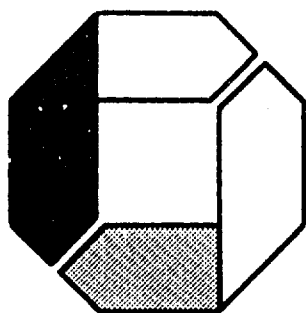


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**Strategic Assessment for
Depot System Command
REvitalization of Army Depots
for the Year 2000**



READY 2000

Renaissance of a National Resource

August 1988

Prepared for
the U.S. Department of the Army
under a Related Services Agreement
with the U.S. Department of Energy
Contract DE-AC06-76RLO 1830

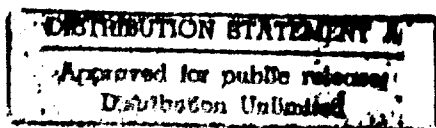
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**Strategic Assessment for
Depot System Command
REvitalization of Army Depots
for the Year 2000 Program**

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Executive Summary

The mission of the Depot System Command (DESCOM) is to supply repair parts and ammunition to combat units and to repair and modify weapons systems and components. DESCOM needs to modernize its facilities, equipment and management systems to meet the future needs of the Army. The REvitalization of Army Depots for the Year 2000 (READY 2000) Program has been initiated to develop and implement a modernization plan for DESCOM that will ensure that the depot system is positioned to carry out its missions in the year 2000 and beyond.

Approach

The strategic assessment presented in this report provides the planning basis for the READY 2000 Program. A recommended new mission statement for the command is presented and a detailed set of recommended modernization targets for the program are described. The recommendations are based on a detailed evaluation of trends inside and outside of the Department of Defense (DoD) that will shape the direction of DESCOM's future.

Information on these trends was collected primarily through an extensive set of interviews. Our staff conducted nearly 200 interviews with policy makers and technical experts in DoD and industry. The interviews were conducted in four general areas: DoD senior executives, DESCOM customers in the commodity-oriented major subordinate commands, future warfare specialists in Training and Doctrine Command (TRADOC) and factory and materials-handling technology specialists in industry and the Army. The findings from the interviews were augmented with information from the relevant technical literature.

Key Trends

We analyzed the results from the interviews and the other information we collected to identify key trends that will be important considerations in planning for READY 2000. Major trends we identified are discussed below.

Customer Needs

Customers expressed a high level of satisfaction with the supply operations in DESCOM. The Area-Oriented Depots (AODs) are viewed as a very good step toward meeting the future supply needs of the system.

There are mixed feelings about the maintenance function. With the exception of the Communications Electronics Command (CECOM), there is general willingness to continue to use the depots for maintenance support, but major improvements are needed in technical capabilities and cost-effectiveness of the operations. The future workload of the depots is difficult to predict. Increases are

likely in some areas such as helicopter maintenance, while declines are likely in communications equipment repair. Future workloads are likely to be strongly influenced by the outcome of the READY 2000 Program. A modern, cost-effective depot system will generate substantial demand for its services.

Weapons System Technology

Totally new systems based on totally new technologies are unlikely until well into the 21st century. Budget pressures are leading to a practice of improving current systems, rather than developing entirely new concepts. New technologies will be applied to these systems through block modifications. The depots could have a major role in installing the block modifications. New capabilities will be needed in the depots to support the modified systems. For instance, many of the block modifications will use electronic technologies to provide new or improved capabilities for weapons systems. Modular subsystems and components will be used increasingly in weapons systems to permit rapid field repair. The depots can expect to work on more modules and fewer end items in their maintenance operations.

Warfighting Doctrine

The future AirLand battle doctrine being developed focuses on heavy, highly mobile units in high-intensity battlefield environments. This doctrine will require rapid field repair of combat equipment using modular repair concepts and rapid turnaround depot-level repair systems. Supply concepts will also need to be modified to sustain combat units in a high-intensity battlefield environment. The Army is also continuing to develop lightweight, air-transportable divisions. This places some unique requirements on the logistics system, but these will be easier to deal with than the sustainment requirements for units in high-intensity battlefield environments.

Factory Technology

Powerful new capabilities applicable to the depot system are becoming available. The most important developments are in information processing and computer



technologies. Major cost savings and capability enhancements are also possible with robotics technology, flexible manufacturing systems and expert systems.

Work Force

Modernization of the facilities and equipment in the depot system will produce major changes in the jobs required to manage and operate the system. Extensive training programs will be needed to successfully implement the modernization program. The depot system will need to attract and retain workers with skills that are in high demand in the commercial sector. Appropriate compensation packages will be needed to accomplish this.

Department of the Army/Department of Defense (DA/DoD) Policy

The executive interviews covered a wide range of topics. There was widespread consensus on the following:

- The depot system needs a centralized management function and management functions of DESCOM headquarters need to be enhanced.
- Mobilization requirements are key to effective planning for READY 2000; however, no generally accepted industrial mobilization policy to guide this planning exists in DoD, DA or AMC.
- The depot system has excess capacity, but major corrective actions, such as base closures, probably would not be approved by Congress.
- DESCOM needs to identify the depots' core functions and focus on enhancing these functions
- Privatization in DoD will continue.

External Factors

Factors outside the direct control of DESCOM will place important constraints on the READY 2000 Program. Political factors will constrain DESCOM's ability to optimally configure the depot system. Environmental controls must be designed into new systems introduced during READY 2000. Correcting existing environmental compliance problems will be a high-priority use for the scarce resources needed to conduct READY 2000 activities.

Mission Statement

Based on these trends, we recommend a new mission statement for the command. The new mission is based on the concept of focusing most of the sustainment functions in the AMC in one major subordinate command. For discussion purposes, we refer to this as the "Sustainment Command." In addition to providing centralized leadership for AMC's sustainment functions, this mission will fill sustainment gaps developing in the logistics system.

This mission would be a major departure from the current mission of DESCOM headquarters. The new command could be the successor to DESCOM or an entirely new organization that absorbs DESCOM's current functions.

The recommended mission for the "Sustainment Command" is to sustain fielded materiel developed and acquired by AMC. Major functions required to carry out this mission include:

- **Supply**—The command will manage and operate the Army's wholesale supply system for repair parts and ammunition.
- **Maintenance**—The command will manage the depot-level maintenance activities for all AMC-controlled materiel. This includes contracting with commercial sources for maintenance support as well as assigning maintenance to the Army depots. A major initiative would be undertaken to develop rapid repair capabilities for combat equipment being used in high-intensity battlefield environments. This could be accomplished using a mobile depot concept, by building permanent depots in selected theaters, or by coupling the depots in the continental United States (CONUS) to a dedicated transportation network.
- **Depot System Management**—The command will manage the Army's depot system. These functions are similar to those currently carried out by DESCOM headquarters.
- **Field Support**—The command will implement and manage a field support network to provide liaison with combat units, support field maintenance, screen components being returned for depot repair, and train field units on the operation and maintenance of new or modified weapons systems.
- **Logistics Support System**—The command will develop and operate the new computerized logistics information systems and other logistics support systems needed to meet the future needs of the Army. The command will be the focal point for the Army's implementation of the DoD initiatives being pursued in LOG 2010.
- **Weapons System Design Support**—The command will have lead responsibility within AMC for ensuring that maintainability and supportability are designed into new weapons systems or block modifications. This includes development of the life-cycle logistics plans for new materiel; working with the system developers to provide sustainability design guidance; and reviewing the sustainability of conceptual designs, detailed designs and prototype systems.



We recognize that high-level approvals are required for a mission change of this scope and that the concept is likely to be modified during the approval process. A number of intermediate steps could be implemented before the concept is finally put in place, but we feel it is an achievable goal for the year 2000 and would enhance the performance of the Army's logistics system.

Recommendations

We developed a series of 22 detailed recommendations for consideration in planning the READY 2000 Program. These recommendations deal with technological developments that should receive priority attention in modernizing the facilities and equipment in the system; development of the management system needed to effectively manage the modernized depot system; and methods to ensure that the command can attract, retain and motivate the work force needed to manage and operate the modernized system. We suggest the following steps to implement these recommendations:

- **resolve mission and organizational structure issues**

It will take substantial interaction with senior AMC and DA management to finalize a new mission statement for the command. The mission statement recommended in this strategic assessment can serve as the starting point for these discussions. We recommend that DESCOM present the mission statement to senior management as soon as possible to begin the process of identifying and resolving issues surrounding the future mission of the command.

- **target technology modernization priorities for near-term action**

A good planning basis for modernizing the facilities and equipment in the depot system must start with a definition of DESCOM's mobilization requirements. In the absence of an approved DoD industrial mobilization policy, we recommend that DESCOM develop its own mobilization planning basis and seek approval for this basis from AMC HQ. Once the mobilization position has been developed, DESCOM can proceed with efforts to define the core functions of the depots and develop an efficient configuration for these functions within the depot system. Plans can then be developed to implement the technology improvements needed to carry out the core functions.

- **enhance current management systems**

Substantial time may be needed to resolve the mission and organizational structure issues for the command. Near-term improvements in the management system are also recommended. These improvements should focus on enhancing the perceived "value added" of the headquarters functions, establishing needed communications links with other parts of the Army's logistics system, and initiating efforts to develop modern management information systems for the command.

The findings and recommendations contained in this report have been prepared by PNL for consideration by the Depot System Command of the U.S. Army and have not been officially endorsed.



Statement "A" per telecon Fred Smith.
U.S. Army Depot Systems Command/AMSD-SP.
Chambersburg, PA 17201-4170.

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Acronyms and Abbreviations

AIF	Army Industrial Fund	ILS	Integrated Logistics Support
AMC	Army Materiel Command	LAO	Logistics Assistance Officer
AMCCOM	Armament, Munitions and Chemical Command	LHX	Light Helicopter Experimental
AOD	Area-Oriented Depots	LOGCEN	Logistics Center
APE	Ammunition Peculiar Equipment	LOGMARS	Logistics Applications of Automated Marking and Reading Symbols
ARDEC	Armament and Research, Development and Engineering Command	MADP	Mission Area Development Plan
AVSCOM	Aviation Systems Command	MICOM	Missile Command
BAS	Battlefield Automated System	MSC	major subordinate command
CALS	computer-automated acquisition and logistics system	NDE	nondestructive evaluation
CECOM	Communications Electronics Command	NDI	nondevelopmental items
CONUS	continental United States	NICP	National Inventory Control Point
CIM	computer-integrated manufacturing	OCONUS	outside the continental United States
CTX	center of technical excellence	ODCSOPS	Office of the Deputy Chief of Staff, Operations and Plans
DA	Department of the Army	OPTADS	Operational Tactical Data System
DCD	Directorate of Combat Developments	OSD	Office of the Secretary of Defense
DCSLOG	Deputy Chief of Staff, Logistics	PEO	Program Executive Officer
DESCOM	Depot System Command	PM	Project Manager
DMMC	Division Materiel Management Center	PNL	Pacific Northwest Laboratory
DPICM	dual-purpose improved conventional munitions	POC	Point of Contact
DoD	Department of Defense	READY 2000	REvitalization of the Army Depots for the Year 2000
EPA	Environmental Protection Agency	TACOM	Tank-Automotive Command
FAAD	Forward Area Air Defense	TCAAP	Twin City Army Ammunition Plant
FMS	flexible manufacturing system	TDP	technical data package
FORSCOM	Forces Command	TQM	Total Quality Management
GOCO	government-owned, contractor-operated	TRADOC	Training and Doctrine Command
		TROSCOM	Troop Support Command
		TSM	TRADOC Systems Manager
		USASAC	U.S. Army Security Assistance Center



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1.0 Introduction

The Depot System Command (DESCOM) is a major subordinate command of the AMC. DESCOM's primary missions are to supply repair parts and ammunition to the Army's combat forces and to perform depot-level maintenance on major Army weapons systems.

In its supply role, DESCOM serves as a key link in the supply chain from the manufacturer to Army units around the world. Thirteen DESCOM depots and six depot activities receive shipments of Army materiel and ammunition from manufacturers; store and maintain it; and ship it on demand to Army bases and units in the field.

DESCOM also has the primary responsibility for maintaining, overhauling and repairing most major Army systems, including tanks, howitzers, aircraft, combat and support vehicles, and missiles. Finally, the depots maintain a manufacturing capability to produce special purpose items for the Army.

The basic functions of Army depots have not changed in over 200 years. However, the materiel handled and manufactured by the depots and the complexity of the international supply function have changed the nature and mission of the depot function remarkably.

In this strategic assessment, the status of the facilities and equipment, management, and logistical capabilities of DESCOM are examined in light of the increased demand for sophisticated personnel, hardware, and management systems to meet the complex sustainment needs of today's Army. Increasingly sophisticated systems require more parts to maintain them in the field, and special equipment and a highly trained work force to repair them in the depots. The current facilities and equipment are becoming outdated. The average age of depot facilities is 41 years; the average age of its industrial plant equipment is 24 years. DESCOM's customers feel the effects of these problems through higher repair costs and slower turnaround times for both supply and maintenance. In the face of these developments, DESCOM is deciding how to modernize its operations.

READY 2000 Program

Recognizing the need for an integrated, top-down approach to modernization planning, DESCOM has initiated its READY 2000 Program. The objectives of READY 2000 are to develop and implement an integrated plan for modernizing DESCOM facilities and equipment, and for upgrading management practices and the skill level of the work force throughout DESCOM.

The READY 2000 initiative will consist of four phases: 1) a strategic assessment to evaluate the impact of the many factors that will influence DESCOM's mission in the future and to establish broad goals for modernization, 2) an analysis phase to establish detailed modernization requirements and implementation plans, 3) a design phase to develop detailed designs for facilities and other systems, and 4) the implementation of the designs.

The Strategic Assessment

DESCOM contracted with Pacific Northwest Laboratory (PNL) through the Production Base Modernization

Activity at Picatinny Arsenal to conduct the strategic assessment.

Objectives

The basic objectives of the strategic assessment were

- to develop a mission statement for DESCOM applicable in the year 2000 and beyond
- to identify policy and doctrine changes occurring in the Army and the DoD and determine their impact on future depot operations
- to determine the level of satisfaction of DESCOM's current customers and project future demands for depot services
- to identify emerging weapons systems and logistics doctrine and evaluate the implications for future depot activities
- to identify emerging technologies in manufacturing and materials handling and distribution, and recommend technologies that should be applied to modernize depot facilities and equipment



- to identify management systems and organizational characteristics needed to respond to future work and requirements;
- to assess the likely impact on modernization options of political, economic, environmental and other factors beyond DESCOM's control.

Approach

The major steps in the development of the strategic assessment are illustrated in Figure 1. The first step was to characterize the current depot system. Key members of PNL's project staff visited selected depots and DESCOM headquarters to review and characterize current missions, organizational structure, management practices, operation and performance. This provided the background information needed to plan and conduct the strategic assessment.

In the second step of the process, a broad-based effort was initiated to collect information on the forces inside and outside DoD that would shape the future direction of the depot system. Information on trends within DoD was collected primarily through an extensive series of personal interviews with key Army and DoD staff. Information on

external forces that would need to be considered in its modernization planning and execution technology developments were obtained from recent technical literature and through personal and telephone interviews with experts in these areas.

We initiated the interviews by talking with top civilian and military staff in the Army and DoD in the area of logistics and materiel. These executives were asked to identify the major visions, plans and organizational issues in the Army and to express their views on the future of the depot system. We also used these interviews to identify trends in military doctrine, new Army weapons systems, and procurement and management philosophies in DoD, DA, and AMC.

Following the executive interviews, we interviewed DESCOM's "customers." These interviews were designed to assess whether the customers were satisfied with the services DESCOM is currently providing and to determine what they will need from DESCOM in the future. The six AMC commodity-oriented commands are DESCOM's primary customers. Others in the Army whose needs partially determine the type and level of work performed at the depots were also contacted.

