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Analyzing the Army's configuration management system applicability to a commercial cataloguing system

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ANALYZING THE ARMY'S CONFIGURATION MANAGEMENT SYSTEM APPLICABILITY TO A COMMERCIAL CATALOGUING SYSTEM

by

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March 1997

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General Motors and Ford Motor Company maintain complete Configuration Control of their products and automobiles. That is, a customer orders a replacement vehicle part from their local dealership. Within a few days, they receive the part that meets the form, fit, and function requirement. Military personnel requiring replacement or spare parts must submit a written request which requires the part name, number with revision level, and the national stock number. Barring any delays, the part is received within two to three days. In most cases, however, there are delays and it takes up to several weeks to receive the part. The purpose of this thesis is to identify the key elements required for Configuration Management, identify policies, procedures, and regulations that govern, shape and dictate secondary item procurements, and to analyze Department of the Army's and Industry's spare parts procurement process. This thesis shows the Department of the Army's and Industry's Configuration Management models are similar; but the polices and regulations that govern, shape and dictate secondary item procurements are quite different; and that Congress and Government agencies must change their policies to adapt to commercial practices. The thesis also demonstrates that the current direction the Government is taking in acquisition reform will seriously impede improvements in the field of Configuration Management, which encompasses the development and maintenance of technical data packages that support secondary item procurements.

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ANALYZING THE ARMY'S CONFIGURATION MANAGEMENT SYSTEM APPLICABILITY TO A COMMERCIAL CATALOGUING SYSTEM

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B.S., Morehouse College, 1983

Submitted in partial fulfillment
of the requirements for the degree of

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from the

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March 1997

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I. INTRODUCTION

Before starting to analyze Department of the Army's (DA's) and Industry's secondary item procurements to determine whether a commercial model can be adopted in a military application, one must first review the significant historical events that have shaped existing procurement policies. In doing this, one will find that internal and external factors influenced Congress to enact legislation that required strict policies and procedures designed to prevent waste, fraud and abuse, allowing the Government to buy spare parts at a fair and reasonable price.

The purpose of this chapter is to give a brief history of the events that shaped existing procurement policies; define the thesis objective; state the primary and subsidiary research questions; define the scope, limitations and assumptions of the research; describe the methodology used to perform the research; and to provide an outline of the thesis.

A. BACKGROUND

The many weapon systems utilized by the Department of Defense (DoD) are supported by more than four million spare parts incurring an expenditure of $22 billion in Fiscal Year (FY) 1995 [Ref. 2]. Spare parts are essential to maintaining fully functional and operational equipment for "combat ready" forces. The parts are procured to replace components that have become worn, broken, or malfunctioned. The range of spare parts includes inexpensive, non-critical individual replacement parts, to critical and expensive parts, and subassemblies or large components of supported end items.

The period of the early 1980s was marked by a great deal of turmoil for DoD secondary item procurements. Headlines focused on horror stories describing DoD's purchase of $100 diodes, $436 hammers, $337 nuts, $640 aircraft toilet seats, $659 aircraft ash trays, and $37 screws [Ref. 1]. These are a few of the more popular and well-publicized examples of spare parts overpricing that caught the public's attention and started a wave of procurement reform. DoD has in the past paid exorbitant prices for spares, and there have been many cases of apparent overpricing on items that are, generally reasonably priced. As a result, there is a general public perception that DoD has historically performed poorly in managing secondary item procurements. [Ref. 21]

Reacting to the mounting criticism of overpricing, waste, mismanagement, and to a certain extent favoritism in the selection of contractors, Government agencies initiate strict policies. In the spring of 1981, the "Carlucci Initiatives" (named after the Deputy Secretary of Defense Frank Carlucci) were designed to improve overall DoD management and provided the impetus for subsequent initiatives and legislation. [Ref. 21:p. 9] On 25 July 1983, Secretary of Defense Casper Weinberger published a memorandum to the Services and the Defense Logistics Agency (DLA) outlining a ten-point spare parts get well plan [Ref. 3]. The Secretary immediately followed this plan with another memorandum mandating 25 specific actions to be taken by the Services in controlling spare parts prices. [Ref. 4]

On the legislative side, numerous bills were introduced in Congress and committee hearings were held, culminating in the passage of three new major laws in 1984: (1) the Competition in Contracting Act (CICA), which overhauled and replaced a major portion of the Armed Services Procurement Act (ASPA) and Title III of the Federal Property and Administrative Services Act (FPASA) which governed procurement by most civil agencies; (2) the Defense Procurement Reform Act (P.L. 98-525); and (3) the Small Business and Federal Procurement Competition Enhancement Act (P.L. 98-577). These laws represented the first overall reform of procurement statutes in over thirty years.

