner, inventory costs increase and responsive support is diminished. Supply managers need to know what items are not being returned so follow-up action can be taken. Without a record of basic information such as the carcass return rate, it is impossible for higher level managers to know how the overall program is working.

A requirements determination process for depot-level reparables cannot be supported by the data currently collected at the supply centers. To properly calculate requirements for depot-level reparables, the supply centers should know the carcass return rate, condemnation rate, repair lead time, and repair cost for each item. Coast Guard policy sufficiently identifies and requires that these data elements be maintained by the supply centers, but current procedures and information systems do not support their collection. Consequently, the repair action point, procurement action point, and stockage objectives cannot be calculated for depot-level reparables. Additionally, appropriation purchase account (APA) budget requests for depot-level reparables and workload estimates are difficult to provide and lack accuracy. (These APA budgets are discussed in more detail in Chapter 4.)

We believe the nonaviation Coast Guard supply centers receive insufficient data for reviewing depot-level reparables and determining whether the quantities currently maintained are justified. Depot-level repair, as a rule, should be less expensive and more responsive than new procurement. Absent accurate repair cost or repair lead time data, supply centers cannot determine if this is true for a particular item. Without complete, accurate, and timely supply-related repair data, important reparable management functions such as requirements determination, reassessing a decision to manage an item as a reparable, and reassessing an item's maintenance level cannot be effectively performed.

To improve reparables management, we recommend:

- Supply center procedures should be improved to ensure that the supply-related repair information maintained for depot-level reparable items is complete, current, and accurate. Specifically, procedures should ensure that

the supply centers maintain a current carcass return rate, condemnation rate, repair cost, and repair lead time for each depot-level reparable.

- In addition to collecting supply-related repair information, the supply centers improve their automated information systems to make this information accessible to managers to perform other supply management functions.

- The supply centers develop procedures to periodically re-evaluate the maintenance-level designation for depot-level reparables. The review will allow the supply centers to adjust the maintenance level based on actual maintenance experience. All Coast Guard-managed depot-level reparables should be reviewed on the basis of the factors that we identify in Chapter 2 and recommend be used to make the original maintenance-level determination.

CHAPTER 4

PROGRAMMING, BUDGETING, AND FUNDING POLICY

INTRODUCTION

Resources needed to support reparables include spares, facilities, tools, test equipment, and skilled manpower. In this section we address methods to assign dollar values to these resources and to reserve the funds necessary to provide reparable item support.

PROGRAMMING AND BUDGETING FOR REPARABLE MATERIEL LOGISTICS SUPPORT

Programming is a disciplined process for allocating funds within major functional areas over a planning horizon (usually 5 years). Budgeting is the process by which funds are requested and appropriated for a specific year.

In DoD, policy requires that resources needed to achieve readiness receive the same emphasis as those required to meet schedule and performance objectives. Resources needed to achieve readiness are those required to design desirable support characteristics into systems and equipment as well as those to plan, develop, acquire, and evaluate the support. To emphasize the importance of those resources, the Deputy Secretary of Defense for Acquisition established an initiative to provide visibility in the planning, programming, and budgeting system (PPBS) of support funding for new weapon systems.[1] We believe that resources to achieve readiness should receive the same attention in the Coast Guard.

Coast Guard policy and procedures for programming and budgeting are specified in COMDTINST M16010.1A[2] and COMDTINST M7100.3.[3] Funding for acquisition of a new system or equipment is generally provided by one of two

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[1]Deputy Secretary of Defense for Acquisition, Memorandum of 28 August 1984 promulgates Acquisition Initiative 30, Management of Initial Support Funding.

[2]U.S. Coast Guard, COMDTINST M16010.1A, *U.S. Coast Guard Planning and Programming Manual*, 2 December 1983 with Change 1.

[3]U.S. Coast Guard, COMDTINST M7100.3, *Manual of Budgetary Administration*, 23 August 1982 with Change 1.

appropriations: the operating expense or the acquisition, construction, and improvement appropriations. The latter is used for the major acquisition, construction, and improvement of vessels, aircraft, shore facilities, and aids to navigation. The operating expense appropriation is used for minor acquisition, alterations, additions, renewals, and replacements with a total project cost of less than $125,000 or renewals or replacements that apply to less than 75 percent of the original facility regardless of the cost.