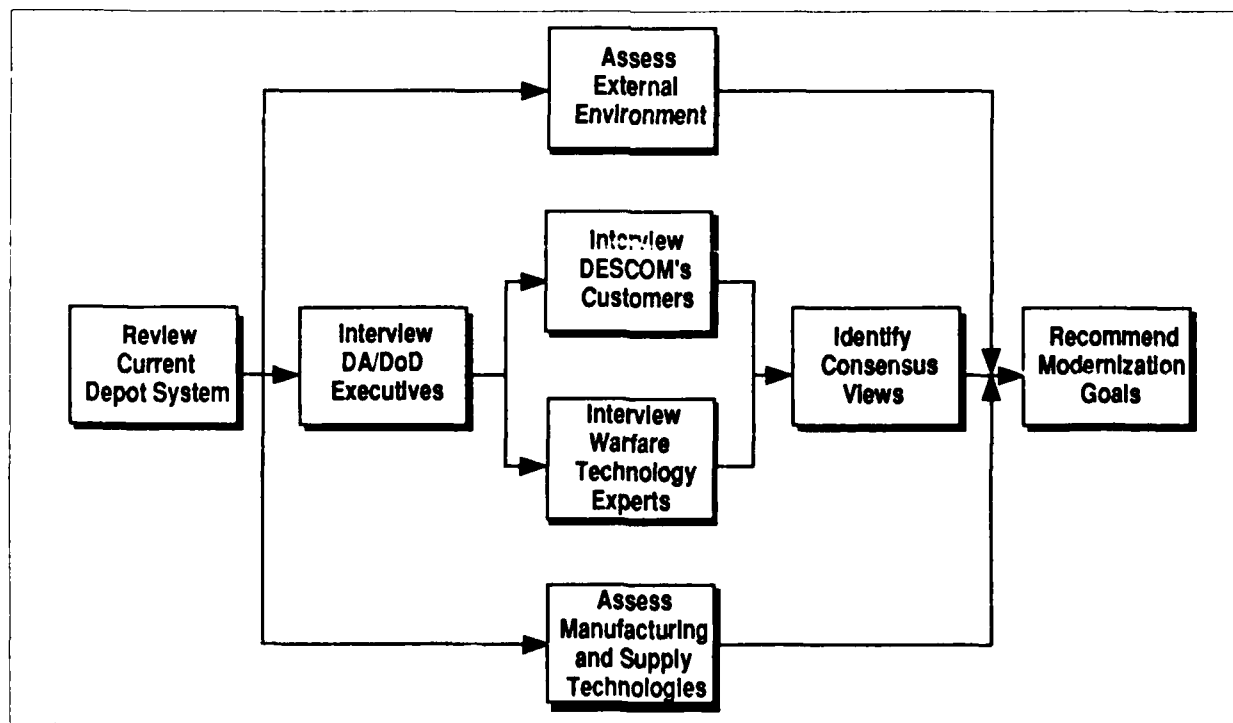


FIGURE 1. Major Steps in the Development of the Strategic Assessment



Interviews were conducted with staff in the Command (FORSCOM). The customer interviews also provided information on future trends in Army weapons systems technology and the impact of these trends on supply and maintenance workloads.

Information on future warfare technology was collected to determine the types of systems DESCOM will have to support in the future and the logistics needs of these systems. To obtain this information, we interviewed staff in the combat developments and training directorates of TRADOC at the Army development centers.

The information obtained from the interviews with executives, DESCOM customers and warfare technology specialists was reviewed to identify the consensus view. This information was then evaluated to identify the key trends important to DESCOM's modernization program. These key trends are summarized in Chapter 2.0 of this assessment. In some important areas, there was no clear consensus; these areas are noted in the discussion.

Significant factors external to DoD that could influence DESCOM's modernization needs and its options for accomplishing modernization were also identified and characterized. These factors included political and regulatory pressures and constraints, economic constraints on modernization, and institutional developments that could help or hinder modernization of the depot system. Trends affecting the work force were obtained from recently published sources on modernization efforts in industry and from labor and management representatives of industries that have modernized. External factors that need to be considered in DESCOM's modernization planning are also summarized in Chapter 2.0 of this report.

To learn about industrial technology, we interviewed executives in private industry, toured manufacturing and warehousing facilities, and analyzed recent trends reported in the trade literature. Knowledgeable personnel in DA provided data on advanced information systems. Key trends in technology development were identified from this information. The trends most important to modernization of the depot system are summarized in Chapter 2.0 of this assessment.

The final step in the strategic assessment was to review the key trends in all of these areas and determine appropriate goals and targets for DESCOM in the READY 2000 Program. Based on this information and the objectives of READY 2000, we developed a series of recommended modernization targets for DESCOM. These recommendations are intended to provide DESCOM with a set of guiding principles for planning and implementing the READY 2000 Program.

As a result of our analysis of all those factors, we have suggested that the mission of the command be redefined. A recommended new mission statement is presented in Chapter 3.0. Detailed recommendations for modernizing the equipment, facilities, and management systems of the command and for developing the work force needed to manage and operate the modernized systems are presented in Chapter 4.0.

Implementing the full set of recommendations will take many years. In Chapter 5.0, we discuss the critical "next steps" needed to initiate the planning phase of the READY 2000 Program.

The findings and recommendations contained in this report have been prepared by PNL for consideration by the Depot System Command of the U.S. Army and have not been officially endorsed.



2.0 Forces Shaping the Depot System Command

To develop a vision of DESCOM's future, it is necessary to understand the forces both within and outside the Army that will shape that future. This chapter summarizes the information we collected to characterize those forces. We assessed future trends in Army and DoD policy and management philosophy; in customer demand for DESCOM's services; in warfare technology; in manufacturing and materials handling technology; and in political, environmental and economic factors.

We collected this information through interviews, studies of emerging trends reported in the relevant trade publications and journals, and independent analysis. We then evaluated the information to identify consensus views and key trends important to DESCOM's modernization planning. In this section, the consensus views and key trends are described. This information is the basis for the modernization recommendations in Chapter 3, and the modernization recommendations provided in Chapter 4.

In presenting the information obtained from interviews, we adopted a policy of anonymity. We adopted this policy because we were interested in obtaining candid responses. We wanted to identify the consensus or themes, rather than any individual's views. The names of individuals contacted is included in the appendix.

In the discussion that follows, the key findings that we evaluated as important to DESCOM's future are presented in bold type; a discussion follows each of these findings.

Trends in the Department of Defense and the Army

To identify major policy, management, and technological trends in the Army, we interviewed DoD and Army executives who set or directly influence policy and have "inside information" on trends that would affect DESCOM and the READY 2000 Program. The interviews were structured to obtain the opinions of these key executives on topics that are important to DESCOM's future and to give them the opportunity to discuss other trends and issues they thought would be relevant. We interviewed over 20 key DoD and Army representatives. A list of individuals contacted is included in the appendix.

The consensus views that emerged from the executive interviews are presented below. The presentation also draws to a lesser extent on interviews conducted with the AMC subordinate commands and DESCOM's customers and clients when those interviews contributed to the consensus on topics covered in the executive interviews.

There was broad support for the supply and distribution mission of the depot system. Opinions about the depots' future maintenance role were mixed.

Generally speaking, DESCOM received high marks for its efforts to modernize supply and distribution. The distribution centers being constructed at the AODs were uniformly regarded as state-of-the-art facilities that would

effectively support the Army's goal to reduce costs. However, there were concerns about the future role of the depot system in maintenance. The views ranged from "industrial mobilization" planning to a serious concern about the ability to compete with the private sector in a highly competitive environment. In general, the differences in opinion seem to be the result of three issues: 1) the uncertainty in the need to retain contractor support for maintenance as well as development; 2) the lack of a definition of core functions that should be reserved for the depots; and 3) the uncertain impact of technology trends on maintenance.

DESCOM's role in the event of mobilization is not clear.

The interviews sought to identify either a DoD or an Army industrial mobilization plan and to determine how such a plan should be used in DESCOM's modernization planning. This information is needed to determine what level of support DESCOM should be prepared to provide to field units in the event of hostilities. Individuals at high levels in DoD and the Army stated that a DoD industrial mobilization plan does not exist. Others stated that such plans exist but that they have limited acceptance and usefulness for depot planning. The implication was that DESCOM should not wait for a strong mobilization policy to be set, but will need to define for itself what mobilization assumptions are appropriate for its planning.



Rapid technological change in logistics management systems will have a major effect on future depot operations.

One of the important factors producing changes in the depot system is the rapid advances in computerized information systems. As the Army moves toward a paperless management system, the depots will find themselves facing increasing needs to link their operations with their customers and with others in the chain of command. The computer-automated acquisition and logistics system (CALS) is a DoD-wide initiative that will receive continued emphasis in the near future. The interviews indicated that DESCOM needs to be continually involved in these activities.

Rapid technological change in weapons systems will lead to greater specialization by depots and to more interservice use of common depots.

The trend toward increasing technological sophistication in weapons systems and the need to keep a close scrutiny on budgets will probably result in more emphasis being placed on individual depots to serve as focal points, or "centers of technical excellence" (CTXs), for certain systems. Similarly, budget pressures and the trend toward the use of common components or items across services (interservicing) are likely to increase the pressure on depots to serve several branches of the armed forces. This last trend is not likely to move rapidly because of long-standing military traditions of each service performing many of its own supply and maintenance activities.

The use of the private sector to provide government services will increase. DESCOM should focus on the "core functions" needed to support the soldier in the field.

Privatization of federal functions is being widely discussed as a mechanism to manage the growth in federal budgets. Although no clear consensus emerged from the interviews regarding the comparative cost or quality advantage of using private sector contractors in lieu of depots, there was general agreement that the pressure to privatize would continue to grow. The need to continue to use civil service employees to perform some depot functions was also stressed because of perceived greater flexibility and control over depot work. An important need expressed throughout the interviews was for the depots to define and focus on the "core functions" that are crucial to providing the necessary Army support.

The existence of excess capacity in the depot system creates pressure to consolidate operations.

Several of the interviewees mentioned that the present depot system has a great deal of excess capacity. Although the level of excess capacity is difficult to quantify because of the uncertainties surrounding mobilization requirements, it was generally agreed that similar capabilities exist at several of the depots and that the overall costs of operating the depot system could be reduced without substantially affecting DESCOM's ability to conduct its mission. Apparently, there are political constraints that have made it very difficult to reduce operations and employment at several of the depots. While there was little agreement on whether depot operations could be consolidated or individual depots closed, several interviewees mentioned that if consolidation were ever politically feasible, now was the time because of the strong pressure to reduce defense budgets.

Modernization of the depots must include active management of the manpower changes associated with technological change.

Given the rapid degree of technology change in both weapons systems and manufacturing equipment, training and manpower management will be vital for future depot success. There is a concern throughout DoD that the rigid pay and management policies of the federal civil service system will constrain productivity improvements. DoD, the Army, and DESCOM need to work together to build productivity-based incentive systems into compensation packages for depot-level personnel so that the depots can attract and retain workers with high-tech skills.

A major initiative is under way in DoD to improve the quality of all DoD activities.

The Secretary of Defense recently issued the Department of Defense Posture on Quality. This major policy statement will have an impact on every DESCOM activity and employee. The memo gives DoD Total Quality Management (TQM) high priority within the DoD and identifies TQM as the vehicle for ensuring that DoD, its contractors, and their vendors focus on achieving higher levels of quality. The DoD TQM Master Plan was also issued. It contains 35 separate milestones for the Office of the Secretary of Defense, the military department headquarters, and various other DoD agencies. These milestones will result in a variety of impacts at major command and installation levels. It is important that this initiative have a continuing high level of commitment and visibility among DESCOM executive-level personnel. Leadership



is the single most important factor in instilling and maintaining quality consciousness within an organization. Other necessary ingredients, such as properly positioning the personnel and establishing the minimum levels of written policies and procedures necessary to ensure program consistency will need to be integrated into the management system planning for READY 2000. TQM will be the underlying management principle for DESCOM's new management systems.

The role of DESCOM headquarters in managing the depot system needs to be enhanced.

The executives were asked to express their opinions about two alternative organizational structures for the depot system. One was the current centralized structure under DESCOM, the other was a commodity-oriented structure in which the depots reported directly to one of the AMC commodity-oriented commands. The latter organizational structure would eliminate the need for a DESCOM headquarters. The executives indicated a need for an independent DESCOM to prioritize workloads and to ensure a "buffer" between the depots and their customers. However, it was also felt that DESCOM needs to take a proactive role in depot system management since there is some question within the major subordinate commands (MSCs) regarding the benefits, or value added, of DESCOM headquarters.

Findings from Customer Interviews

Interviews with customers of the depot system identified trends affecting future workloads, improvements needed in the depot system to support current mission areas, and potential new mission areas for support from the depot system. Most of these interviews were conducted with the six AMC commodity-oriented commands and selected project managers (PMs). Limited interviews were conducted with field units in FORSCOM. The appendix contains a list of interviewees.

Maintenance Functions

The use of modules in new systems is increasing and could increase depot-level workloads.

Use of modules reduces the amount of repair that needs to be done in the field. However, because of the expense associated with "throwaway" modules, this trend has the potential to increase depot-level workloads since modules that are returned from the field will require testing to determine whether repair is warranted. At the current time, however, it is not clear how much testing and repair of modules will be done by the depots and how much will be performed by contractors.

Customers question the ability of depots to repair sophisticated systems.

Maintenance workloads will continue to become more technologically complex, particularly in electronics. However, maintenance of sophisticated electronics and other high-tech equipment is viewed as an area in which the depots are currently weakest because resources have not been available to upgrade depot capabilities. Some customers doubt that the depots will be able to develop the necessary skills to repair certain equipment. The reasons cited include the difficulties in attracting skilled workers as well as contractors' proprietary knowledge of the systems. With one key exception (CECOM), customers are willing to send complex systems to the depots if the depots can develop those skills.

Depots will face increasing competition from the private sector.

Competition from the private sector comes from two primary sources: 1) increased procurements of non-developmental items (NDIs) with contractor support for maintenance; and 2) the trend to use outside contractors to maintain highly sophisticated new systems and to maintain these systems for a longer period of time than has traditionally been the case. Customers agreed that workloads will shift to contractors if depots do not have the capability or the technical data to maintain a system. Workload may also shift to contractors on the basis of cost. However, there was no consensus that outside contractors were less costly; this seems to depend on the particular system, and contractors appear to be more costly for sole-source items.

Cost comparisons between depots and contractors are also made difficult by the recent instability of depot maintenance costs. Customers favor longer-term fixed prices from the depot so they can properly evaluate the two alternatives. Finally, customers agreed that the lower costs of contractors on some systems was because of the high costs associated with Army requirements for technical documentation and test sets.

Projections of maintenance workloads vary from customer to customer and are subject to considerable uncertainty.

The principal factors that would reduce future workload are increased use of NDIs with contractor support and the improved reliability of fielded systems. Factors that tend to increase workload include 1) keeping systems fielded longer, 2) modifying and upgrading existing systems, and 3) performing less repair in the field.



Table 1 shows projected maintenance workload by MSC, together with each MSC's portion of the current workload. MICOM and AVSCOM, which together account for almost 40% of current maintenance budgets, expect to increase their depot workloads. AMCCOM, with 9% of the maintenance budget, anticipates stable or declining workload. The remaining MSCs, which now account for just over 50% of maintenance workloads, foresee smaller depot workloads by the year 2000. The most dramatic decline was predicted by CECOM; with its heavy commitment to NDI, CECOM indicated that a single depot would be able to handle its entire workload within the next ten years.

The MSCs had a great deal of difficulty projecting future workloads out to the year 2000 and beyond, so these projections contain large elements of uncertainty. The reasons for this uncertainty include 1) the useful lives of existing systems and the effects of future budgets on procurement of new systems; 2) possible need to extend the useful lives of existing systems; 3) timing for new systems to be brought under depot-level maintenance; 4) extent of NDI purchases; 5) level of future competition from the private sector; and 6) reliability of new systems.