In conjunction with Congressional action, President Reagan established an independent, bipartisan blue-ribbon Commission on Defense Management under the chairmanship of David Packard. The Commission reviewed efforts previously undertaken to improve management and procurement practices, considered the organization and decision-making procedures at Defense, studied the Congressional oversight of the Department, and submitted a blueprint for further action. In June 1986 the Commission published its final report that made sweeping recommendations. This report reiterated many earlier recommendations, including increased reliance on competition, more purchases of off-the-shelf items to curtail costs, increased self-policing by military contractors, and a reduction in Congressional oversight [Ref. 49]. Those recommendations were implemented by the National Security Decision Directive 219 in April 1986, the Goldwater-Nichols Department of Defense Reorganization Act in October 1986, and the Defense Management Report in July 1989. [Ref. 6]

Following the Reagan era, another effort began to tighten control over the $300 billion U.S. military budget. During the early 1990's, procurement reform focused on improving weapon requirements determination and acquisition organizations and processes. The impact of reduced defense procurements on the defense industry, together with the budget-driven need to reduce procurement costs, elevated the importance of reform efforts designed to broaden DoD's industrial base by increasing reliance on commercial products and processes. Secretary of Defense William Perry's February 1994 white paper stated in order to meet the new national security challenges, DoD must maintain its technological superiority and a strong national industrial base by relying more on commercial state-of-the-art products and technology, assisting companies in the conversion from defense-unique to dual-use production, aiding in the transfer of military technology to the commercial sector, and preserving defense-unique core capabilities and reduce acquisition costs (including overhead costs) through the adoption of business processes characteristic of world-class buyers. [Ref. 5] The paper includes an acquisition reform strategy, or "vision for the future," to accomplish these objectives. Key elements of the strategy include (1) reducing the use of defense-unique specifications and relying more on commercial performance-based specifications in defense procurements; (2) eliminating non value-added oversight, controls, and requirements that discourage commercial companies from doing business with DoD or substantially increase the cost of doing business compared to the commercial sector; and (3) adopting acquisition processes and practices similar to those of commercial companies [Ref. 5].

Recently, Congress approved four new laws that seek to streamline the acquisition process and minimize Government-unique reporting and compliance requirements: The Federal Acquisition Streamlining Act of 1994 (FASA), the Federal Acquisition Reform Act of 1995 (FARA), the Defense Acquisition Management Reform Act of 1995, and the Federal Acquisition Improvement Act of 1995. However, these four new laws are in direct conflict with the regulations lawmakers approved in the 1980s in an effort to obtain low prices, avoid favoritism, conflicts of interest, prevent waste, fraud and abuse, and to provide offerors with a fair chance to compete for Government contracts.

B. OBJECTIVE

The objective of this research is to analyze and evaluate the Department of the Army's secondary item procurement process. Factors, internal and external, to the Configuration Management (CM) and procurement process that contribute to the logistics supply centers are analyzed and compared to commercial processes to determine a more efficient way of supporting fielded systems. The purpose of this research is to identify the key elements required for CM, identify policies and regulations that govern, shape and dictate secondary item procurements, and to analyze Department of the Army's and Industry's secondary item procurements, in order to answer the question of whether a commercial model can be adopted in a military application.

C. THE RESEARCH QUESTION

The primary research question is derived from the above stated research objective and asks: "Is a commercial cataloguing system a valid goal in restructuring the Army's Configuration Management (CM) system for secondary item procurements?"

In support of the primary research question, the following subsidiary questions are addressed: (1) What is CM and what is its purpose?; (2) What are the elements of CM?; (3) What are Department of the Army (DA) and Industry viewpoints toward CM?; (4) What are the policies that govern, shape and dictate secondary item procurements?; and (5) Are there better ways to support secondary item procurements?

D. SCOPE, LIMITATIONS AND ASSUMPTIONS

This thesis is limited to analyzing and evaluating the configuration management system used to support secondary item procurements for Army fielded systems. The focus is on reviewing DA's post-production baseline configuration control in an attempt to compare Industry's secondary item policies and processes to DA's in order to design an efficient CM model.

A recommended method for managing secondary items for the Army is not included nor does this thesis include details of implementation for any specific CM program or acquisitions being supported or conducted by the five Inventory Control Points (ICPs) or DLA. It consider implementation with respect to any individual branch or other organizational unit having CM responsibilities unique to a specific program. Rather, the thesis identifies DA's and Industry's policies and procedures that shape, govern and dictate the maintenance of CM in order to procure spare parts to support post-production configuration items.

It is assumed that the reader is generally familiar with the concepts of CM as practiced in both Government and Industry. It is assumed that the reader has ready access to Government instructions, written policies, supplemental written material, and other references listed in the list of references. The assumption is that the reader has sufficient technical background to independently analyze technical material presented but not explained in the body of the text as it refers to CM issues.

E. LITERATURE REVIEW AND METHODOLOGY

Research techniques for this thesis include personal and telephone interviews with DoD and Industry personnel. A thorough literature review using the resources at the Naval Postgraduate School Dudley Library, the Defense Logistics Studies Information Exchange (DLSIE), and the Internet were used for research.

The research includes data collection from and an assessment of DoD and Industry technical reports; General Audit Office and Procurement Administrative Lead-Time reports; previous thesis research papers; periodicals and publications; Congressional Hearings; and DoD/DA regulations and standards.

F. DEFINITIONS AND ABBREVIATIONS

Definitions and acronyms common to DoD, the Army, and Industry are used throughout this thesis. A listing of abbreviations and acronyms are provided at Appendix A.

G. ORGANIZATION OF STUDY

This thesis is organized to give the reader a comprehensive overview of policies and procedures that govern, shape and dictate DA's and Industry's CM secondary item procurements. Analysis shows that inefficient policies and procedures can have damaging effects on a ICP's ability to ensure that adequate parts are available to support and maintain post-production configuration items.