Resource change proposals are the budgetary documents that identify the need for funds to accommodate new requirements such as the acquisition of new systems and equipment. Part 1 of a resource change proposal permits the identification of costs to develop logistics support of reparable materiel during the acquisition process in Block 12, "Impact on supporting activities and other programs." That block is broken down into three subareas, which are described in Table 4-1.

TABLE 4-1

RESOURCE CHANGE PROPOSAL ENTRIES APPLICABLE TO MAINTENANCE AND SUPPLY SUPPORT COST IDENTIFICATION

Area	Content
Research and development (R&D)	Enter "none" if no R&D resources are required. When they are, describe the essence of R&D activity: "Hardware Development," "Concept Development," etc. If accomplishment is contingent on R&D, say so and show the impact in terms of "pressure" on R&D capability and time.
Engineering and maintenance	State whether workload for engineers and maintenance crews will increase or decrease and by how much. Describe how the change is to be accommodated. If no change, say so – but think very carefully before making this entry. It is a rare proposal that does not involve some increased maintenance load.
Supply and contracting	State whether workload for supply and contracting personnel and facilities will be increased or decreased and by how much. Describe how the change is to be accommodated. If no change, say so – but, as above, give such an entry careful thought. Again, it is a rare proposal that has no supply or contracting workload.

Further clarification of the identification of costs to develop the maintenance and supply support of new systems is provided in the *Planning and Programming Manual.* That document identifies the acquisition paper as one of the primary tasks for obtaining support and funding for the project. The manual describes the acquisition paper as the vehicle for project approval and background support for the resource change proposal entry into the budget cycle. The instructions for preparing an acquisition paper are provided in Department of Transportation (DOT) Orders 4200.9 and 4200.14, *Acquisition Review and Approval.* With regard to logistics support requirements, the DOT orders require that the acquisition paper include a discussion of the overall logistics strategy to put the system into operational use, including support requirements such as documentation, technical data, spare parts and services.

Our literature search did not reveal that operating and support program managers are instructed on the detailed costs that must be considered and how to estimate them for programming and budgeting the funds needed to develop logistics support capability during the acquisition phase. In our interviews, we discovered that detailed analysis of logistics support funding requirements for reparable materiel is seldom performed. Instead, estimates of funding requirements are generally based on the amount that was requested in previous acquisitions.

Detailed analysis of funding requirements for procurement of reparable-item logistics support resources during the acquisition phase is not performed because existing programming and budgeting policy does not require it. Logic dictates that the policy for programming and budgeting funds for reparable-item support resources be consistent with the policy on the determination and procurement of those resources. Since the latter policy does not promote detailed item analysis to determine support resources, as previously shown, detailed analysis of funding requirements should not be expected.

Current methods for estimating funding requirements for logistics support of reparable materiel cannot be used to justify program and budget requests or perform impact analysis of reduced funding. Consequently, in the likely event that funds are not sufficient to satisfy all requirements, logistics support may not receive the same emphasis as schedule and performance objectives.

We recommend that COMDTINST 4105.2 require itemization of acquisition funding requirements for reparable-item logistics support. Using methods that are consistent with the policy for determining and acquiring needed logistics support resources, the Coast Guard should develop funding estimates for the following areas:

- Spares and repair parts
- Tools and test support equipment
- Personnel, training, and training support
- Facility modifications
- Technical data, including drawings, manuals, and repair specifications.

We recommend that policy require that all logistics support funding estimates be reviewed by the Logistics Management Division (G-ELM) before resource change proposals are submitted by support managers to program managers/sponsors.

The format of resource change proposals for equipment acquisition or modification should be revised to accommodate itemization of reparable-item logistics support funding requirements. COMDTINST M16010.1A should reflect the revised format and require that all logistics support resource change proposals be prepared in the revised format.

FUNDING POLICY

Funding policy defines how reparable items supported by the supply system are financed. A particular reparable may be either centrally funded by headquarters and issued free or supply funded and sold to requisitioning units. The selection of the funding method is based on factors such as level of repair, expected demand, and cost. The funding method can be used as a means to provide management control and to give incentive to unit-level managers to efficiently manage resources.

Coast Guard funding policy for supply center system stocks is outlined in COMDTINST M4400.19 and COMDTINST M4121.2. Those instructions name two funding methods for financing supply center inventories: the APA method and the supply fund method.