The Army is reducing its purchases of technical documentation and test sets, limiting the ability of the depots to maintain some systems.

Preparation of technical data packages (TDPs) for the depots is expensive. The PM can save money in the initial fielding of a system by not purchasing them. This decision generally ties the Army to the system developer for maintenance support. Without technical data the depots are either prevented from maintaining a system or will have a substantial learning curve to develop the necessary maintenance procedures and specialized equipment.

The use of NDIs is likely to increase, especially for electronic components and end-use items, thereby reducing a portion of that depot workload in the near term. The impact of NDIs on workload will be felt primarily by depots workloaded by CECOM, which has by far the greatest commitment to NDIs. NDI workloads may be shifted over to depots eventually, however, if the Army continues to use systems after manufacturers no longer support them.

TABLE 1. Projections of Maintenance Workloads by Major Subordinate Command

MSC	Current Workload*	Workload Trend
AMCCOM	9%	<u>stable or declining</u> unless depots develop capabilities to support new systems
AVSCOM	27%	<u>increasing</u> , and will increase even more if the depot system expands its physical capacity to handle aviation workload
CECOM	20%	<u>decreasing</u> because of NDIs; by 1995, it will have workload for only one depot
MICOM	11%	<u>increasing</u> as more systems are being added than are being displaced
TACOM	29%	<u>decreasing</u> because of the increased reliability of new systems, although trend may be offset by programs to modify and upgrade equipment
TROSCOM	4%	<u>decreasing</u> as Army opts for new purchases over maintenance, but trend may be offset as reduced field maintenance results in more items being returned to the depot.
USASAC	included in above figures	<u>stable</u>

*Percentage of total depot maintenance workload. Based on FY 88 direct Army reimbursable program funds.



Government-owned, contractor-operated (GOCO) operations are viewed as a good compromise between depot and contractor maintenance.

Most customers felt that too much concentration in the private sector would make the logistics system less responsive in surge or mobilization conditions. The depots are viewed as being more committed and accountable in wartime. The depots also have the potential to be more flexible in responding to their customers' needs. At the same time, customers recognized that rigidities in the government system restrict the depots' ability to hire and retain skilled personnel, set manpower levels and operate efficiently. GOCOs appear to offer many of the advantages of both the private sector and the traditional depots. Not all MSCs have direct experience with GOCOs, but those that do, rate them highly and recommend increased use of GOCOs at depots.

Supply Functions

Customers project that supply workloads will increase and that there will be some changes in composition.

Workloads were projected to increase for two reasons. First, the number of items in inventory is expected to rise, and second, new systems being introduced tend to have a greater variety of parts, increasing the complexity of supply operations.

The composition of the workload could change in several ways. First, future supply workloads will increasingly require handling of palletized and containerized loads, especially for ammunition. Depots need the capability to handle these loads. Also, if current trends continue, there will be fewer end items in service and more modules and other types of generic components whose specific functions can be altered by depot-level modifications.

Information management associated with the supply mission needs to be improved.

Customers highlighted the need for compatible software systems between the National Inventory Control Point (NICP), DESCOM headquarters and the depots. They recommended integrating software systems into a single real-time information system with full asset visibility from the depot to the field. These improvements would offer several advantages, including 1) getting the order to the depot floor more quickly, 2) enabling the NICP and the field units to look into the system, and 3) enabling the NICP to keep track of material after it has left the wholesale system.

Steps need to be taken to speed up supply operations and reduce cost.

There is general consensus that the supply mission is performed well and that the depots are positioned to handle the workloads of the year 2000. Customers speak highly of the AOD concept and the planned automated distribution facilities.

However, customers suggested a number of ways to speed up the supply response and generally make the system more efficient. One is to routinely ship ("stovepipe") a predetermined quantity of items (such as tires) with stable and well-defined needs in advance of receiving orders for them. Another is to prevent the AODs from becoming clogged by putting all fast-moving items into the AODs and taking slow-moving items out. Slow-moving items such as excess and war reserves should be stored at other depots. Efficiency could also be improved by contracting with manufacturers to maintain inventories of certain items, especially items with limited shelf life.

The customers also recommend developing systems to speed up the return of parts into inventory. Another suggested improvement was to continue the trend towards automated systems in distribution, including making wider use of Logistics Applications of Automated Marking and Reading Symbols (LOGMARS) and next-generation coding technology. In addition, supply items and cheap durables should be combined into kits to reduce both wholesale and retail handling costs. Handling costs can also be reduced by making the unit of issue of many small items equivalent to the number of items in the package received from the supplier.

Ammunition Functions

The Army is facing a problem in the future by accumulating a large quantity of unserviceable conventional ammunition.

For a variety of reasons related to budget constraints, safety, environmental compliance, and manpower availability, the Army has chosen not to demilitarize conventional ammunition as soon as it becomes unserviceable. The result is that the percentage of unserviceable ammunition in current stocks is slowly increasing. Much of this ammunition is accumulating in DESCOM's ammunition storage facilities. AMCCOM projects that this practice may continue for another 20 to 50 years until there is no longer any safe storage space available in the depots. When that occurs, large-scale efforts to demilitarize this ammunition will have to commence.



At the current time, no planning is being devoted to this activity to determine, for example, the impact of environmental regulations on anticipated investments in facilities. DESCOM's plans to modernize its ammunition maintenance and demil facilities will have to be closely coordinated with AMCCOM because they provide all the Ammunition Peculiar Equipment (APE) used in the depot facilities.

Plans are being implemented to dispose of old chemical weapons.

The Army has large inventories of old chemical munitions. Most of this inventory is stored at DESCOM installations. DoD recently approved plans to construct chemical munitions demil facilities at these installations. These plans are subject to Congressional review and possible legal challenges, but eventually these facilities should be constructed and used to dispose of all of the old-style chemical munitions in the Army's inventory. The current generation of chemical munitions are the "binary" type, designed for safe handling, storage and disposal. Major investments for chemical demil facilities should not be required in the READY 2000 Program.

Potential New Missions

There is a need for coordinated, MSC-wide software support.

Most customers agreed that there would be a proliferation of software-driven systems that would require full support. Currently, software support is the responsibility of each MSC. The depot system could fill a niche by developing a software CTX to program, debug, maintain and reprogram software-driven systems in communications, electronics, weapons and ammunition. However, accomplishing this will require attracting and retaining highly skilled people whose services are in high demand in the private sector.

There will be an increasing need for field support in ammunition, maintenance and supply.

Customers uniformly praised current depot initiatives that bring both maintenance and training support directly to the field. The need for field support will increase as the number of levels of maintenance decreases. In many parts of the logistics system, the distinction between the wholesale and retail systems is fading away. At the same time, recent combat developments require a level of sustainability that is not consistent with current depot operations. Customers recommended providing some form of mobile depot support as far forward in the high-intensity battlefield as possible. Depots outside the continental United

States (OCONUS) may be well-suited to play a key role in enhanced field support activities.

Trends in Future Warfare Systems and Doctrine

Several significant trends in future warfare will have a direct impact on the missions and workload of the depot system. These trends were identified by interviewing TRADOC staff and by examining the logistics literature. The appendix to this document contains a list of interviewees. Trends were identified in the areas of weapons systems technology, warfighting doctrine, and doctrine for sustaining combat forces in the field.

Weapons Systems Technology

Army equipment in use in the year 2000 is likely to be improved versions of the newest equipment currently being fielded rather than entirely new developments

Budget pressures will slow the introduction of entirely new weapons systems and will produce a general trend to keep existing systems in the inventory longer, while improving these systems through a series of block modifications (large-scale product improvements) and software reprogramming. Armor, infantry, and aviation are all adopting this approach with their major systems. Improvements will likely come in the following areas: 1) increasing use of modular components; 2) replacement of hydraulic, pneumatic or mechanical systems with electronic systems to provide built-in testing and diagnostics and entirely new capabilities; and 3) development of general purpose hardware that can be upgraded or modified with changes to specialized software.

With the likely exception of new applications of micro-circuit and laser technology, technologies that are currently in the early R&D stages—ceramic engines, robotics, liquid propellants, and light-weight composite materials (outside of aviation)—are not expected to be adequately developed for large-scale battlefield use until after the year 2000.

Technologies being applied to upgrade weapons systems require enhanced depot capabilities.

Among the new technologies that will be applied to upgrade existing systems, electronics and laser technologies will require the most critical depot-level capabilities. In addition to their traditional role in communications, these technologies are coming into widespread use in fire and maneuver control systems and in target acquisition. Electronic systems will continue their trend toward miniaturization, and components will switch from through-hole to



surface mounting. Built-in test features will speed the repair process, and an increasing percentage of repairs will consist of replacing modules rather than individual components.

It is expected that specialized facilities will be required for both electronics and electro-optics repair as the systems become increasingly sensitive to contamination. There is already a shortage of these facilities in the depot system. Other sophisticated equipment, such as test equipment designed to check the integrity of seals that protect systems against electromagnetic pulses, may also be needed.

Army combat units in the year 2000 will still be using some older equipment currently in the field; this equipment will require continued support.

Because new equipment is expensive and defense budgets are tighter, selected older systems are likely to be in use in the year 2000. Depots will be required to maintain and supply parts for the newest systems, such as the M1 Abrams Block III tank, while still maintaining the capability to support older systems, such as the M60A3 tank. Many of the systems in use in 2000 will be improved versions of the current systems.

Warfighting Doctrine

Most developmental effort appears to be oriented toward the heavy division in a European, high-intensity battlefield.

Warfighting trends are being most strongly influenced by the Army's Deep Battle doctrine. This doctrine focuses on a high-intensity battlefield environment in Europe, and has resulted in development of highly mobile, hardened tanks and field artillery; antitank weapons; sophisticated missiles; and electronic systems designed to survive in a highly lethal environment. However, light divisions and specialized light-weight, air-transportable equipment are being developed for low-intensity battlefields outside Europe.

The Army has made extensive use of NDI technologies in both environments in an effort to field lighter equipment faster. In some cases, this has tied the Army to domestic and foreign contractor support for these items.

The maintenance concept evolving for high-intensity battlefields emphasizes part replacement in the field with repair at the depot level.

The availability of major weapons systems will be critical to success on the high-intensity battlefield. To enhance availability, the number of levels of maintenance is being reduced from four to two or three. New equipment is

being designed for easy identification and replacement of damaged components in the field. Use of modular components and, where field testing of systems is required, portable and built-in test equipment is increasing. In-theater depot-level maintenance is evolving to obtain fast turnaround of depot-repairable items. Both of these trends have the potential to increase depot-level workloads, though not necessarily in CONUS depots. In addition, if some maintenance traditionally performed in the field is pushed back into the depots, the composition of the workload may change away from overhaul and perhaps more toward troubleshooting and repair of modules.

More depot-level maintenance performed in-theater may reduce the role of the CONUS depots and increase the role of the OCONUS depots. An alternative concept is being evaluated that would couple the CONUS depots with a dedicated transportation system to provide rapid return of depot-repaired items to forces in the field. This concept would substantially increase the workload of CONUS depots in wartime. A decision on which sustainment concept to use is probably several years away.

Sustainment Doctrine

The need to sustain forces in contact with the enemy on high-intensity battlefields will require modifying current resupply practices.

Because of the high anticipated use rates of munitions in the high-intensity environment, ammunition resupply in particular is expected to be a major problem. The Army's doctrine emphasizes a supply system that anticipates unit requests and pushes ammunition forward using prepackaged loads that require minimum field rehandling.

The depots may be required to simultaneously preconfigure commonly used tank, small arms, and aircraft ammunition for both direct distribution (to light division units) and wholesale distribution (to theater supply points). Because fire missions tend to be customized, preconfigured combat loading for individual field artillery units may not be practical except for very common high-use ammunition such as 155mm high explosive or dual-purpose improved conventional munitions (DPICM) ammunition.

Some development efforts are focused on simplifying these resupply problems by reducing the numbers of calibers, types of artillery munitions and fuses, and the amount of special handling. However, the development of "smart" or "brilliant" munitions virtually guarantees that munitions supply will require development of a very fast and flexible demand-driven system for special items.



Improved identification and marking of an increasingly complex mix of specialized ammunition, and real-time tracking of high-value munitions will be important.

The ability to rapidly reequip forces that sustain heavy personnel and equipment losses in a high-intensity battlefield environment can have a major effect on the outcome of the battle. The depots should expect surges in demand for in-theater depot-level support as a result of reconstitution demand. Since much of this equipment is being fielded without extensive parts inventories or war stocks, it is not clear what the depots' role would be in reequipping divisions with sophisticated equipment. Unless this situation changes, the depots may be required to maintain existing stocks of less-sophisticated equipment and parts to reequip field forces, and be prepared to ship enough on short notice to reequip relatively large units, including whole divisions.

The Army may need to replace contractor maintenance of critical systems with depot maintenance to ensure sustainability on high-intensity battlefields.

To reduce fielding times and costs, many systems are being fielded with contractor-operated theater maintenance of line replaceable units (LRUs). This situation is demonstrated by air defense, which uses highly sophisticated, low-density, high-value missiles and fire control systems. Because these assets are under the command of the theater air commander and are critical to his mission, they are supported in an "intensive management" environment using extensive civilian contractor support. This system meets peacetime readiness needs, but in case of hostilities, the Army currently has no capability to augment or replace contractor maintenance. A potential depot role exists in developing field contact teams to replace contractor maintenance in time of war. It was not clear from the interviews how this contractor maintenance could be kept on the job during hostilities.

There is no consensus among PMs and TRADOC Systems Managers (TSMs) concerning whether depot-level maintenance should be performed by depots or by contractors, or whether it should be performed in the United States or in the theater. The maintenance solutions appear to be system-dependent and driven by fielding cost and schedule. Incorporating other objectives, such as sustainability, into the decision-making process might reduce dependence on in-theater contractor maintenance.

Interservicing and interoperability are both being increasingly stressed in logistics doctrine.

Both the executive and the TRADOC interviews indicated a strong trend toward interservicing and interoperability.

Interservicing could eventually lead to a combination of the logistics support systems from all three major services. Interoperability is being pursued to enhance the logistics support of allied forces. This trend could result in depots becoming major supply points for allied as well as U.S. forces. The use of metric-based equipment to support interoperability will probably increase.

The Concept-Based Requirements System is not being uniformly implemented.

The Concept-Based Requirements System is used by TRADOC and AMC to coordinate development, acquisition and sustainment of Army materiel. A key component of this system is the Mission Area Development Plan (MADP) used to develop research, development and acquisition strategies in each major mission area. Our interviews indicated that some TRADOC schools and centers have well-thought-out and current MADPs, while others do not. Logistical support often is not considered at an early stage.

It appears that the depot system's current planning role is minimal before the actual fielding of new systems. Since the logistical concept for new systems is developed without depot input, it is not surprising that depots find themselves reacting to plans made by others. This might change if DESCOM became more actively involved in the research, development and fielding of new systems.

Developments in Factory Technologies

A major goal of READY 2000 is to apply advanced factory technology to modernize the depot system. This section discusses the primary trends and developments in factory technologies. Information contained in this section was obtained from trade publications and technical journals, interviews of executives in private firms, interviews with information systems specialists in DA, and tours of commercial manufacturing and warehousing facilities. A list of those interviewed is provided in the appendix.

Information Technologies

The most important advances taking place in factory technology involve information processing.

Developments in computer technology are leading industry toward paperless production systems in which all the workers at the factory will have access to seemingly limitless amounts of information. Paperless manufacturing data systems are being implemented that allow technical data such as assembly drawings to be electronically distributed from the vendor to the customers and the



overhaul shops. Personal work stations will soon be available that have the processing capability of today's smaller mainframe computers. Storage devices are improving so that more information can be stored and accessed with smaller hardware volume. Fortunately, as more people are expected to use computers, the interface between man and machine will become more accommodating with features such as voice input/output and the ability to communicate in familiar language.