Chapter I is the introduction to the spare parts procurement business and provides an overview of the thesis. Chapter II defines and identifies key elements for Configuration Management (CM). This chapter defines the purpose of CM in order to sustain the operation and efficiency of fielded vehicle systems and will also analyze both DA's and Industry's perspective of CM. Chapter III provides an in-depth review and description of the procurement process. Chapter IV describes DA's and Industry's viewpoints applicable to spare parts procurement and identifies any impediments that may prevent an efficient way of doing business. Interviews as well as computer generated reports from DLA and the Army Materiel Command (AMC) are used to gather statistical data to establish a baseline and analyze trends applicable to technical data package development and procurements. Chapter V presents conclusions and recommendations.

II. CONFIGURATION MANAGEMENT

The most important element in secondary item procurements is the development, maintenance, and distribution of technical data packages (TDPs).

What is a TDP? A TDP is any form of information that conveys the shape, dimension, or function of an item, and how that item interrelates with other items [Ref. 26:p. 19]. A TDP distinguishes one item from another. Many items may appear to be physically similar, because they have the same form or fit, but are different functionally, because of the difference in material. Therefore, a TDP is a process of transferring information from one entity to another to assure the consistent manufacturing of an item to meet specific requirements. Hence, Configuration Management (CM) is simply the maintenance of TDPs. The purpose of this chapter will define and describe CM, and analyze Department of the Army's (DA's) and Industry's perspective of CM.

A. BACKGROUND

During World War II, armored ground vehicle systems rolling-off the production line were inconsistent. The tanks or trucks were mostly hand-made with some automated manufacturing, and each vehicle had subtle differences as a result of the labor-intensive manufacturing processes. As production methods became more sophisticated during the post war period, automotive vehicle manufacturers devoted more space and time to the research and development of DoD ground vehicle systems and subsystems. Multiple configurations of components often went undiscovered until maintenance, troubleshooting, part interchangeability, and supporting documentation presented compatibility problems.

The first program to effectively deal with these uncontrolled changes was ANA Bulletin (Army, Navy and Air Force) No. 390 issued by the Office of the Secretary of Defense (OSD) [Ref. 10:p. 14]. This document introduced the

Engineering Change Proposal (ECP) which formalized Industry guidelines for proposing changes. ANA Bulletin No. 391A took ECPs a step further by establishing a classification priority and forcing the requirements on the electronics and ground support equipment industries [Ref. 10:p. 15]. In 1963, ANA Bulletin 445 was issued as a refinement by consolidating the previous bulletins into one set of guidelines and further specified procedures for the submission of ECPs for Government approval [Ref. 10:p. 15]. In addition, Bulletin 445 included reliability and maintainability as elements required in engineering changes. The standard that superseded ANA Bulletin 445 was MIL-STD-480. Entitled "Configuration Control - Engineering Changes, Deviations and Waivers", it represented the most complete description of change control. [Ref. 8:p. 16]

All DoD Services involved in the procurement process recognized the need for CM and a proliferation of individualized instructions followed. While MIL-STD-480 represented the most complete description of change control, it did not provide implementation procedures, nor did it address any type of systems approach to management. The results were that major contractors and subcontractors now had to contend with multiple requirements.

Finally in 1968, OSD took the lead by providing new guidance in an attempt to achieve a conceptually more consistent degree of uniformity within DoD and between DoD and Industry. DoD Directive 5010.19, issued July 17, 1968 established CM policy [Ref. 10:p. 16]. This policy emphasized that a TDP be placed under Government CM control to assure product uniformity and similar manufacturing methods and procedures. Superseding this policy is DoD Directive 5010.12-M entitled "Procedures for the Acquisition and Management of Technical Data" [Ref. 11]. This alternative approach in policy dictates that CM is only required for the system and performance specification (see Figure 1). Emphasis is now shifting toward controlling performance, form, fit, and function and shifting away from controlling detailed engineering drawings and material/process