Nonaviation APA items are centrally funded annually, with AFC-45 and AFC-42 funds, to provide materiel without being reimbursed. AFC-45 and AFC-42 are accounting classifications for funds under the administration and control of

G-ENE and G-TEO, respectively. The policy describes APA items as being relatively high cost, having an unpredictable demand, being insurance items, or being subject to central program control.

The supply fund is a revolving fund that is reimbursed by requisitioning units at the time of issue. Supply-funded items are described as consumables with a stable, predictable demand. The concept of supply funding is comparable to the buyer-seller relationship found in commercial business practice. When commercial vendors have sold a portion of their items, the funds accumulated from those sales are used to purchase additional items from manufacturers. In the Coast Guard, the ICPs perform as the vendors who sell items to the requisitioning units.

The supply-fund method is preferred for most supply items. Items in the supply fund must experience a steady demand to generate "sales" that allow the fund to repurchase new inventory. If a significant portion of the supply fund is invested in slow-moving inventory, the fund will not have sufficient "cash flow" to replenish inventory.

The APA method allows the supply centers to stock slow-moving, expensive items and avoid "cash flow" problems. Typical APA-funded items are insurance items or program materiel. The supply centers can use AFC-45 or AFC-42 funds to stock supply items that will eventually be issued "free" to the end user. The item is free to the requisitioner at the time of the requisition but had been purchased in advance with either AFC-45 or AFC-42 funds. In the case of insurance items, APA funding allows the supply center to have a slow-moving, critical item on hand at the time it is needed, rather than waiting for a failure before initiating procurement action.

Coast Guard policy[4] contains a funding decision chart that depicts the five-step process used by the supply center to assign a funding method. Each step asks a "yes/no" question to determine which funding method is appropriate. The first four questions attempt to assess the item in relation to four general criteria: Is the item a depot-level reparable? Is the item an insurance item? Is the item an aeronautics or avionics item? Is the item's unit price greater than $500? If the item has one of those four characteristics, it is considered for APA funding. If it has none of those characteristics, it is supply funded. The fifth question provides the supply center with the

[4]See Note 3, Chapter 2, p. VII-3-3.

flexibility to reverse any of the first four steps by asking, "Should the item, based on final management review, be supply funded or APA funded?" Thus, final management review may override the four general criteria. Coast Guard policy documents do not discuss what additional factors should be considered, nor do they provide rules governing how the additional factor should be evaluated relative to the general criteria.

Our review of SCCB's inventory records shows that two-thirds of all organizational-level and intermediate-level reparables are APA funded. That is, of all the items designated for repair at the field level, two-thirds are issued free to the end user.

The high percentage of SCCB-managed reparables coded for organizational-level or intermediate-level repair that are APA funded creates incentives that may be in conflict with sound management practices. The designation of an item as a field-level reparable should result from an analysis that determines the item to be most economically repaired at the field level. Funding those items as APA may encourage the manager to rationalize requisitioning a replacement free of charge, rather than to consume limited resources repairing the item. Because it removes the incentive of free replacements, supply funding will encourage the repair of economically repairable field-level reparables at the lowest level.

The current final management review process for assigning a funding method does not sufficiently explain the additional factors that are appropriate for overriding a funding method decision. It allows the Coast Guard to make funding decisions that are inconsistent with, or in opposition to, supply system goals.

We believe changes in funding policy will provide better management of reparables. To achieve those improvements, we recommend the following actions:

- The Coast Guard should modify its policy to use the supply fund for all demand-based intermediate- and organizational-level reparable items and transfer AFC-45 and AFC-42 funds from the supply centers to the field. We believe planning for the transfer of those reparables to the supply fund should begin now and implementation should occur concurrent with distribution of AFC dollars to finance reimbursement of the supply fund.

- The supply centers should develop their automated information systems and procedures to track the return of failed items from the field to the supply centers and record DLR repair costs. The supply centers must have that

capability to determine the price charged to the customer for the DLR. With those capabilities, an alternative to APA funding DLRs becomes available. We recommend the Coast Guard perform a comprehensive review of supply funding all DLRs

- The supply centers should procure reparable insurance items with the supply fund and sell them to either the AFC-45 or the AFC-42 fund that establishes the requirement when budgeted funds are available. The supply fund would provide lead-time financing for the insurance items, but because of the low demand for those items, they would later be purchased with AFC-45 or AFC-42 funds. The items should remain centrally controlled by the supply centers but in the "ownership" of the AFC-45 or AFC-42 fund. The supply fund, however, should be used to procure program requirement items and those items should be held in the supply fund until program execution. The program requirement items should be purchased from the supply fund with AFC-45 or AFC-42 funds when they are needed to execute the program.