Several other trends in hardware systems that could impact depots also deserve mention. First, packet-switched communications technology will allow information to be shared globally and in real-time. Second, hardware and software systems will move toward standardization so that all of the computer systems can talk to one another. Third, miniaturized and fault-tolerant systems will continue to be developed, resulting in greater penetration of computer systems into new markets.

Artificial intelligence and expert systems have many potential applications in the depot system.

Artificial intelligence and expert systems are certain to become increasingly common and powerful by the year 2000. Use of expert systems is expected to increase at an annual rate of 50%. Many of the potential applications could be beneficial to the depot system. For example, IBM has an expert system for diagnosing computer equipment failures; the system cost about \$100,000 initially and now saves the company \$12 million yearly. By the end of next year, Ford service technicians will be able to link up to a central system for help in diagnosing particularly difficult engine problems. One recent study found that every expert system examined resulted in productivity improvements of at least an order of magnitude.

Factory Technologies

The most important developments in factory technology are taking place in the application of computers to information management and work flow organization.

Computer-integrated manufacturing (CIM) is a developing trend that uses computer networks to get real-time information to all potential users in a firm. For instance, in a CIM-equipped factory, a customer's order would cause the following information flows: materials and parts would be ordered, machine drawings would be electronically sent to the shop, numerical control programs would be sent to the appropriate machining centers, the billing department would be alerted, parts and materials inventories would be adjusted, the fabrication and assembly work would be scheduled, and accounting would be notified of production costs as they occur. The

advantage of CIM is that all of this information gets automatically transmitted in real time to and from a variety of individual systems.

Group technology and flexible manufacturing systems can be applied in the depots to improve work flow.

Group technology and flexible manufacturing systems (FMS) are being used in industry to optimize the production of high-variability/low-volume products such as the depots handle. Group technology involves grouping similar product components together to increase the effectiveness and use of production and distribution equipment. For instance, products with similar physical features would all be manufactured on shared equipment to increase productivity.

Flexible manufacturing systems are sets of automated work stations that are adaptable to families of work-in-process components. A typical FMS at a depot might include work stations such as automated disassembly, inspection, repair, and reassembly.

Significant productivity improvements can be obtained in the material-handling process.

In typical commercial manufacturing firms, 85% of product throughput time is spent in handling and storage, and 55% of the factory floor space is dedicated to material handling and storage. For instance, forthcoming machine vision systems, when combined with robotics, will allow automated warehousing systems to select parts and assemble kits autonomously. Real-time information systems will result in inventory control systems that are much quicker and more accurate than those typically in current use.

Mini-automated storage and retrieval systems can be integrated directly into overhaul and repair operations by surrounding them with work stations. This is a particularly appealing concept for overhaul of electronic equipment. The transportation of large end items (e.g., trucks) through the rebuild process by such methods as overhead crane can effectively be replaced by large automated guided vehicles serving as disassembly/assembly platforms. This approach results in greater routing flexibility and improved productivity.

Robotics technology is potentially applicable to many depot activities.

Robots with very sophisticated capabilities will be available by the year 2000. Major hardware improvements being made include the development of vision systems and end effectors that will enable robots to perform more



sophisticated tasks. Major improvements are also being made by connecting the robots to the large amounts of electronic information available in a modern factory. This will make the robots more flexible and easier to use. For example, the output from an expert system used to diagnose a fault on a circuit board can be passed to a robot that will make the necessary repairs. Robots for painting are continually improving, and non-chemical paint stripping methods such as high-pressure water and lasers are being developed.

Trends in the Work Force

To successfully modernize the depot system, DESCOM must be able to attract, retain and motivate a work force with the capabilities needed to carry out its future missions. This section summarizes the information we collected to assist DESCOM in planning the personnel aspects of READY 2000. We examined industry experience with staff-related issues that arise with advances in technology. We also developed projections on the availability of skilled workers in the labor force at six representative depots to determine if DESCOM is likely to experience problems in obtaining the workers needed to operate its modernized facilities.

Extensive training and education programs are required to bring labor force skills in line with the demands imposed by modern systems.

Modernization and automation will result in jobs requiring employees with generally higher abilities. For example, entry level personnel in automated plants will often need to have math and reading skills not required of workers in conventional plants.

In general, one third of the employees can easily move from manual to automated jobs with minimal training, one third can make the transition with more extensive training, while the final one third are considered non-trainable. Thus, it appears safe to conclude that personnel required to operate automated equipment can be found from the current pool of depot employees. However, DESCOM will need to screen the current pool of employees to find those able to perform the more technical jobs.

Modernizing factory systems requires changes in job classification and responsibilities.

Many depot employees in the 21st century will perform tasks and use equipment that are very different from that currently in use. Industry experience indicates that substantial lead times are needed to assess the impact of new systems on job skills. Realigning the work force to

accommodate modernization can take up to three years. This lead time is spent analyzing jobs to identify how manual jobs are changed when automation is added, and developing the new organizational policies and practices needed to operate the new plant and manage the work force. Operating the new plant may require changes such as increasing or decreasing the number of shifts, extending or reducing hours, or modifying the workers' and supervisors' roles. For example, in one plant, designers determined that the role of supervisor was no longer necessary because the workers were being trained to operate in teams and to monitor their own performance and output. Participative management systems or other management changes may also be needed to effectively operate the new systems.

Depots should be able to attract needed skills provided the wages they offer are competitive with high-tech employers in the private sector.

To evaluate the availability of workers needed in the modernized depot system, we projected the labor force out to the year 2000 at the Sierra, Sharpe and Sacramento depots in California, and the Letterkenny, New Cumberland and Tobyhanna depots in Pennsylvania. The projections, made with a PNL demographic model, show that although changes will take place within the labor force, workers with the requisite skills and experience for a modernized depot system will be available. To attract and retain these workers, wages must be sufficiently high to compete with employers in the private sector. High wages will attract workers not only from outside the local labor market but from other occupations within the local labor market as well. Wage premiums in critical jobs could be used to motivate many labor force participants to acquire the necessary training.

Political Influences

Political factors that will influence the READY 2000 Program are discussed in this section. Most of this information was collected from the literature. Much of our effort was focused on the issue of consolidation or closure of DESCOM installations to determine if this management option could be used in the READY 2000 Program.

It will be difficult for DESCOM to obtain Congressional approval to consolidate or close depots.

DoD has not closed a base since 1977. This reflects policy trends beginning in the mid-1960s when force modernization and costs associated with the Vietnam War caused



then-Secretary McNamara to attempt to close 95 military installations. As a result, Congress legislated restrictions on DoD base closures; this led to a series of statutory restrictions that severely limited the authority of the executive branch in closing bases. These limitations 1) require Congressional review periods, adherence to environmental stipulations, a closer examination of the costs of closure, and various impact studies; 2) authorize further investigations of particular installations; and 3) deny the use of construction funds for closure. Possibly the most effective of the Congressionally-imposed limitations is the requirement conveyed by the National Environmental Policy Act that the environmental impact of base closure must be assessed. This requirement can lead to court deliberations that may last for years. In 1969, the Nixon administration proposed an extensive base realignment package that would have affected 307 military installations. Several bases were closed, but most of the recommended closures were rescinded because of economic and political pressures.

Continuing escalations in federal budget deficits may have softened Congressional opposition to base closure. Secretary Carlucci is proceeding cautiously with plans to eliminate a significant number of the 871 bases viewed as unneeded by the Pentagon. The effectiveness of these efforts will not be known for some time.

Political forces will play a large role in shaping the READY 2000 Program.

DESCOM operates 13 major installations employing 42,000 people. Many of these installations are key employers in the region in which they are located. To illustrate the importance of the depots to the local economy, PNL estimated the regional economic impact from a typical depot with 5400 employees and an annual payroll of \$150 million. The results of our analysis indicate that this depot would support 8700 direct and indirect jobs and would account for 20% of the economic base of the county in which it is located.

When these economic factors are combined with the general political sensitivity of any major DoD initiative, it becomes clear that Congress will use its budgetary authority to strongly influence the direction of the READY 2000 Program. DESCOM will need to understand and respond to these political factors and treat them as the key external constraint in the planning process for the READY 2000 Program.

Environmental Factors

Current and future activities at the depots must comply with increasingly stringent environmental regulations. Significant financial and management resources will be required to assure that environmental compliance problems do not interfere with the operation of the depots. We evaluated the status of environmental regulatory compliance at the depots and forecasted trends in environmental regulations. These assessments are based on information obtained from regulatory agencies, from DESCOM headquarters and depot staff, and from a comprehensive review of pertinent regulations and technical literature.

DESCOM will have to expand its environmental program to gain compliance with current regulations.

One of the top priorities presently being pursued under the Resource Conservation and Recovery Act program is reduction of violations at federal facilities. This tendency toward more rigorous enforcement is illustrated by the Interagency Agreement between the Environmental Protection Agency (EPA) and the Twin City Army Ammunition Plant (TCAAP) signed in August 1987. This agreement commits the Army to strict schedules to develop and implement remedial measures at TCAAP and is expected to set precedents for inactive waste sites at other Army facilities. The agreement gives the EPA and state authorities technical and enforcement authority over TCAAP and states that the regulators will initiate studies and remedial actions. According to the agreement, the Army will be required to pay fines for noncompliance. These penalties can be imposed by either EPA or the state environmental protection agencies. The agreement also encourages community participation in the technical and managerial decisions involving cleanup of the site.

These regulatory trends suggest that DESCOM needs a comprehensive and adequately staffed and funded environmental program in the near future. The program should include sampling plans, analytical plans, community relations plans, remedial investigations/feasibility studies, and closure and post-closure plans. A successful program will involve community and regulating agencies in the decision processes. Command-level involvement will be increasingly important to the success of the environmental program. An inadequate environmental program will result in restrictions on depot activities and possible depot closures.



Inactive waste sites are a growing area of concern for the depots.

Of the 48 federal facilities listed on the National Priority List in 1987, eight belong to DESCOM. The budget, resources, and means of compliance for dealing with these problems are still being identified within DESCOM, DoD and DA. The Defense Environmental Restoration Account, which was established to provide funding for the cleanup of inactive waste sites, is not sufficient to address all of the inactive waste site problems.

U.S. Industrial Base Capabilities

We collected information on U.S. industrial base capabilities to determine if there were key capabilities that DESCOM might need to provide because they were not available from U.S. commercial sources. This information was collected primarily from the literature.

There is increasing concern that key industrial capabilities may not be available to meet mobilization and other key security needs.

Complex forces are at work changing the industrial base in the United States. The manufacturing base in the country is shrinking and key defense-related industries have been slow to modernize. Many U.S. industries have lost most or all of their market share to foreign competitors. As a result, many of the high-technology components in Army systems and the newest factory technologies are supplied by foreign vendors. DoD is becoming increasingly concerned about the implications of these trends for

meeting defense needs both in peacetime and in the event of mobilization. The Secretary of Defense has instituted a high-level examination of this issue. The objective of this examination is to develop a DoD industrial policy. This policy will address DoD's role in ensuring U.S. competitiveness in industrial technologies as well as guiding programs to ensure that U.S. industries can provide the capabilities needed to meet key defense needs.

The implications of this policy for DESCOM are not clear at this time. Possible impacts include the following:

- Some needed industrial capabilities will not be available from industry at a reasonable cost. DESCOM could be asked to provide some of these capabilities.
- There may be a need to stockpile foreign-made components to ensure adequate supplies for mobilization. This would impact the supply operations in DESCOM.
- Alternative maintenance sources may be needed for foreign-made materiel. DESCOM could be asked to furnish this capability at the depots.
- Alternative sources may be needed for spare parts for foreign-made systems or for systems that have limited industrial support in the U.S. The depots could be asked to develop the capability to make these parts.

DESCOM should monitor the development of the DoD industrial policy and factor the final policy into its modernization plans.



3.0 Mission Statement

Our recommended mission statement for the DESCOM of the year 2000 and beyond is presented in this section. This mission statement is based on the information we collected in the interviews with DoD/DA executives, DESCOM's current customers, and key staff in TRADOC. The recommended mission is based on several key themes that emerged from the interview process:

- A number of sustainment functions expected to be needed in the near future are either not currently being carried out within AMC or are too small to meet future needs.
- Several important sustainment functions are currently scattered throughout AMC headquarters and the MSCs.
- Coordination of sustainment functions within AMC, between AMC and TRADOC, and between AMC and the field needs to be improved.
- Rapid repair of sophisticated weapons systems in wartime will be needed to maintain the force superiority necessary to win a major conflict. To achieve the required mobility of the field units, these repairs must be carried out by rear echelon units.
- The current functions carried out by the depots and depot activities need to evolve to meet the changing needs of the Army.
- DESCOM headquarters is currently perceived by its customers as having marginal "value added."

The mission statement is not a consensus of the people we interviewed, but rather a synthesis of the opinions expressed. The mission we recommend is significantly different from DESCOM's current mission. Substantial organizational changes in AMC would be required to put these functions together into one MSC. These changes will require approval by AMC and DA and will probably take substantial time to implement. Although the transition to the new mission would probably require several intermediate steps, we feel these changes could be accomplished by the year 2000.

The organization that would carry out the mission described could be the successor to the current DESCOM or a new organization that absorbs DESCOM's current missions. We have made no judgment about which of these strategies should be pursued. We believe this is a mission that needs to be performed within AMC and that it makes sense to collect these mission elements together into one organization.

To distinguish it from the current DESCOM, the new organization is referred to in the mission statement as the Sustainment Command.

Mission Summary

The mission of the Sustainment Command is to sustain fielded materiel developed and acquired by AMC. The Sustainment Command will

- ensure that supportability and maintainability are designed into new weapons systems before they are fielded
- take the lead within AMC to develop life-cycle logistics plans for fielded materiel
- design and operate the logistics support systems needed to sustain fielded materiel
- provide the depot and contractor maintenance capabilities required to perform repairs not conducted by field units
- provide the repair capabilities needed to ensure adequate availability of major weapons systems in wartime
- provide the facilities and support systems needed to store and distribute spare parts and assigned commodities to field units and repair facilities
- maintain stored commodities to ensure their readiness
- manage the supply and maintenance depots and the ammunition storage and maintenance activities at the depots and depot activities.



Description of Mission Elements

Each of the major missions of the Sustainment Command is described in more detail below. The discussion is divided into two major pieces: the mission of the headquarters command and the mission of the depots and depot activities.

Headquarters Mission

- **Logistics Support**—The Sustainment Command will take the lead within AMC for developing and operating the logistics support systems needed to sustain the materiel in the field. These systems will implement the logistics doctrine developed by TRADOC. Examples of activities conducted to carry out this mission include developing and implementing CALS within AMC and developing and implementing the command and control system required to provide repair capabilities needed by field units in wartime.
- **Weapons System Design Support**—The Sustainment Command will have lead responsibility for ensuring that maintainability and supportability are designed into new weapons systems before they are fielded. In this role, they will work with the system developers from the commodity-oriented commands. The commodity-oriented commands will continue to lead the design, development and testing activities for new weapons systems. Critical decisions on design tradeoffs, such as functional performance versus maintainability, will be referred to higher levels of command if necessary.

The Sustainment Command will develop supportability and maintainability design criteria for new weapons systems. It will also review designs and evaluate prototype equipment to identify potential supportability and maintainability problems and recommend solutions. The Sustainment Command will also review maintenance, repair and other data from the field and rear echelon repair facilities to identify sustainability problems in fielded equipment and recommend modifications to correct the problems.

In cooperation with the commodity-oriented commands, the Sustainment Command will develop life-cycle logistics plans for new equipment. The objective of these plans is to ensure maximum weapons system availability throughout the life cycle at minimum cost to the Army. Life-cycle logistics plans will address issues such as the optimal split between field maintenance and depot-level maintenance, the best source for major maintenance and repair at various stages in the

life cycle of the equipment, required TDPs, source of repair parts, and the optimal inventories of repair parts to ensure readiness of Army materiel and to minimize purchase and inventory costs.