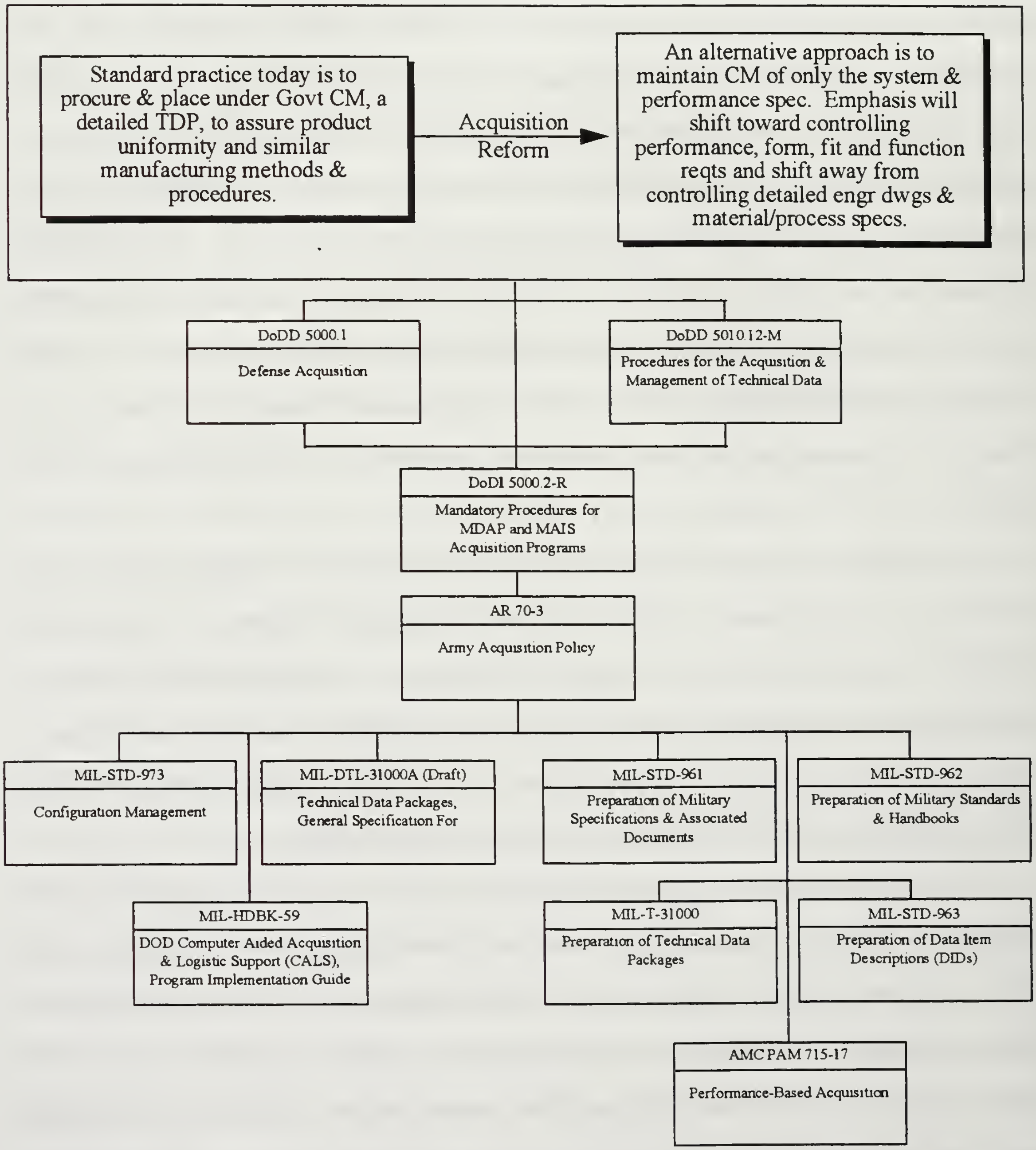

Figure 1. DoD Configuration and Technical Management Standards (Ref. 15)

specifications [Ref. 12]. This change in policy is consistent with the newly enacted legislation applicable to Acquisition Reform. The next section discusses the Military Standards and DoD directives that govern CM policies and procedures.

B. OVERVIEW

As a result of Acquisition Reform, many changes are taking place concerning the use of Military Specifications and Standards. One of the affected standards is MIL-STD-973; Configuration Management (CM). This standard was released 17 April 1992 to consolidate requirements which have been scattered throughout a number of documents [Ref. 13]. MIL-STD-973 cancels and replaces MIL-STD-480, 481, 482, 483, 1456, and 1521. In addition, it contains guidance and information on CM; including deviations, waivers, and Continuous Acquisition and Lifecycle Support (CALS).

Originally, CM rules implemented in Government and Industry were established by Military Standards (MIL-STD) developed by DoD. But now, DoD is canceling many of its MIL-STD requirements and turning to commercial organizations to provide the necessary replacements, known as Non-Government Standards (NGS). [Ref. 14] These new standards are expected to be widely accepted among commercial organizations that want to improve the quality of their products and processes.

In the CM environment, the Electronics Industries Association (EIA) has taken the lead in drafting the new standards. [Ref. 14] EIA/IS-649 standard proposal for CM is currently being coordinated through the American National Standards Institute (ANSI). The functional areas considered most critical in the new developing standards are computer software development, systems engineering, engineering drawing practices, integrated logistics support, CALS, CITIS, ISO standards and application protocols, TDPs and acquisition practices. [Ref. 14] The new CM standard provides for sound business principles and processes and there are no requirements dictated by the standard. Each Industry user is able to tailor these principles and processes to best fit their products and environment. Though MIL-STD-973 continues to be in effect, DoD plans to cancel this standard when EIA/IS-649 achieves ANSI accreditation.

There are other organizations in addition to EIA, that are working on interface standards which provide data models and data dictionaries needed for data representation and data transfer to various users [Ref. 14]. For example, the International Organization for Standardization (ISO), headquartered in Geneva, Switzerland, has developed a set of standards in the area of Quality [Ref. 13]. The basic set includes ISO 9000, the overview document; ISO 9001, covering design, manufacturing, installation, and servicing; ISO 9002, on production and installation; ISO 9003, regarding final product inspection and testing; and ISO 9004, on quality management systems (see Figure 2).

It is anticipated that EIA/IS-649 will be released to Industry as well as DoD, FDA, FCC, and DoE regulated environments in FY 1997.

All CM controlling documents are centered around MIL-STD-973. The central focus is the configuration disciplines to control, identify, account, and audit. But the most distinguishing feature is the separation of Class I and Class II changes. [Ref. 15] The next section defines and identifies the elements of CM.