- As a minimum during the first year following initial transfer, each MLC should manage a fund to assist the units in paying for the organizational-level and intermediate-level reparable items transferred to the supply fund and for any increased maintenance costs. The MLC should manage that fund until adequate historical information is available to estimate each unit's true funding needs. During the transition period, requisitions from units for items coded for intermediate-level repair, which the MLC repairs and condemns, should be approved and funded by the MLC before the supply centers issue the item.

Supply funding will improve the management of organizational-level and intermediate-level reparables. The supply-fund method, because it sells materiel to the field, provides an incentive to unit-level managers to repair or return failed units. Managers in the field will no longer have the financial incentive to dispose of economically repairable organizational- or intermediate-level reparables.

BUDGETING PROCESS FOR SUPPLY CENTER-MANAGED REPARABLES

In a previous section on funding policy, we described the two funding methods used in the Coast Guard and the reasons for choosing either method. We recommended that all demand-based organizational- and intermediate-level reparables be supply funded and supply fund be used to procure insurance and program requirements. Additionally, we recommend DLRs continue to be APA funded until information system capabilities support repair cost data collection. This section addresses the APA budget request.

The annual APA budget request represents the supply center's best estimate of the funds necessary to maintain centrally funded inventories for the next year. The basis of the budget estimate should be the next year's expected buy-and-repair actions. The budgeting process then assigns a cost to the estimated repairs and procurements and translates these actions into dollar requirements.

The foundation of the APA budget request is a sound requirements determination process and accurate supply-related repair data. We found that neither supply center has an automated requirements determination process specifically designed for DLRs. We also found that key supply-related repair data such as carcass return rates, condemnation rates, repair lead times, and repair cost are not collected.

In practice, we found that APA budget requests have not been based on actual requirements but on the previous year's request plus an additional factor for inflation or growth. To determine the validity of that approach, we reviewed the procedures, data, and planning assumptions used by SCCB in preparing the FY90 AFC-45 budget request. We found most planning assumptions to be within actual ranges. However, we also found other key factors missing from the budget request procedure that limited its ability to accurately estimate funding requirements. The missing factors were a sound depot-level requirements determination process and reliable data to support the process. SCCB improved the procedure by using available data and updated assumptions in the FY91 AFC-45 budget request and has developed interim changes to its requirements determination process. However, we believe that the annual APA budget requests cannot accurately estimate actual budget requirements in the absence of a well-defined requirements-determination method for depot-level reparables and reliable data at the supply centers.

To improve the budgeting process for APA-funded reparables, we recommend that Coast Guard policy require the supply centers to submit requirements-based budget requests for APA-funded items. The budget request should be generated by the requirements-determination process and presented in time-related dollar requirements for purchasing replacement or additional items and for funding repair of those items being returned to inventory.

To accomplish this, the Coast Guard must first develop a separate requirements-determination process for depot-level reparables, and supply center information systems must be improved to collect reliable supply-related repair data.

GLOSSARY

AFC	=	allotment fund code
APA	=	appropriation purchase account
ARB	=	Acquisition Review Board
ASPs	=	Acquisition and Support Plans
ASRT	=	average system response time
CGARC	=	Coast Guard Acquisition Review Council
COTR	=	contracting officer's technical representative
CSMP	=	current ship's maintenance project
DLR	=	depot-level reparable
DOT	=	Department of Transportation
EMD	=	electronics maintenance detachment
EOQ	=	economic order quantity
G-A	=	Chief of Acquisition
G-E	=	Chief of Engineering, Logistics and Development
G-ELM	=	Logistics Management Division
G-ENE	=	Naval Engineering Division
G-T	=	Office of Command, Control, and Communications
G-TEO	=	Electronic Services Division
HQINST	=	Headquarters Instruction
ICP	=	Inventory Control Point
I-level	=	intermediate-level
ILS	=	Integrated Logistics Support
ILSMT	=	ILS management team