- **Materiel Maintenance**—The Sustainment Command will manage the depot-level maintenance program for all AMC materiel. Depot-level maintenance includes any repair or modification that cannot be performed in the field. The command will contract for maintenance with the equipment vendor or another source of maintenance support and will assign maintenance performed in the Army depots. The Sustainment Command will work with the commodity-oriented commands and the field units to schedule depot-level maintenance for major weapons systems and support equipment. It will allocate and schedule work to the contractors and the depots.

Peacetime maintenance activities will be configured to permit rapid ramp-up to wartime conditions. The maintenance mission during wartime will be to ensure a high availability of weapons systems in the field. This may include the development of mobile or fixed facilities for repair of major weapons system components in-theater. The maintenance mission will be conducted in accordance with the DoD industrial policy currently being developed by the Secretary of Defense.

- **Supply**—The Sustainment Command will manage and operate the Army's wholesale supply system. This includes receiving repair parts and other materiel from the supplier, storing required inventories of materiel, and distributing supplies to the field and maintenance facilities. Materiel in storage will be maintained as needed to ensure it meets service requirements when issued.

The required inventories of materiel will be determined through the logistics support function of the command. Some or all of the activities currently performed by the NICP would be transferred to the Sustainment Command. Inventories will include repair parts and other materiel to meet peacetime requirements, war reserve stocks and sufficient quantities of items with long lead times to meet mobilization requirements. Other items such as strategic raw materials, repairable but unneeded equipment, and GSA-controlled items will be stored as needed.

- **Field Support**—The command will implement and manage a field support network. This network will include groups of Sustainment Command staff at key



field locations to support field maintenance, to provide liaison for repair parts acquisition, to pretest modules and components removed from service and determine disposition for repair, and to provide other logistics support functions to field units.

The field support staff will serve as a liaison between field units and the Sustainment Command to ensure the command is meeting the needs of the field units; to ensure effective flow of information between the command, the depots and the field; and to identify supportability, reliability, maintainability or operational problems with materiel in the field early and begin the process of developing fixes. The field support staff will be the focal point for training field units to maintain new equipment. The field support network will provide the skeleton crews for the major communication interface that would be needed between the command and field units during surge/mobilization.

The command will also be responsible for fielding new weapons systems. This may include final assembly of major components provided by vendors, acceptance testing of the system, delivery of the system and the total support package to the field, set up and field test, and initial training of field operating and maintenance personnel. Services from the vendor will be used as needed to field the system. Fielding activities will be closely coordinated with the commodity-oriented command and the PM for the system.

- **Software Support**—Software is being used increasingly as an integral part of weapons systems. Maintenance and modification of these systems requires troubleshooting, testing, and modifying the on-board software. A need was identified to centralize the software maintenance functions in AMC. The Sustainment Command will provide this software maintenance support by developing and managing a network of reliable sources for software support. Potential sources of software support include the equipment vendor, independent contractors or an organic AMC software support center. The command will work closely with the commodity-oriented commands and the PMs to ensure that adequate documentation is obtained for new software systems to ensure that these systems can be efficiently and accurately maintained and modified throughout the lifetime of the weapons system.
- **Depot System Management**—The Sustainment Command will manage the Army's depot system. This

function will be similar to the one currently carried out by DESCOM. A major near-term focus of the command will be to modernize and restructure the depot system to prepare it to meet the needs of the 21st century Army.

Depot Missions

The basic missions of the depots will not change substantially under the recommended organization, although substantial changes at individual depots may be needed to carry out the maintenance and supply activities needed to support the Army of the year 2000 effectively and efficiently. Major missions of the depots include

- **Supply**—The AODs will carry out most of the supply mission of the Sustainment Command. They will operate the wholesale supply system and coordinate the supply activities at the other depots. The maintenance depots will continue to have a supply mission, primarily for storage of low-turnover items. Maintenance depots will stock parts and materials needed in the repair process, using a "just-in-time" inventory method.
- **Ammunition**—The depots have a major asset in their ammunition storage, maintenance and disposal facilities. These facilities will continue to receive and store needed inventories of conventional ammunition, special weapons, missiles and components, and new generations of "smart" and "brilliant" munitions expected to be developed in the future. Stored items will be maintained as required. Inventories will be shipped to field units or other sites at the direction of AMCCOM. Unneeded ordnance will be destroyed.
- **Maintenance and Repair**—The depots will provide depot-level maintenance for selected materiel. Materiel maintained at the depots will generally be specialized military equipment that will undergo significant modifications and upgrades before it is replaced with the next generation equipment. Cost-effective commercial sources for the maintenance will generally not be available, or the maintenance capability required will be one that the Army wants to retain in its own facilities to attain required readiness levels. The depots will also maintain materiel that includes significant quantities of hazardous substances that have specialized safety requirements or would pose unacceptable liability problems for commercial firms. The depot system would also provide flexibility, specialized quality assurance and accountability that are not available from commercial vendors.



- **Manufacturing**—The depots will also continue to provide limited manufacturing capabilities. The emphasis will be on flexible manufacturing processes that can be used to quickly and cost-effectively make parts not available from the commercial sector; small lots of materiel for modifications or other needs that would be uneconomical to obtain from the private sector; specialty or one-of-a-kind maintenance or repair equipment; or equipment needed on very short notice.
- **Security Assistance**—The depots will continue their mission to support the Security Assistance program. They will provide repaired or modified materiel according to the specifications provided by the U.S. Army Security Assistance Command. This service will meet the objectives of the security assistance program as well as levelize depot workloads and maintain capabilities to support Army maintenance needs.



4.0 Recommendations for Modernizing the Depot System Command

In this section we present detailed recommendations for modernizing DESCOM's management systems, equipment and facilities. To reiterate, our major recommendation is that DESCOM pursue the mission statement presented in Chapter 3.0. When pursued in conjunction with the mission statement, the recommendations presented in this section will result in an efficient and modern depot system in the year 2000.

We have made recommendations in three areas: technology, management systems, and work force. The technology recommendations apply primarily to modernizing the facilities and equipment in the depot system. The management recommendations focus on the actions needed to modernize the headquarters management systems. Recommendations for managing the impacts of modernization on the work force are presented at the end of the section. The information in this chapter is intended to provide a set of "guiding principles" DESCOM can use to focus its efforts and help make decisions during the analysis phase of the READY 2000 Program.

Most of the recommendations are for action DESCOM should initiate now to achieve the goals of the READY 2000 Program in the most efficient and cost-effective manner. When future developments will determine the impact on DESCOM's modernization, we recommend that DESCOM monitor developments and take action at the appropriate time.

The action DESCOM takes depends on the degree of control it has in a particular area. Many of our recommendations apply to areas under the direct control of DESCOM, and during the READY 2000 Program DESCOM will plan and implement appropriate activities in these areas. In other areas, the outcome depends on actions by others. In these cases, we recommend that DESCOM participate as appropriate to influence the decisions and actions of the responsible parties so the outcome helps DESCOM accomplish its goals and objectives.

Recommendations are presented in bold type. The rationale for the recommendation is presented next, followed by our assessment of the degree of control DESCOM has in implementing the recommendation.

Recommendations for Technological Modernization

Two types of technological forces are at work to shape the DESCOM of the year 2000:

1. The weapons systems that DESCOM supports are becoming more technologically sophisticated, as are their sustainment requirements.
2. The technologies available to DESCOM to carry out its missions are continuing to improve. Technologies currently becoming available for materials handling, manufacturing and repair, and information processing offer major opportunities for modernizing the supply and maintenance operations in the depot system.

We present recommendations that will help DESCOM focus its modernization investments in key areas needed to support changing weapons systems technologies. We recommend technology areas that should receive high-

priority attention in modernization planning. These technologies will not be good investments for all the depot activities to which they might be applied. The decision to use a new technology in a given area depends on the potential payback from the investment, the importance of that area to the command's missions, the projected workload in that area, the modernization priorities established, and the funding available. Substantial analysis will be required during Phase I of the READY 2000 Program to match available technologies to the depot system's modernization needs.

Establish a fully integrated, real-time, paperless, widely accessible technical and management information system.

An important action that DESCOM can take to modernize the depot system is to establish an integrated, real-time, paperless, and widely accessible information system. While establishing such a system is difficult and costly,



the tremendous benefits available from this type of system make the investment of time, energy and money well worthwhile.

The integrated information system should include both management and technical information, and should be designed to support the maintenance, supply, and ammunition missions of the depot system. Vendors, MSCs, field users, and the depots should all be linked together with a single, comprehensive network. Eventually, the system should be expanded to link other services together so that common items can be managed from a single point, with status and technical information widely available.

Besides the fact that virtually all of DESCOM's customers suggested improved information flows, an integrated information system would yield other benefits to DESCOM. The comprehensive system recommended would be a big step toward applying the principles of computer-integrated manufacturing to the depot system. A typical benefit would be that a depot needing to fabricate a certain repair part could instantly access the part drawing and numerical control machine program in electronic form from the vendor. An integrated information system would also remove incompatibility barriers such as those that currently exist between the Standard Depot System, the Master File for Maintenance, and the Maintenance Data Management System. The cost of TDPs would probably be less if vendors, MSCs, and depots were linked electronically. TRADOC specifically mentioned a need to track high-impact, low-density items through the material system more closely; an improved information system would meet this need.

A number of DoD initiatives such as LOG 2010 are under way that will dramatically improve logistics information systems and enhance interoperability. DESCOM initiatives should complement these DoD-wide efforts.

Control: Development of a fully integrated information system would require an AMC initiative. As a major user and beneficiary of the system, DESCOM should recommend the initiative to AMC headquarters and pursue this initiative vigorously.

Configure the depots to repair more modular components and, possibly, fewer end items. Reorganize the maintenance functions into CTXs that are specialized to repair classes of modules as well as to modify and repair end items.

The MSC and TRADOC interviews identified a strong trend toward use of modules in weapons systems to make

field-level maintenance quicker and more effective. The depots can expect to repair or overhaul more modules and fewer end items as a result of this trend. The modules can be electronic (e.g., avionics LRUs), mechanical (e.g., M1 turbine recuperator), or a combination of both. In response to this trend toward modularity, DESCOM should reorganize and specialize some of the depots as CTXs for particular classes of modules.

To obtain maximum benefit from this concept, the module-based CTXs should be responsible for modules that are shared with other services, as well as for Army-specific items. There are currently numerous examples of electronics modules that several services use (e.g., communications and infrared sensor components), and these can be more efficiently maintained in the larger lot sizes afforded by interservice, module-based CTXs. The electro-optics facility at the Sacramento Depot would be a good example of a module-based CTX if it also handled airborne infrared systems.

The Army is tending to keep weapons systems in the inventory for longer periods of time and to use periodic major modifications to improve the capabilities of the system. Depots can expect to perform fewer overhauls and more block modifications of end items. This means that CTXs for end items will also continue to be needed. The alignment of the maintenance functions at the depots must accommodate both of these trends.

Control: DESCOM

Monitor the development of new weapons systems technologies such as ceramics, composites, liquid propellants and robotics. Invest in facilities and equipment to support these technologies at the appropriate time.

Weapons systems using radically different technologies are not expected to be introduced in significant quantities before the end of the century. Helicopters will gradually use an increasing percentage of composite materials, but components such as ceramic tank engines are not expected in the next 15 years.

Trends in material changes are subject to fluctuating funding levels and other variable factors, so this topic should be continuously monitored as depot modernization proceeds. When these new technologies are introduced, they will have major implications for the depot system. Substantial changes in facilities, equipment and staff skills will be required to support systems with these technologies. Decisions on investments in new facilities



and equipment to support current technologies need to consider the implications of these future changes.

Control: DESCOM

Expand the capabilities of the depots in electronic component repair. Build more "clean room" facilities and expand the capabilities of existing special facilities.

Electronic items are being used more and more in military hardware. This trend will be reflected in the depot workload. The increasing use of electronics will be somewhat offset by greater use of NDIs, especially in communications electronics, but the electronics workload in the depots should continue to increase.

Three strategic implications for the depots arise from this trend. The depot system will need facilities and equipment to perform this work at a reasonable cost. It will need a greater percentage of workers with electronics skills. The depot system will also need to increase the number of "clean room" facilities to have the capability to maintain future electronic items. As electronics continue to be miniaturized, the need for cleanliness becomes greater.

Control: DESCOM

Make extensive use of artificial intelligence and expert systems.

Artificial intelligence and expert systems are currently being applied successfully in a number of industries. The most obvious application for expert systems in the depots is in diagnosing the condition of items to be repaired.

Expert systems could be applied to items as small as circuit boards or as large as tanks and helicopters. Another use for expert systems is for workloading and work flow management. In this application, which frequently does not have one "correct" solution, an expert system can consider hundreds of factors to arrive at the best compromise among competing demands. Other examples of applications for expert systems include facilities maintenance decisions and interactive training systems.

As information becomes more widely available throughout the depot system, artificial intelligence can be used to make human/computer and computer/computer interfaces easier to bridge. Artificial intelligence will eventually allow software packages to "interpret" at interfaces where language barriers currently exist. Systems to perform these functions will be commercially available.

Control: DESCOM

Use group technology and flexible manufacturing systems for selected depot maintenance functions.

Group technology and flexible manufacturing systems are two emerging industry tools that DESCOM could put to good use in developing module-based CTXs. These tools are especially useful in the typical depot environment which produces low-volume/high-variability products.

Group technology would be especially applicable to module repair. Group technology analysis can be used to identify which CTX should be developed for module repair and which modules should be grouped for assignment to a particular CTX.

Flexible manufacturing systems would form the technological backbone of the centers for module repair. These systems would be designed to efficiently perform the repair functions common to each group of modules.

Control: DESCOM

Use robotics technology for selected materials handling and other labor-intensive operations and for selected operations with hazardous materials in the depots.

Robotics technology is developing rapidly, and factory applications of the technology are accelerating. Circuit board repair is an obvious area for application of robot technology in the depots. At least three other functions at the depots should be considered high-priority applications for robots: automated storage and retrieval, ammunition operations, and painting.

With improved vision systems and manipulating capabilities, robots should be added to the automated storage and retrieval systems (AS/RS) used for both wholesale and retail supplies. In these applications, no human intervention should be required as robots are used for stocking, retrieving, kitting, and for loading automated guided vehicles. This use of robots will relieve humans of these tedious and potentially dangerous activities and will likely improve quality control in these operations.

Another robot application that would significantly impact depot operations is to use them as replacements for humans in dangerous ammunition operations. As in the AS/RS applications, improved vision and manipulation capabilities will enhance the robots' usefulness, with the major benefit being reduced safety risks for humans. Finally, robots could be used as painters, particularly camouflage painting, which is a very labor-intensive job.

Control: DESCOM



Obtain appropriate levels of TDPs for materiel supported and maintained in the depot system.

One of the factors that limits how much maintenance can be done on a particular item at the depots is whether or not the TDP is procured along with the item itself. While it is obviously not realistic to obtain complete TDPs for every item procured by the Army, life-cycle sustainment cost analysis should be used to determine the appropriate level of technical data that should be procured. Too much data has been procured for some items, while for others, there has not been enough. Implementing a test equipment methodology to make this decision would lead to more effective TDP procurement.

Control: DESCOM influence. TDP procurement decisions are currently the responsibility of the PM for the system. The proposed new mission for DESCOM would expand its responsibilities to include development of life-cycle logistics plans for new materiel. This would include specifying the appropriate level of TDPs for new items.

Prepare DESCOM's ammunition demilitarization operations for increased environmental restrictions and increased workload volume. Make decisions on indefinite storage of conventional ammunition based on life-cycle costs and risks.

Army officials within AMCCOM and elsewhere commented that the need for demilitarization activities was likely to increase in the future. However, the amount of these activities that would actually be performed will be a function of both the Army's financial priorities and environmental restrictions. Environmental restrictions are reducing the amount of material that can be disposed of in open-air pits. Specially designed APE will be required for disposal of this material. AMCCOM controls all APE. Close coordination between DESCOM and AMCCOM is needed to manage the large inventory of unserviceable ammunition that could accumulate in this situation.