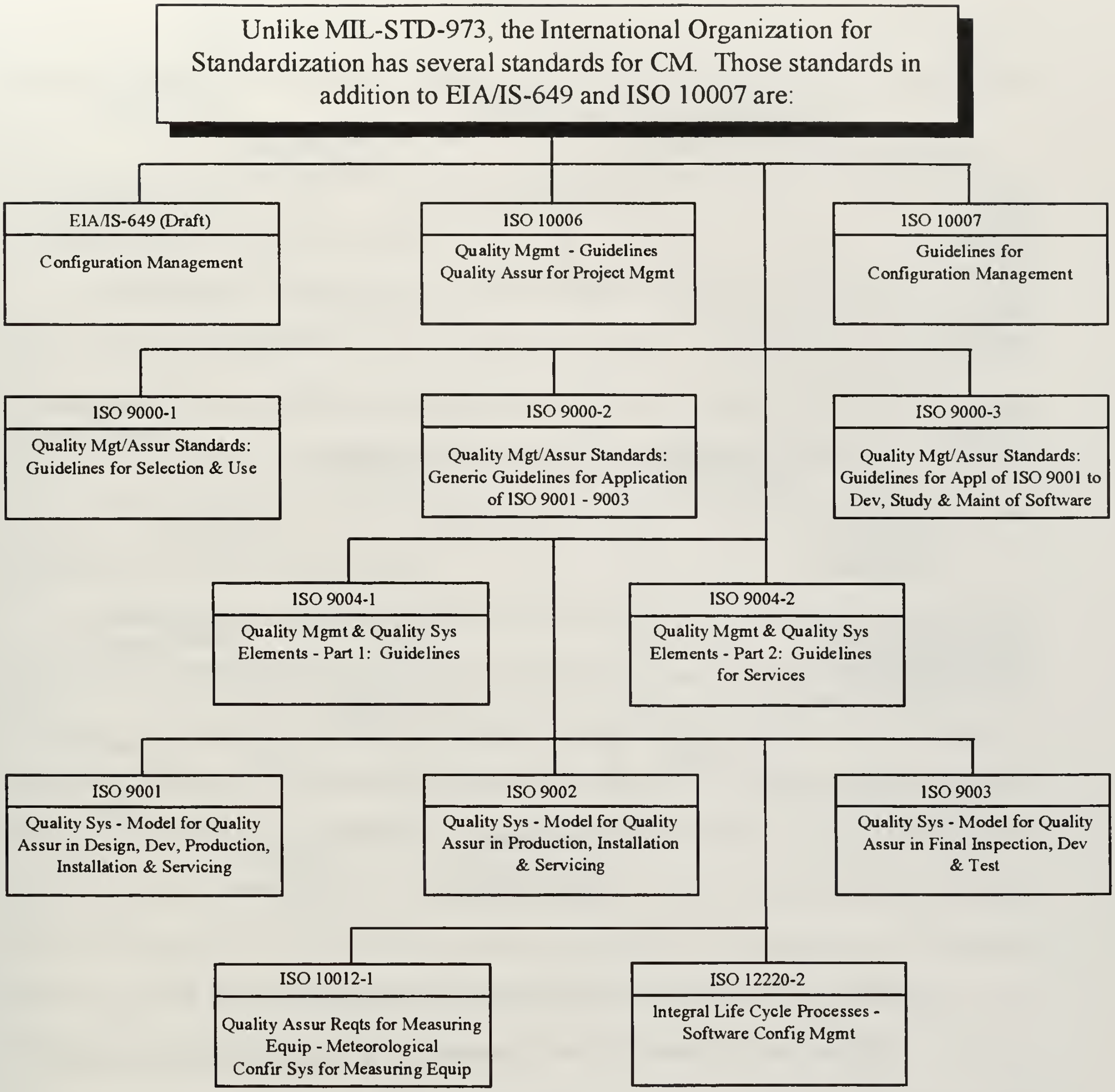

Figure 2. ISO Configuration and Quality Management/ Assurance Standards (Ref. 12)

C. DEFINITIONS

CM is a discipline applying technical and administrative direction and surveillance over the life cycle of items to (see Figure 3):

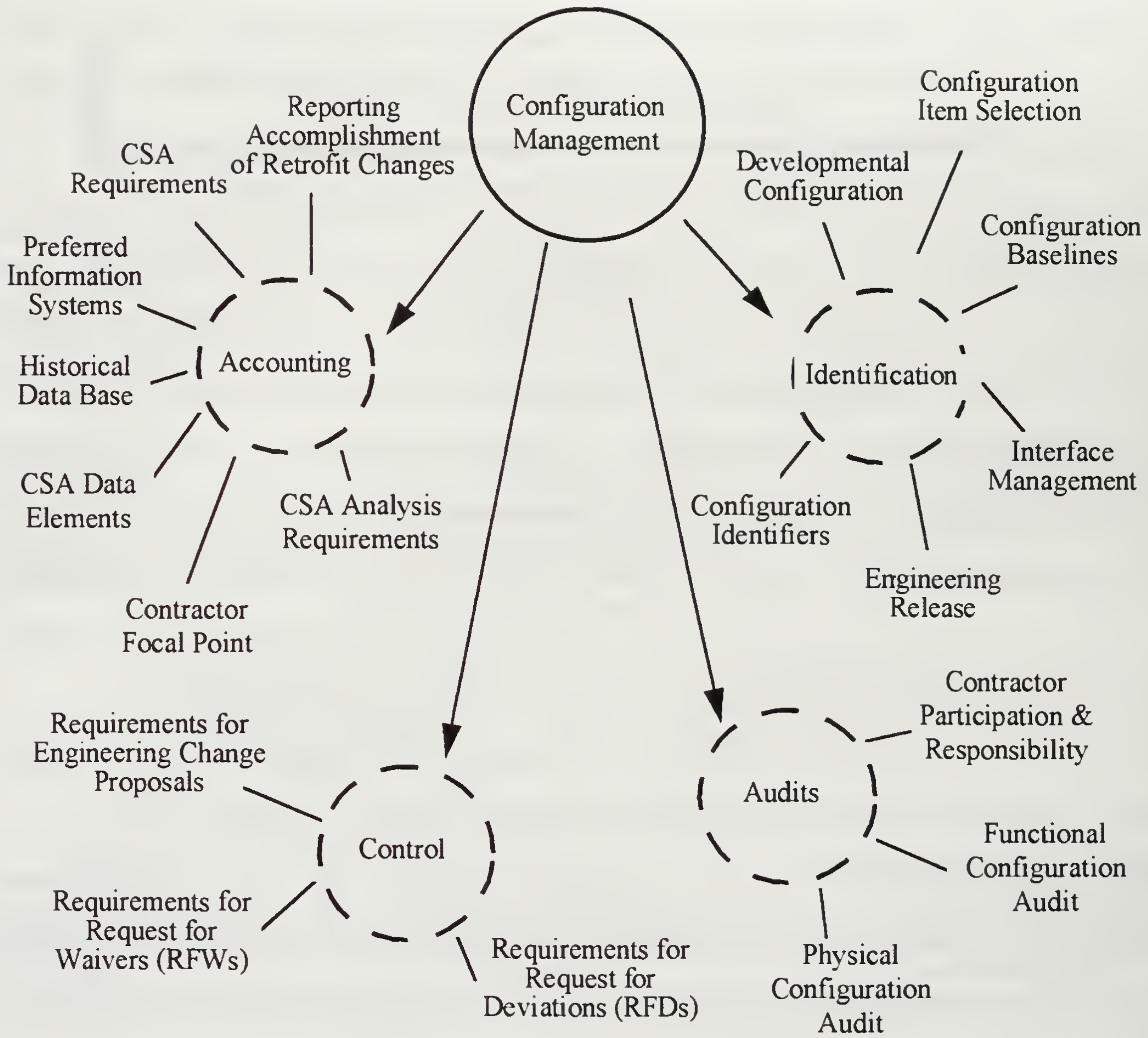

Figure 3. Major Facets of Configuration Management (Ref. 8)

1. Identify and document the functional and physical characteristics of configuration items.

2. Control changes to configuration items and their related documentation.

3. Record and report information needed to manage configuration items effectively, including the status of proposed changes and implementation status of approved changes.

4. Audit configuration items to verify conformance to specifications, drawings, interface control documents, and other contract requirements. [Ref. 7:p. 313]

To summarize, the basic functions of CM are identification, control, status accounting, and verification (audit).

Configuration Identification is the process of identifying the critical components of an item to whatever level of detail is needed to separate and support uniqueness. These critical components are called Configuration Items (CIs). In addition, it is necessary to identify the document set that accomplishes the definition of the uniqueness to the level of detail needed to support the item throughout its life cycle. [Ref. 20]

For example, a major component of an item may be a housing assembly that consists of a machined casting, some bolts and nuts, a gasket and a couple of roller bearings. In order to support the unique characteristics of this component, we would need an assembly drawing, a detailed drawing of the casting, and a detailed drawing of the casting as machined. The nuts, bolts and roller bearings in this case may be industry standard and are thus not unique. They can be supported by just calling out their size or an industry code and possibly a manufacturer's reference number on the assembly drawing. The gasket may be unique enough to be detailed on a separate drawing or shown in enough detail on the assembly drawing to support its configuration. Now these are the documents that define the configuration of this component and its parts and should be controlled. The key here is to identify the component and its documentation to the level of supporting uniqueness of the configuration.

Therefore, Configuration Identification is the determination of the types of configuration documentation required for each CI; the issuance of numbers and other identifiers affixed to the CIs and to the technical documentation that defines the CI's configuration, including internal and external interfaces; the release of CIs and their associated configuration documentation; and the establishment of configuration baselines for CIs. [Ref. 15: p. 9]

Configuration Control is divided into two categories; design and change. Design control is the set of methods used to ensure that a design is developed in accordance with the specifications of the end result as well as the specifications of facilities, regulations, technology and resources used to deliver the end result [Ref. 20]. Methods used should also produce an audit trail showing the evolution of the design and the supporting documentation that validates the ultimate configuration. The audit trail can be accomplished by programmed snapshots of design documentation at successive points or milestones in the design process. The purpose of design control is to ensure a design is evolving with proper consideration for all the factors it will live with during its life cycle. [Ref. 20] The amount of design control applied is directly proportional to the criticality of those life cycle factors.

Change control is a collection of procedures and forms used to capture a proposed change [Ref. 20]. Change controls should facilitate changes rather than restrict them. In order to facilitate any change, it must be examined from three viewpoints:

1. Is the change feasible? Can it actually be done?
2. If feasible, is it good business practice to make the change?
3. When can the change be put in place? What is the schedule or effectivity? [Ref. 20]

To summarize, Configuration Control involves the systematic evaluation, coordination, and approval/disapproval of proposed changes to the design, and the construction of a CI whose configuration has been formally approved internally by a company, the buyer, or both [Ref. 8: p. 7].