APE sometimes does not keep pace with technology advances in ammunition, which occasionally results in a need to retool before demilitarization activities can be completed. More advanced technology (e.g., robotics) could result in lower operating costs and improved safety. DESCOM could be more proactive in working these technology improvements with AMCCOM.

Decisions to store unneeded ammunition rather than to demilitarize it are often based on short-term budgetary considerations. The long-term costs and safety issues may not be adequately considered. DESCOM should work

with AMCCOM to develop a mechanism for making store versus demol decisions based on cost and safety information. The system should be used to set budget priorities and request appropriate funds for demol activities.

Control: DESCOM, AMCCOM

Recommendations for Management Systems

Modernizing the management systems in DESCOM is as important to achieving the goals of READY 2000 as modernizing the facilities and equipment. The mission statement presented in Chapter 3.0 describes an organization with a leadership role in carrying out the sustainment mission of the Army.

The organization required to successfully carry out this mission must interact effectively with many other parts of the Army and must conduct its internal operations efficiently. The technological changes required to modernize the depot system will also require new management practices and modern management systems. Design and development of the required management systems will require substantial effort during the planning and implementation phases of READY 2000.

Develop a logical definition of the management structure and process for the DESCOM headquarters, including links above and outside DESCOM, as well as the interface with the depots.

Significant confusion on the procedures, responsibilities, and communication links of the DESCOM management function exists, leading to decreased effectiveness of the organization. The fundamental requirement is to resolve the future mission of the depot system and organization and to then develop a structured, logical model of the management structure to guide the development of the new organization and management systems.

Once established, the model will provide a reference for defining requirements for information systems; planning needs and responsibilities; planning communication requirements; and many other functions that will be critical to the modernization effort. It also will provide a means for defining how other management recommendations in this section can be integrated into the DESCOM system. Tools and expertise for developing this model are readily available from sources both inside and outside the Army. Because the schedule for review and approval of a new mission for the depot system is uncertain, DESCOM should initiate development of a logical management



model of current operations. Once mission resolution is completed, the model can be adapted to fit the mission, resulting in a reference for management planning of the modernized organization.

Control: DESCOM can initiate the activity and develop the expertise and tools as necessary. DESCOM can influence the mission resolution and ensure that a structured management model is developed to meet the new mission.

Focus headquarters management of the depots on planning, coordination and oversight functions. Delegate responsibility for day-to-day operations to the depot staff.

Our interviews indicated that DESCOM headquarters is more involved in the day-to-day operations of the depots than it needs to be to effectively carry out its depot management and oversight functions. Headquarters should focus on planning for the system as a whole, setting performance goals, monitoring depot performance against those goals, ensuring communication among the depots, and dealing with generic depot problems. Depots that have realistic performance goals and senior depot managers who are held accountable for achieving those goals will have a great deal of autonomy in their day-to-day activities. This will free headquarters staff to perform some of the new missions outlined for the command in the recommended mission statement presented in Chapter 3.0.

Headquarters activities to manage the depot system would include

- developing management performance indicators for the depot system to enhance overall effectiveness. Measures in the areas of workload, capacity, product delivery, productivity, quality, and contribution to Army readiness are essential to an effective, integrated management system. Measures should be selected, developed, and integrated into the management and information systems for ready access by headquarters and the depots.
- developing long-term plans for the depot system and allocating investment resources to implement these plans; monitoring the development of new weapons systems; and continuing to modernize the depots so they are ready to support these systems when required
- allocating workload to the appropriate place in the system and setting priorities for the workload
- developing performance goals for the individual depots and mechanisms for measuring performance

against these goals; and dealing with performance problems at the depots through senior depot management

- maintaining relationships with the customers and ensuring that their needs are being met
- developing workable systems that can be used by all of the depots to ensure compliance with environmental and other regulations; planning the regulatory compliance programs; and allocating resources to carry out these plans
- allocating operating funds to the depots so they can achieve their performance goals
- developing computerized information systems, training programs, productivity improvement programs and other tools that will benefit all of the depots
- developing effective systems for communicating lessons learned and other information among the depots
- monitoring developments in repair technology, materials-handling technology, and other technologies applicable to the depots; and developing plans for introducing new technology where it is cost-effective.

Control: DESCOM

Adopt the most effective management practices of high-productivity, modernized commercial firms.

The scope of the management changes taking place in successful U.S. companies rivals the scope of the technological changes. Many of these changes are necessary to successfully manage the new technical systems being used. Others represent improved ways of dealing with traditional management problems. We reviewed management practices of commercial firms that use modern factory technologies in their operating facilities. Effective management practices that would be applicable to DESCOM include the following:

- employing a flatter organizational structure with fewer vertical layers of management
- decreasing the number of job classifications of depot workers while increasing the range of skills for each worker; and developing teams of workers responsible for major pieces of work in the repair cycle
- adopting a participative management style characterized by less centralized decision making and more authority delegated to plant-level work groups; making a broad range of information readily available to workers at all levels in the organization; and clearly communicating organizational values and goals to all workers



- making individuals more responsible for the quality of their own work
- adopting statistical process control or "total quality management" as a fundamental management philosophy.

Control: DESCOM can initiate this recommendation on its own. Some of these management practices may require changes to or exemptions from Army policy or federal personnel regulations and policies. A number of approvals would be required to implement this system.

Establish effective lines of communications with other organizations, between the depots and headquarters, and among the depots to ensure that required information is exchanged in a timely fashion.

DESCOM has a very complex customer base and its components are geographically scattered. Improved communications and planning mechanisms are essential to the success of the organization. To some extent, these needs can be met by modern methods of automated information processing. However, the basic requirement is for effective, proactive management practices. These practices are largely intangible and involve subjective concepts such as leadership. However, improvements are possible. The communications initiatives described below can contribute substantially to DESCOM'S overall effectiveness.

More deliberate, formalized approaches to information exchange, as well as joint planning among the depots and between DESCOM and the commodity-oriented commands should be introduced. Any exchanges regarding interservicing objectives should include representatives from the logistics commands of the Navy and the Air Force.

The goals of these communications should be 1) to forecast and efficiently distribute workloads; 2) to anticipate and allow preparation for technological and other changes that will affect the depots; 3) to share current information on technical, legal, and regulatory issues and experiences; and 4) to monitor customer satisfaction so that any problems can be identified and corrected quickly. The net result should be to give DESCOM more active and effective latitude in shaping its future. Appropriate joint technical committee(s) with command guidance and participation would be helpful in this process.

The leadership of DESCOM should make all reasonable efforts to enhance relations with the local, state, and national political factions that influence depot activities. This is largely a matter for individual initiative on the part

of management and command. At a minimum, the advantages to be gained from regular, personal interactions with powerful legislators and other influential, politically oriented groups and individuals should be made clear to DESCOM leadership. To some extent, these interactions could be construed as a command responsibility. Information and influence acquired through these interactions can be useful in anticipating, evaluating the feasibility of, and implementing a variety of depot realignments, including consolidations and shifting missions and workloads. A mechanism such as an Army, AMC or DESCOM Congressional caucus may be useful in facilitating these communications.

Control: DESCOM can initiate the establishment of effective communications channels on its own. However, the communications will only be effective if DESCOM has cooperation from the other organizations with which it needs to interact.

Develop an independent mobilization planning basis and use it to plan DESCOM's future activities.

A clear consensus from our executive interviews is that DA and DoD have no consistent mobilization policy to guide mobilization planning. A bottom-up mobilization planning process is currently being used. Mobilization planning has become primarily an administrative exercise. Installation plans are not based on a consistent set of planning assumptions, and little action is taken in response to the plans. Because of the lack of a coherent mobilization policy, major investments in facilities and equipment cannot be justified based on mobilization needs.

DESCOM is clearly caught in the middle in this situation. Without clear planning guidance from higher levels of command, it is difficult to develop and implement an effective mobilization strategy for the command. To deal with these uncertainties most effectively, we recommend that DESCOM review the available information and develop its own mobilization planning guidance. This would enable the command to conduct its own mobilization planning on a consistent basis and to communicate this basis to AMC. Peacetime activities could then be conducted in a way that enhances readiness for mobilization.

Our interviews indicate that reasonable information is available to help DESCOM with mobilization planning. Information we collected indicates that two types of scenarios would form a reasonable planning basis: 1) a Grenada-type rapid-response, limited action of short duration and 2) a full-scale conflict in Europe lasting up to



several months. These mobilization scenarios have major implications for decisions on modernizing and sizing depot facilities and equipment. Current fiscal constraints make it unlikely that DESCOM can meet all of the needs these scenarios imply. Using the scenarios in mobilization planning allows DESCOM to clearly understand its readiness requirements, to communicate these requirements to AMC, to make decisions about how to prioritize these requirements and to plan its peacetime activities to maximize readiness.

Control: DESCOM can implement this recommendation at its own initiative. Implicit in the recommendation is obtaining approval from higher levels of command to pursue this course of action.

Define the core functions of the depots and configure and manage the depot system to carry out these core functions efficiently.

The depots currently carry out a broad range of activities. Some of these activities are peripheral and do not contribute in a significant way to the key missions of DESCOM. Resources spent in support of these peripheral activities are not available to enhance the capabilities that are most needed by DESCOM's customers. Development of an efficient and modern depot system requires that the core functions of the depot system be defined and the resources of the organization be invested in these core areas. This will enable DESCOM to do the best possible job of meeting the needs of its customers. Satisfied customers translate to reduced workload problems.

The core functions of the depots will have the following characteristics:

- support major weapons systems in the Army's inventory
- reflect future requirements of customers. This would include emphasis on module repair, block modifications and increased use of electronics discussed previously under technology modernization recommendations.
- capitalize on the strengths of the depots. These strengths include flexibility, ability to change priorities quickly, no contractual constraints, commitment to the forces in the field, and direct accountability for the product.
- emphasize areas in which readiness is significantly enhanced by having capabilities organic to the Army
- emphasize areas in which there are limited or no viable commercial sources for the service

- be consistent with the move toward interservice consolidation of maintenance functions.

Using the core function concept, the depot system can be configured around CTXs. The depot system can then be managed as a single, combined operation. Workload can be structured, investments allocated and capabilities developed to carry out the missions of the system most effectively. The AODs are a good example of this concept.

Control: DESCOM

Focus investments in the depot system on areas most important to carrying out the core functions of the command. Develop the mechanisms to effectively manage major realignments in depot missions or workloads.

The depot system currently has excess capacity. One of the difficulties with excess capacity is that it drains management, operations, and maintenance resources to preserve facilities and activities that are not essential to the mission. This problem can be partly overcome by focusing investments on key activities and spending minimal resources on peripheral functions and facilities.

Efficiently configuring the system to meet peacetime missions and to ensure readiness for mobilization may require substantial realignment of functions and workload within the system. Major realignments of military facilities are often prevented by political forces external to DoD. In some cases, realignments such as consolidation and/or closure of some facilities may be a clearly preferred approach. The feasibility of such actions will always be questionable at best, but can be enhanced by proper initial planning and analysis.

Realistic, defensible estimates of costs, savings, and other impacts associated with realignments should be made before making specific recommendations. To the extent possible, this process should be apolitical and should reflect a consensus of opponents and proponents on the implications of any proposed actions.

Realignments that involve negative impacts to local economies may be feasible if these impacts can be offset by new programs or activities. If at all possible, replacement activities should be identified at the outset of the realignment process and should be phased in as realignment progresses. Sensitive, thorough planning, combined with constructive interaction between the command function and influential political factions, might result in badly needed realignments that ordinarily would have no chance of succeeding.



Control: DESCOM can unilaterally establish the communication channels that are vital to this process. Decisions concerning major depot realignments or replacement activities will require the involvement of higher levels of command up through the Secretary of Defense.

Investigate privatization as a mechanism for improving the efficiency of selected operations, stretching available investment resources, and managing mandated workloads/manpower levels at the depots.

Privatization is receiving increasing attention as a possible tool for reducing the cost of federal services and controlling growth in the federal budget. This concept may also be applicable to some of DESCOM's operations that could potentially be carried out at less cost in a GOCO arrangement.

Converting some of the depot functions to GOCOs or financing some of the modernization program with outside funds could enable DESCOM to accelerate the modernization program in spite of tight federal budgets. For example, a GOCO operation can be set up so that the contractor finances equipment upgrades. This would spread the cost of these investments over several budget years so DESCOM could move its modernization program along more quickly.

DESCOM may also be able to use GOCOs as an effective management tool when Congressional mandates require that certain workload or work force levels be maintained at some depots. If the functions being carried out at these locations are not core functions, the activity may be converted to a GOCO to reduce the amount of management attention expended on a noncritical function.

The decision to privatize a particular function is a complex one. It was not possible within the scope of the strategic assessment to identify likely targets for privatization. The approach may have substantial benefits in selected situations, however. Privatization options should be identified and evaluated in detail during the analysis phase of READY 2000.

Control: DESCOM can identify and evaluate privatization options. DESCOM also has the authority to set up GOCO operations. Other privatization options may require enabling legislation; this legislation is being investigated by a number of federal agencies, including DoD.

Develop the capability to determine the actual life-cycle costs of DESCOM activities. Base management decisions on these costs.

The Army Industrial Fund (AIF) and other cost accounting systems currently being used by DESCOM are best suited for allocating costs to the appropriate budget category. However, they do not allow DESCOM managers to accurately assess the cost of the various parts of their operation. DESCOM needs information on the actual life-cycle costs of its functions in order to price services provided to customers, to identify opportunities for reducing costs, to make good investment decisions, and to support many other management functions.

DESCOM should develop a good system for tracking the costs of its operations and should make this information widely available to its staff. The system will improve decision making in the organization, enhance awareness of costs at every level, and eventually lead to a more cost-effective operation. Commercial firms that have put these kinds of systems in place have found that, in many cases, their costs bore little relationship to prices they were charging their customers. The availability of good cost information allowed them to reconfigure their product lines and prices and, in some cases, to dramatically improve profitability.

A related problem for DESCOM is that customers either do not always pay for the services they receive or they pay for them in a very indirect way. For example, item managers do not directly pay the storage costs for items in the depots. This means that they may make purchase and storage decisions based on an incomplete picture of the cost to the Army of their decision. If DESCOM had a good system for estimating the life-cycle costs of its activities, it could pass this information along to its customers so they could make better decisions about how to use depot services. Eventually this information might be used to make changes in the AIF system so customers would get a true picture of the cost of the services they were using.

Control: DESCOM can implement much of this recommendation on its own. However, this approach would be most effective if it were implemented throughout AMC.

Develop a comprehensive environmental management program for the depot system that permits DESCOM to positively manage its activities rather than react to external influences.

Federal and state environmental protection agencies are exercising increasing control over the operations of



DESCOM facilities. Environmental compliance is entering a new era in which noncompliance will be permitted only for the most pressing national needs. DESCOM's current environmental management program is similar to the program in other parts of DoD: it can best be characterized as "surviving." Available resources permit the organization only to react to the current problems. Major impacts on operations are likely if this situation continues.

To begin to control its own destiny in this area, DESCOM needs a long-range, properly funded environmental program. Commercial firms that have taken this approach have been successful in making environmental compliance an integral part of their business planning and operations.

The environmental problems confronting the depots must be better characterized and the resources needed to deal with them better defined if an effective long-range plan for environmental compliance is to be developed. Current funding for this purpose is not adequate and is not allocated on a functional priority basis. A larger, more highly qualified environmental staff will be needed to develop the long-range plans and to implement effective environmental programs. A well-defined, consistently implemented approach for communicating regulatory information and experiences among the depots and for constructively interacting with regulatory bodies should also be developed.

Control: DESCOM can do much to improve the situation; however, significant increases in funding or changes in environmental program scope or thrust will require action through the DoD level.

Recommendations for Managing Changes in the Work Force

The major changes expected within the command during the READY 2000 Program will have major impacts on the work force. Changes in the work force will be managed primarily through staffing and training practices. Recommendations for preparing the work force to carry out the work of the depot system of the year 2000 are presented below.

Plan and budget for extensive training programs during and after the modernization program.

Private sector firms have found it essential to install a significant training program to help workers become fully productive in a newly modernized facility. Workers, supervisors and managers will need training to operate the

modernized facilities and equipment put into place in the READY 2000 Program.

Employees at all levels in the organization will need to learn additional skills so they can take full advantage of the new information sources available to them. Increased training will also be necessary to support implementation of other recommendations contained in this strategic assessment.

Participative management, statistical process control (total quality management), self-QC and use of multi-skilled workers have all been recommended as effective management tools for the READY 2000 Program. All of these approaches require training of workers and managers for implementation.

Training programs should begin early in the modernization efforts, as soon as job analyses can be completed for the tasks that will be affected by the hardware and procedural changes. Some firms have found it beneficial to work with local colleges and vocational schools to develop the training curricula. This strategy may also be applicable to some of the depots.

Private sector firms have found that it is necessary and cost-effective to make training a continuous process after the modernization program has been completed. Continuing training programs can be developed from the curricula used for the initial transition efforts. Training programs should be periodically upgraded to meet the continuing training needs of the organization.

Control: DESCOM

Focus the reward and incentive system to better support the management objectives of the organization.

Many of the employees DESCOM will need to manage and operate the modernized depot system will be in high demand in other industries. An effective reward structure and incentive system will be an important part of a program to attract, motivate and retain high-quality employees. This program should include a pay scale and a career development program that can attract and retain workers with key technical capabilities, including computer, electronic and environmental personnel. A productivity-based reward structure can also be a valuable tool to help motivate and retain the staff required in the year 2000. Mechanisms to increase contact with the "soldier in the field" should also be explored to increase the sense of belonging to an organization with a well-defined and important mission.



Control: Some parts of this recommendation may require changes in the federal personnel system. DESCOM can influence these changes and may be able to test them through its participation in the model installation program.

Staff the "modernized" depot system by retraining and reassigning current employees to the maximum extent possible.

Modernizing the facilities, equipment and management systems in DESCOM and configuring the depot system for cost-effective operation and maximum readiness will have a major impact on the work force. Overall employment levels may fall as more of the operations are automated. The skill levels required in the work force will increase and the content of individual jobs will change dramatically in many cases. DESCOM must carefully manage these changes to minimize the chances of labor problems during this transition, to keep morale high, and to assure maximum productivity from the work force. Drawing from the experience of industries who have successfully made this transition, we recommend several specific strategies for achieving these objectives:

- The key to managing this type of transition is long-range planning. With sufficient lead time, a program can be put in place that allows the transitions to be made gradually. Training, hiring and other personnel programs can be used to produce an orderly transition to the work force composed of employees with the skills needed to operate the modernized facilities and equipment.
- It is essential to work closely with the workers during the transition period. If the workers are involved in the process and kept informed about the reasons for and timing of the changes, chances of misunderstandings and labor problems are substantially reduced. The participative management systems discussed previously will make this process easier.
- The transition should be accomplished as much as possible by retraining and realigning the current work force. If the workers know that their jobs are secure, they are much more likely to support the modernization efforts, even if attrition or other means are used to reduce the overall work force. Layoffs of existing workers to hire workers with required skills should be a course of last resort.

Control: DESCOM



5.0 Steps to Implement Key Recommendations

This strategic assessment presents a new mission statement and 22 detailed recommendations that merit consideration by DESCOM in the development of the READY 2000 Program. The dominant message from the strategic assessment is a clear need for significant change within and above DESCOM. Substantial technology upgrades will be needed to modernize the depot system, but equally important changes will be required in organizational structure, personnel, public policy, strategic planning, and management. We also believe that the success of modernization efforts such as READY 2000 requires significant change in how the Army plans and manages its logistics activities. The eventual success of READY 2000 depends upon attention and support from upper management throughout DA and the Office of the Secretary of Defense (OSD).

This chapter presents a description of the key "next steps" we feel DESCOM/AMC/DA management should take to initiate the next phase of READY 2000. These steps are a subset of the recommendations presented in Chapter 4.0 and need to be addressed first to ensure the future success of the program. The key recommendations fall into four general areas: 1) mission, 2) technology modernization, 3) management structure modernization, and 4) funding. We recommend that DESCOM headquarters undertake the following activities to prepare a strong foundation for the READY 2000 Program.

Mission Resolution

Our assessment identified trends and issues within and outside DESCOM that we feel merit a fundamental realignment of the mission and structure of the command. The dominant factors identified include 1) gaps in the ability of the Army to sustain current forces, 2) organizational barriers to effective management of DESCOM as currently configured, and 3) long-term trends that require a redefinition of how the Army needs to conduct the wholesale logistics business.

A proposed mission statement for an organization that would better addresses the Army sustainment requirements of the next two decades is presented in Chapter 3.0. The proposed mission statement would require major changes in the structure of AMC. These changes could be implemented in stages and will undoubtedly be modified and refined as AMC and DA management address the changing sustainment needs of the Army. Resolution of a mission statement for DESCOM is an essential prerequisite to developing detailed plans for modernizing the depot system. Definition of the mobilization mission of the command is also needed to establish the basis for developing cost-effective modernization plans. Key steps required to resolve these fundamental issues are outlined below.

Seek DA and AMC reaction to the mission statement presented in the strategic assessment.

The mission statement presented in Chapter 3.0 of this report is a major departure from DESCOM's current

mission. We intended that this mission statement be a "strawman" that DESCOM could use as a starting point in considering new mission options. As part of the process to develop a command position on a new mission statement, the proposal presented in this report should be discussed with senior AMC and DA management. This discussion can be used to verify the accuracy of the sustainment gaps and logistics trends on which the mission statement is based; to get senior management input for consideration in developing the DESCOM position on a new mission statement; and to get current information on AMC/DA plans for addressing the emerging sustainment needs. This information will be of value to the DESCOM management team in developing its official proposal.

Develop a DESCOM position on a new mission for the command and submit it formally to HQAMC.

Senior DESCOM management needs to evaluate the proposed mission statement presented in Chapter 3.0 of this report, develop a command position on a new mission statement, and officially present it to AMC/DA management. Once the official proposal has been made, substantial interactions will be needed with AMC management to identify issues in the proposal and resolve them. DESCOM's efforts will need to be coordinated with other efforts in AMC to prepare for the changing needs of the Army. Initiation of all the changes needed in AMC will likely take some time. DESCOM may need to establish some intermediate changes in its mission statement that lead to the full set of required changes over a period of several years.



Establish a clear mobilization policy.

The mission statement will define the functions that DESCOM will carry out. To a large extent, mobilization requirements will determine the size and capabilities of the physical plant and work force needed to carry out these functions. The managers of the wholesale logistics system need clear definition of depot expectations in times of both peace and conflict. This fundamental issue drives all subsequent modernization strategy. Given that no usable mobilization policy is in place, DESCOM must initiate the development of a mobilization target that will allow it to design its strategies for modernization and operation. This must be approved by AMC/DA as soon as possible to allow cost-effective modernization.

**Targeting Technology Modernization
Priorities for Near-Term Action**

Rapid change in technology, weaponry, and battle philosophy requires that the Army logistics activity modernize the maintenance, supply and management activities for its most critical functions. Given that severe sustainment gaps exist and budgets will remain tight, DESCOM should focus modernization efforts on the most critical functions. Simply spreading the investment across the current activities will lead to 1) ineffective expenditures and 2) failure to fill critical sustainment gaps. The following activities should be initiated immediately to establish this initiative.

Define core depot functions.

"Core functions" are those activities that need to be retained as organic elements of the wholesale logistics system to ensure that the system can meet the peacetime and mobilization requirements of the soldier in the field. A near-term effort to identify these core functions is needed. This will allow management and resources to be focused on the critical set of activities that merit aggressive modernization. The balance of activities would 1) have lower priority for modernization, 2) be contracted to the private sector, or 3) be conducted through GOCO organizations.

A methodology for identifying the core functions must be developed and applied. Criteria for selecting the core functions should be approved by the Deputy Chief of Staff, Logistics (DCSLOG) to assure consistency with the DA's logistics vision. The core functions must also be consistent with the OSD/DA strategic vision for military logistics and industrial base revitalization.

Configure the depot system to efficiently carry out the core functions.

The core functions will identify the key activities to be carried out in the depot system. An efficient configuration of the system can then be developed. This configuration will include defining appropriate CTXs to support the supply and maintenance requirements of the Army. Decisions about the configuration also need to consider peacetime and wartime workload requirements, the reliability of the system, vulnerability issues, and applicable external constraints such as political factors and environmental compliance problems. Configuration planning should be closely coordinated with the OSD initiative to close unneeded DoD installations.

Initiate detailed planning for technology improvements.

After the core function and configuration issues have been addressed, efforts can focus on selecting the most cost-effective technologies and management systems for conducting the core functions. The technology trends with the most impact on the future depots will be in 1) information processing 2) electronics, 3) systems based on modular components, and 4) robotics.

Information processing technologies offer opportunities to make major improvements in depot productivity and the level of service provided to the customer in the field. These improvements range from computer-integrated manufacturing to total asset visibility in the field. System dependence upon electronics will accelerate rapidly, requiring new diagnostics, investments in clean rooms, different personnel training/management strategies, and new repair technologies. The shift to modular components will have a dramatic impact upon logistics doctrine in general. This shift will require greater flexibility and new maintenance/repair philosophies and technologies in the depots. Finally, robotics will have significant payoffs in repair activity, automated storage and retrieval systems, and handling of hazardous materials (such as ammunition).

Significant introduction of additional advanced technologies such as ceramic engines and composites will be delayed until after 2000, as most weapons systems changes will entail modifications to systems currently being fielded. DESCOM must, however, strengthen its ability to monitor developments of these technologies and ensure that current modernization allows adaptability beyond 2000 to incorporate these technologies.

The dominant requirements for successful supply and maintenance functions will be the need for flexibility (to meet the modular systems requirements) and integration



with an information-rich environment. The priority technologies for modernizing these functions will be

- group technology, flexible manufacturing systems principles, and computer-integrated manufacturing principles in designing facilities and repair/maintenance strategies
- artificial intelligence with primary value coming from the development of system diagnostic tools and depot management decision support.

Management System Modifications

Optimal modernization of the management system should follow mission development. However, recognizing the potential time needed to resolve the mission issue mentioned above, we recommend that DESCOM initiate several activities that merit immediate attention and can be integrated with the mission resolution when it occurs.

Develop a structured model of the current management system and use it to develop near-term management system improvements.

The strategic assessment identified a need to enhance the "value-added" of the DESCOM headquarters functions. Major changes in the management system can only be made after some of the major mission issues are resolved. A structured model of the current management functions for DESCOM headquarters should be used as the basis for identifying near-term improvements that can be made. The model can be used to identify actual management processes and communication links within and outside the depot system. This model should be used to support resolution of current problems and prepare management staff to identify improvement targets once the mission issues are resolved.

Improve external communications.

The strategic assessment provides a current evaluation of developments in the Army and DoD that are critical to DESCOM's future, but these areas change rapidly. DESCOM needs to establish the communications links that will keep updated information flowing into the READY 2000 planning process and keep key senior officials informed about the progress of the program. High-priority communication links include 1) PMs of major systems, 2) logistics planners in TRADOC, 3) customers (MSCs), 4) OSD staff responsible for programs to strengthen the industrial base, 5) DA strategic planners, and 6) DoD technology developers.

Initiate plans for improved logistics information systems.

Current logistics information systems are fragmented and insufficient to support the logistics requirements of the year 2000. While definition of an integrated information system must be driven by 1) mission and 2) management structure, DESCOM management should begin immediately to develop a long-range plan for a unified system that is driven by the mission/management structure and is linked to DoD logistics trends in management and information philosophy. We believe that CALS and other DoD initiatives are leading to a logistics system that will be integrated across the services. This provides the target DESCOM and AMC can use to focus planning for an integrated supply and maintenance information system that links to DoD and the other services. This is a 15-year vision. DESCOM and AMC efforts must be closely coordinated with DA and OSD.

Funding for Modernization

The funding requirements of READY 2000 were not addressed in the strategic assessment, but it is clear that significant near-term attention will need to be devoted to ensuring adequate funding for the program. READY 2000 is an ambitious modernization effort being initiated at a time when there are severe funding constraints in the federal government in general and DoD in particular. DESCOM will need to work hard to achieve its objectives in this environment. It will need to establish good working relationships with key decision makers within DoD and the Congress; develop sound investment strategies for the program; and be prepared to defend the budget requests by clearly and concisely presenting the benefits of the program. This will be made more difficult by the potential size of the program and the fact that good budget estimates will not be available until the detailed planning efforts are completed, even though initial budget requests must be submitted very soon. The importance of effectively working the budget process cannot be overemphasized.

Summary

We believe there is significant opportunity and need to improve the depot system. The critical first steps outlined above and summarized in Figure 2 will establish a firm foundation upon which to drive change and significantly enhance sustainment of Army forces around the world. The additional recommendations in Chapter 4.0 merit attention once the basic mission, organization, and management strategies are enacted.

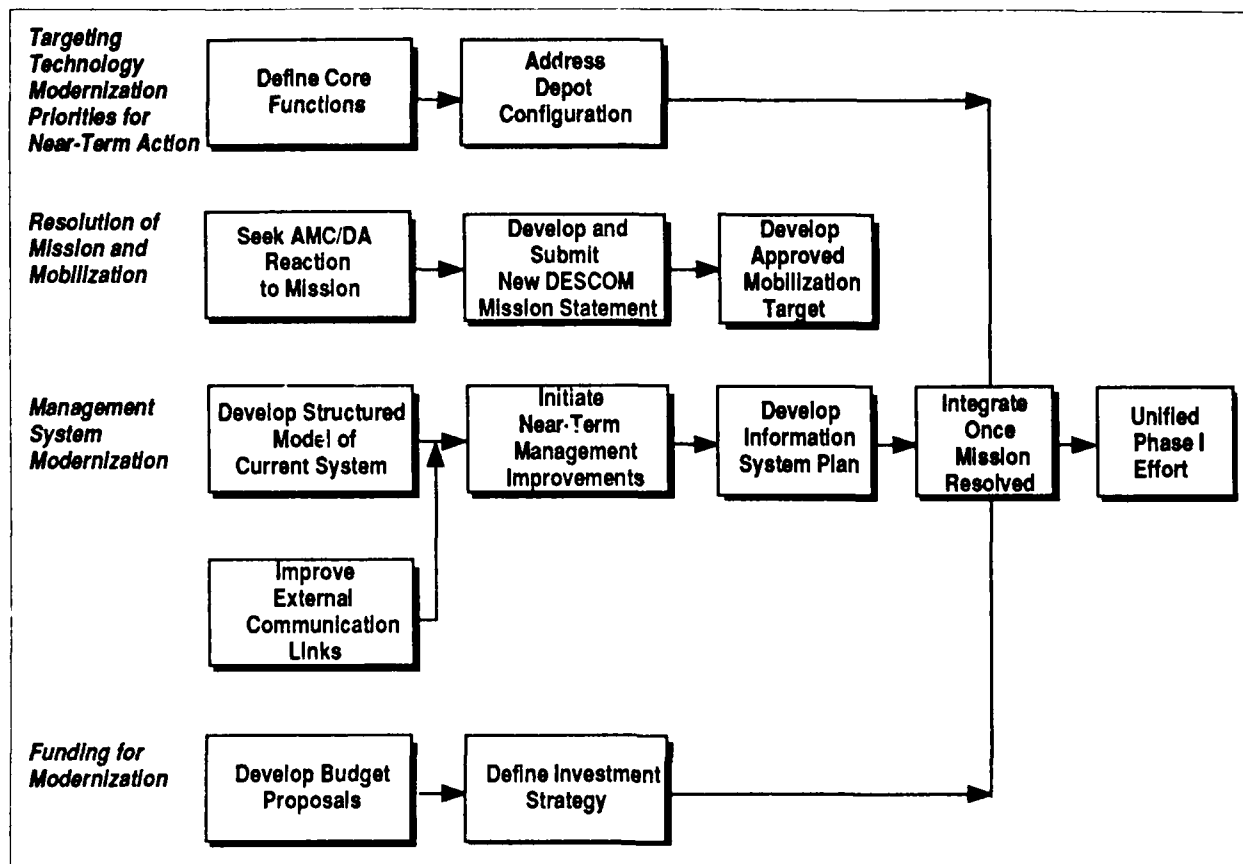


FIGURE 2. Priority Actions for READY 2000 Program Implementation

Appendix

READY 2000 Interviews



Appendix

READY 2000 Interviews

Executive Interviews

GEN Louis C. Wagner, Commanding General, AMC

Marie Acton, Director for Management and Analysis
AMC

Dr. J. R. Sculley, Asst. Secretary of the Army
(Research, Development, and Acquisition)