Configuration Status Accounting is the recording and reporting of information needed to manage the configuration effectively. This includes:

1. An authoritative list of the approved configuration identification and the definitive documents that support that identification.

2. The status of any transactions against the list of documents that defines the approved configuration, including proposed changes, waivers, deviations, approved changes and implemented changes.

3. The residence and present location of the master documents that define configuration.

4. The approval authority, or owner, of the definitive documents. [Ref. 20]

Therefore, Configuration Status Accounting (CSA) is referred to as the reporting and documentation activities involved in keeping track of the status of a CI to include all departures planned or made from the configuration at all times throughout the entire lifetime of the system. Configuration Status Accounting may also be defined as the systematic recording and reporting of information vital to the total configuration management task; a listing of the approved CIs; and the listing of configuration identification approved for technical documentation of all CIs. [Ref. 9:p. 26]

Configuration Audit is the process of insuring that the as-built configuration matches the as-designed configuration [Ref. 20]. In a manufacturing situation, the item can deviate from the original design documentation through special contract provisions; approved waivers or deviations. In most cases, there are no exceptions and the item must match the documentation or it is reworked until it matches the documentation.

At the outset, one may feel that this is not very important. After all, what is really important is whether the item works. That may be so, but equally important is the facilitation of future changes, additions, upgrades, and maintenance of the CI. If future changes are engineered and planned using the documents that were not up-to-date for the as-built condition, the construction of those changes could entail extensive expenses. In addition, the difference between the documentation and the as-built condition may complicate and confuse training, safety, liability and operating issues that are expensive and directly affect the operation of the CI and the overall system.

To summarize, Configuration Audit is the action performed before and after establishing a product baseline for a CI. These audits consist of a Functional Configuration Audit (FCA) and a Physical Configuration Audit (PCA). [Ref. 15]

Even though CM is defined into four elements, objectives and goals must be established to help guide entities toward a systematic process and approach. The overall objective of CM as it relates to secondary items can be stated to:

> guarantee the buyer that a given product is what it was intended to be functionally and physically, as defined by contractual drawings and specifications, and to identify the configuration to the lowest level of assembly required to ensure continuos performance, quality, and reliability in future products of the same type. [Ref. 7:p. 7]

There are five major goals that comprise an integral part of the CM effort. They are:

1. Define all documentation required for product design, fabrication, and test.

2. Ensure correct and complete descriptions of approved configurations; including drawings, parts lists, specifications, test procedures, and operating manuals.

3. Provide traceability of the resultant product and its parts to their descriptions.

4. Ensure accurate and complete identification of each material, part, subassembly, and assembly that goes into the product.

5. Ensure accurate and complete pre-evaluation control and accounting of all changes to product descriptions and to the product itself. [Ref. 7:p. 7-9]

The central focus of CM are the configuration elements which control, identify, account, and audit. However, the most distinguishing feature of these elements are the classification of Class I and Class II changes.

D. CLASS I ECPs

Class I ECPs are those changes to CIs that are necessary, or which offer significant benefit to the Government [Ref. 15:P. 37]. Such changes are those required to:

1. Correct deficiencies.
2. Make a significant effectiveness change in operational or logistics support requirements.
3. Effect substantial life cycle cost savings.
4. Prevent slippage in an approved production schedule.

MIL-STD-973 presents a more objective check list for the classification of engineering changes. More precisely, an engineering change is classified as Class I when one or more of the four factors listed are affected. Once it has been determined that a change is a Class I, it must be fully justified and documented by the manufacturer. MIL-STD-973 provides a series of applicable justification codes. [Ref. 15:p. 11] After justification and preparation in the format specified by the scope of work, the engineering change is processed through the chain of command. Class I changes have priority assignments with specified time allowances for the processing of more critical changes. An Emergency ECP time allowance is 48 hours; an Urgent is 30 calendar days ; and a Routine is 90 calendar days. [Ref. 15:p. 38]

E. CLASS II ECPs

As applied to the Configuration Control definition, Class I changes are difficult to approve but the easiest to trace. Class II changes are easy to approve but the most difficult to trace. Class II engineering changes are generally defined as those changes which do not fall under the Class I definition. [Ref. 15:p. 50] In other words, any change that is not a Class I is a Class II. An alternative definition might be one that distinguishes a Class II engineering change as having no affect on form, fit, function or cost. All others then would be classified as Class I.

The approval authority for a Class II engineering change is at a much lower level than that for a Class I. The variability in this review is subject to several factors:

1. The number of qualified engineers assigned to the Government Plant Representative office.

2. Time available to perform the review.

3. Talent of the individuals assigned to do the review including their depth of understanding CM objectives.

4. Working relationships between plant representative and contractor engineers.

5. Pressure from program management (both Military and Contractor) to keep changes at the Class II level.

6. Funding constraints. [Ref. 10:p. 29]

Given the loose requirements for approval of Class II changes, it is not surprising that the identification and accounting function is limited in its ability to track these changes and properly document them. The next section describes the current data systems that allow for storage and retrieval of drawings and specifications that support secondary item procurements.