MGEN Stephen Woods, Director
Program Analysis and Evaluation
Office of Chief of Staff

BGEN Paul Greenberg, PEO for Ammunition, AMC

Darold Griffin, Deputy Chief of Staff for Production
AMC

Dr. Richard Donnelly, Director of Industrial Resources
Assistant Secretary of Defense
(Acquisition and Logistics)

John Mittino, Deputy Assistant Secretary of Defense
(Logistics)

Robert McCormack
Deputy Assistant Secretary of Defense
(Production Support)

LGEN Fred Hissong, Jr.
Deputy Commanding Gen. for Material Readiness
AMC

Dr. James Ambrose, Undersecretary of the Army

LGEN Max Noah, Comptroller of the Army

LGEN T. Rogers, Director, Information Systems for
Command, Control, Communications and Computers

LGEN Jimmy Ross, Deputy Chief of Staff for Logistics

COL John Rose
Chief, Long-Range Planning Division, ODCSOPS

Robert Mason, Director, Maintenance Policy
Assistant Secretary of Defense (Products and Logistics)
Office of the Secretary of Defense

James Reay, Director, Supply Management Policy
Assistant Secretary of Defense (Products and Logistics)
Office of the Secretary of Defense

Corps of Engineers, various staff

LTC Michael Peters
Executive Assistant to the Assistant to the Chairman
Joint Chiefs of Staff

Customer Interviews

AMCCOM

MGEN Marvin D. Brailsford, Commander

Perry Stewart, Deputy Director
Logistics and Readiness

Richard Hussom, Deputy Director, Maintenance

Dean Warnecke, Director, Materiel Management

LTC Larry Cardell, Director, Readiness

Dr. Marion Thompson
Deputy Director
Industrial Preparedness and Installations

Spencer Hirshman, Technical Director, ARDEC

Les Griffen, Quality Assurance

COL J. E. Gregory
Weapons Ammunition System Acquisition

William Holt, Ammunitions Inspector

AVSCOM

MGEN Richard E. Stephenson, Commander

BGEN Donald R. Williamson, Deputy Commander



COL Larry D. Holcomb
Director, Materiel Management

George Hendon, Deputy Director, Depot Maintenance

CECOM

MGEN Billy M. Thomas, *Commander*

James Skurka, Deputy Director
Logistics and Readiness

James Carter, Deputy Director, Materiel Management

COL Francis Collins, Director, Maintenance

George Schwartz, RD&E Center

COL Robert L. Berner, Director, Readiness

MICOM

LTC James M. Link, Director, Materiel Management

John W. Finafrock, Deputy Director
Materiel Management

Wayne Horton, Acting Director
Maintenance Engineering

Don Gula, Chief, Deployment Branch

Dannie Ogle, Chief, Transportation Branch

J. T. Artis, Chief, Distribution Mgmt. Branch

Marshall White, Chief, Stock Control Mgmt. Branch

TACOM

BGEN Carl W. Tipton, Deputy Commander
Procurement and Readiness

COL Leonard Leasser, Director, Maintenance

COL Phillip Schrock, Director, Materiel Systems

LTC Robert Woodson, Director, Readiness

Donald W. Cargo
Director of Design and Manufacturing Technology
RD&E Center

LTC Patrick Kirby, Deputy Director, Depot Maintenance

Richard Bujak, Equipment Specialist

Charles Armstrong, Chief, Program Management

Ed Thomas, Acting Chief, Product Improvement Office

TROSCOM

MGEN Henry G. Skeen, *Commander*

COL Clarence Mills, Deputy Commander
Procurement and Readiness

COL Brent Lawrence, Director, Maintenance

Dr. Robert G. Hutchison
Deputy Director for Maintenance

COL James B. Wood, Director, Readiness

Allen Christensen
Director, Research, Development and Integration

Steven Randol
Division Chief for Distribution and Transportation

Randall Warner
Acting Maintenance Management Division Chief

USASAC

Paul Donovan, Principal Deputy

PEO FAAD

Don Barker, Deputy for Program Support

MAJ Rich Loyd
Logistics Manager for FAAD PEO Office

PM Bradley

Barry Crawford, ILS Manager

PEO Close Combat Vehicles

COL Eugene Colgan
Program Executive Officer, Close Combat Vehicles

John Kalamanir, Close Combat Vehicles
Logistics Specialist (M1)

PM Blackhawk

COL William E. Turner, Program Manager

J. W. Dean, Logistics Management Chief



PM Apache

COL Curtis J. Herrick, Program Manager

PM Ammunition Logistics

COL James Voss, Program Manager

PM OPTADS

Joseph D'Oria, Deputy Director

FORSCOM-Ft. Stewart

LTC James C. King, Assistant Chief of Staff, Logistics

MAJ Dan Fairchild, Commander, DMMC

LTC John Phillis, LAO

LTC Edward Puhala, Director, Logistics

Defense Logistics Agency

LTC Richard Campany (USAF)
Plans, Policies and Programs

CDR Tom Duffey (USN), Supply Corps

Ed Herman, Statistic Management Specialist

Future Warfare Interviews

LOGCEN

LTC Landon Gore, Deputy Director
Materiel Systems Directorate

MAJ Gregory Bergeret, Combat Service Support Area
Mission Area Development

MAJ Wayne Truselle (Australia), POC Deep Battle

Mike Autrey, Acting Director
Concepts and Doctrine Directorate

LGEN William G. Tuttle, Jr., CG

COL Joe Cansler
Deputy Director for Combat Development

LTC Barry Gardner, Division Chief
Log Automation Management Directorate

Nick Flaim, LOGMARS POC

Ft. Leavenworth, Kansas

Thomas Douthitt, Chief
Deep Battle Office, Combined Arms Center

LTC Brad Cox

Resources and Sustainment Branch
Command and General Staff College
(Also Present: LTC John Ritter, LTC Charles McInnis)

LTC John Shepard

TSM Force Maneuver Control System
Command, Control, Communications,
and Intelligence Directorate
Combined Arms Center

Ft. Sill, Oklahoma

Edward Stiles
TSM Fire Support Command and Control
Field Artillery School and Center

Fred Rowzee, TSM Cannon
Field Artillery School and Center
(Also Present: MAJ David Little, CAPT Pat Parker,
CAPT Robert Zablielski)

MAJ James Wimberly
Office of TSM Rocket and Missile Systems
Field Artillery School and Center
(Also Present: CAPT Michael Barron)

Douglas Brown, TSM Target Acquisition Support
Field Artillery School and Center

Robert Willis, TSM Fire Support
Field Artillery School and Center

Ft. Bliss, Texas

Hank Tarkowski, DCD Air Defense Artillery
Air Defense Artillery Center
(Also Present: CAPT Earl Sutton, DCD Concepts;
Michael Toomey, Operational Concepts)

LTC Thomas A. Vereb
TSM Forward Area Air Defense
Air Defense Artillery Center

Ft. Knox, Kentucky

Richard Renfrow, Deputy Combat Developer
Training Devices, New Systems Training Division
Directorate of Training and Doctrine, Armor Center

Maj. William Horton, Technology Branch
Materiel Logistics Division
Directorate of Combat Developments, Armor Center



James Montgomery, Chief, Materiel Logistics Division
Combat Service Support Branch
Directorate of Combat Developments
Armor Center

MAJ Gary Parvin, TSM Tank
Chief Logistics Branch, Armor Center
(Also Present Briefly: LTC Frederick Moll, TSM Tank)

Ft. Gordon, Georgia

LTC August Kertnar, Chief
Logistics Management Division
Directorate of Combat Developments
Signal Center

Beverly Butler
TSD Transmissions Operations Department
Signal Center

Forster Farmer, Operations Branch, TSD C&SED
Signal Center

Eugene Bracewell, DCD BAS ACSD
Signal Center (Also Present: Will Harral)

MAJ John Smith
TSM Tactical Communications Satellite
Signal Center

CW2 R. David Slade, Warrant Officer Division
Signal Logistics Division
Signal Center

Dwight Townsend, T&E Division, DCD
Signal Center

CAPT William Wooten, Logistics Committee
AirLand Battle Division
Signal Center

CAPT Kenneth Kraft
Logistics Committee, AirLand Battle Division
Signal Center

MSG Robert Ledford
Manpower Requirements Criteria Branch
Operations and Plans Signal Division, DCD
Signal Center

Garland Wills, Logistics Management Division
Directorate of Combat Developments
Signal Center

SFC K. Mangle
Combat Development Logistics (Combat Radios)
Signal Center

Glenn Strellner
TSM Multiple Subscriber Equipment
Signal Center

Ft. Benning, Georgia

MAJ Paul Buckheister, TSM Antitank Missiles
Infantry Center and School

MAJ Richard Wampler, Firepower Branch
Directorate of Combat Developments
Infantry Center and School

Ben Maxham, Firepower Branch
Directorate of Combat Developments
Infantry Center and School

CAPT Richard E. Davidson
Anti-Armor Training Devices
Directorate of Training and Doctrine
Infantry Center and School

MAJ Lavelle Martin, Concepts and Studies Branch
Directorate of Combat Developments
Infantry Center and School

CAPT Timothy Hallman, Directed Energy Branch
Directorate of Combat Developments
Infantry Center and School

CAPT Thomas Grandin, TSM Bradley
Infantry Center and School

Don Parks, Mobility Branch, Materiel Division
Directorate of Combat Developments
Infantry Center and School

CAPT Christopher Serpa, Bradley Program
Directorate of Training and Doctrine
Infantry Center and School

MAJ Ray Whitney
Armored Family of Vehicles Program
Directorate of Training and Doctrine
Infantry Center and School

Ft. Rucker, Alabama

LTC Walter Hinman TSM Missiles, Aviation Center
(Also Present: MAJ Richard Scales,
CAPT Ronald Salyer)



CAPT Cantor, TSM AH64 (Apache), Aviation Center

LTC Clarence Ebbinga TSM LHX, Aviation Center

LTC John Riggs, Materiel Development
Directorate of Combat Developments, Aviation Center
(Also Present: MAJ Christopher Sargent, MAJ James Johnson)

Factory Technology Interviews

Ray Tryba, Ammunition Peculiar Eqpt. Division
AMCCOM, Rock Island, Illinois

Michael P. Baccellieri, Industrial Engineer
Office of Deputy Chief of Staff Production
AMC HQ, Alexandria, Virginia

Perri Palmer, Applications Engineer, XYTEC, Inc.
Tacoma, Washington

Dr. Dan L. Shunk, Director
CIM Systems Research Center
Arizona State University

FMC, San Jose, California
John Schreier, Supervisor
Producibility Manufacturing Engrg.

Bill Highlander, Marketing Representative

Jim Hill, Production Engineering

Marvin L. Kohn, Senior Staff Engineer
Technology Development

Tom Burke, Coating Technology

Bobby W. Folkening, Associate Project Engineer
Technology Development

Max Soldenwagner, Armor

William J. Ferguson, Composites, Manufacturing
Technology Development

Ed Rolls, Computer Manufacturing and Automation

Timothy N. Daly, Supervisor, Industrial Engineering

Ronald R. Stringer, Sr. Industrial Engineer
Manufacturing Engineering Development Group

Richard J. Rush, Sr. Industrial Engineer
Manufacturing Engineering Development Group

Kaiser Electronics, San Jose, California

John Howell, Executive Director for Product Support

Mark Bailey, Manager of Field Services

Boeing Helicopter, Philadelphia, Pennsylvania

Dan Tomasso, Director
Engineering Development Support

Bob Ford, Manager
Manufacturing and R&D for Composites

Carl Iacovelli, Manager, Quality Control

Army Materials Technology Laboratory Watertown, Massachusetts

CAPT Karen Frahm, Research and Development
Coordinator for Materials Exploitation

Dr. Ralph Adler, Metallurgy and Materials Sciences

Dr. Bernard Halpin, Chief
Composites Development Division

Walter Roy, Head of NDE Material Analysis

Dr. John Antal, Neutron Radiography

Charles Hickey, Metallurgist

Factory Technology Interviews (Staffing Issues)

COL Daniel Kashporenko, Director of Strategic Planning
Command, Control, Communications, and Computers
Department of the Army
Office of Department Information Systems

Eugene Bardach
National Federal Marketing Representative
Information Systems Group, IBM

Robert J. Ziese, Federal Account Manager
Digital Equipment Corporation

COL A. E. Lancaster, Jr.
Information Science and Technology Office
Defense Advanced Research Projects Agency

Daniel Epps, Chief, Advanced Technology
Information Systems Command, AMC

Carlton Braun, Vice President
Motorola Manufacturing Institute



Fred Good, Staff to Vice President
Electro-Optical System Group Design
Hughes

Paul Hanson, Corporate Salary Administrator
John Deere Company

Andy Karlness, Mill Manager
Weyerhaeuser Corporation

Kevin Keyes, Personnel Supervisor
John Deere Co.

Robert Nogler, National Representative
American Federation of Government Employees

Sylvia Ohanesian, Sector Manager of Employees
Motorola Manufacturing Institute

Lee Sanborn, Training Coordinator
Ford Motor Company

Dr. Dan Shunk, Director
CIM Systems Research Center
Arizona State University

Ronny Stanton, Government Equipment Group
Motorola

Material Handling Interviews

Thomas McHugh, Regional Manager
Hamischfeger Engineers

Mark Soderberg, Executive V.P.
CNA Manufacturing Systems Inc.

George Salisbury, Principal V.P.
CNA Industrial Engineering Inc.

Charles Wenzel, Regional Manager, SPS Technologies

Vincent Colabello, Director, Syscon

James Apple, Jr., Partner, Syscon

Roy Freas, Systems Planning Manager
Mannesman-Demag

Tony Callahan, Project Manager
Cybermated Controls Corporation

Charles Rouse, Director of AGV Systems
Litton Industrial Automation Systems

Terry Poll, Regional Manager
Buschman Conveyors

Larry Frey, V.P., Marketing, Buschman Conveyors

Dr. James A. Tompkins, President
Tompkins and Associates

James Pierce, Jr., V.P. and General Manager
Automation Engineering Inc.

Steven Barlow
Marketing and Government Contracts Manager
Eaton-Kenway, Inc.

Fred Kimball, National Manager, Warehouse Systems
Integrated Automation

Dr. Leon McGinnis, Director
National Material Handling Research Center
Georgia Institute of Technology

Dr. Richard Ward, Director of Education
Material Handling Institute

Jim Allred, Director, Factory Automation
Intel Phoenix

John Ward, Production Manager, Parker-Hannifin

Robert Pollock, Senior Associate
Eric C. Baum and Associates

Dr. Wayne Turner
Oklahoma State University

Dr. W. R. Taylor
College/Industry Council on
Material Handling Engineering
Material Handling Institute and
Associate Professor, Montana State University