F. ENGINEERING DRAWINGS PLACED ON DISK

The Air Force Logistics Center and Army Materiel Command (AMC) generate, store and use vast numbers of engineering drawings. The B-l bomber alone requires 1.5 million drawings for manufacturing and logistics support. Compounding the problem, each month a typical Logistics Center engineering division produces 35,000 new drawings and fields about 6,500 requests for copies that will be used in competitive procurement, modifications and maintenance. [Ref. 17]

The outdated manual system for managing these data involve millions of punch cards, each containing design information and a 35mm microfilm copy of a drawing. It can take up to six days to locate and copy a single drawing and up to six weeks to locate the multiple drawings needed for procurement [Ref. 17]. The risk of for misplacing or losing a card is high with a manual system. That becomes particularly serious when it affects bid packages assembled for prospective suppliers. If key data are missing, the Military often must "sole source" items rather than submit them for competitive bid. Or request the prime contractor or holder of the original drawing to provide an original copy/reproduction of the missing data.

The Army and the Air Force resolved such problems with an AT&T-designed computer system. Drawings are stored on optical disk, making them easy to update, retrieve, reproduce and transmit electronically. Response time is reduced from days to minutes. The Air Force's engineering data computer-assisted retrieval system has the acronym EDCARS. The Army named its version the digital storage and retrieval engineering data system (DSREDS). The benefits of computer-based image management systems are savings in time, space and money. Studies indicate it takes six hours to revise a typical engineering drawing manually. Computer-based systems can reduce that time to 36 minutes. Access time also improves. With a combination of sophisticated database management techniques and laser precision, the system reads data from its CAL storage disks at rates up to two million bits/sec. [Ref. 17]

The Army and Air Force now are able to automate their parts procurement reducing the need to stockpile spares. It is now easier to compile the multiple bid packages needed for competitive procurements. The Services also save space by replacing bulky files. Each optical disk can store 40 times more data per square inch than a comparable magnetic disk, and thousands of times more data than paper copies or aperture cards. [Ref. 17]

As a result of DoD's efforts to streamline the work processes and reduce operating costs throughout the Army, Air Force, Navy, and DLA, the Joint Engineering Data Management Information and Control System (JEDMICS), an outgrowth of the Engineering Data Management Information and Control System (EDMICS), has been installed at engineering drawing repositories throughout the United States The mission of the JEDMICS Program Management Office (PMO) is to achieve Corporate Information Management (CIM) goals for the Department of Defense (DoD) by creating and maintaining a standard engineering data management system. [Ref. 16] This includes:

1. Acquisition, storage, management and distribution of engineering data in digital form.

2. Support for procurement, operations, modernization, repair construction and logistical requirements. [Ref. 16]

JEDMICS is a direct outgrowth of taskings included in the Secretary of Defense memorandum of August 1983 on Spare Parts Acquisition [Ref. 16]. In that memorandum, the Military Services were directed to standardize their automated engineering data repositories. JEDMICS is an Automated Information System (AIS), which is defined in DoD Directive 5200.28 of 21 March 1988 as an assembly of computer hardware, software and/or firmware configured to collect, create, communicate, compute, disseminate, process, store and/or control data or information. The basic functions of JEDMICS are controlled by software. [Ref. 16] The conversion or migration of data from DSREDS and EDCARS to JEDMICS began in FY 1996 [Ref. 19]. Three Army sites and two Air Force sites are currently migrating their data.

In the Army, Rock Island Arsenal (RIA), CECOM, and MICOM are aggressively pursuing their migration efforts. RIA has finished the migration of its active file of 1.1 million images; CECOM has completed the on-line migration of over 400,000 images; and MICOM is beginning off-line migration in anticipation of receiving the JEDMICS production system. In the Air Force, both Robins Air Force Base, with over 800,000 images migrated, and Tinker Air Force Base, with over 140,000 images migrated, are well on their way towards completing migration of their legacy data. [Ref. 19]

Once the sites have loaded critical data into JEDMICS, opportunities for savings will be realized. The data needed to build TDPs are now available through on-line, concurrent workstation access provided by the client/server architecture of JEDMICS. The next step is to make the system accessible at JEDMICS sites and remote locations to larger user populations to those personnel who perform functions requiring engineering data.

These two complimentary factors, loading and expanding connectivity, are the backbone of the DoD's efforts to streamline the work processes and reduce operating costs [Ref. 19]. Another benefit is the system's ability to accept digital formatted data directly from contractors [Ref. 17]. Because information does not have to be re-entered, time and money will be conserved and the potential for errors reduced. Now that we have stated the purpose, identified and defined the components of CM, and identified the automated system that accesses the data maintained in the CM system, the next section discusses Government's and Industry's viewpoints and attitudes applicable to CM.

G. GOVERNMENT VERSUS INDUSTRY CONFIGURATION MANAGEMENT (CM) VIEWPOINTS

The purpose of Government CM is to ensure the continuing logistics supportability of systems in the inventory. In order for DoD to support and provide spare parts for existing vehicle systems, the Military Services must place strict CM constraints on the configuration baselines. The mechanism that allows the Military Services to do that is the monitoring, reviewing, and approval of Class

I and Class II engineering changes. By reviewing the Class I and Class II definition requirement, it should be noted that significant constraints are placed on qualifying Class II changes. Considerable time and energy are expended by CM managers to categorize an engineering change into a Class II rather than having the change go through the burdensome, tedious and expensive Class I process (refer to Figure 4). In Class IIs, the contractor can sidestep sensitive funding issues, and approval can take a relatively negligible amount of time. On the other hand, a Class I does provide an uncompromised accounting procedure. This accountability is critical when the engineering function is transferred from the manufacturer late in the acquisition process to the Government. With the proliferation of Class II changes and the deficiencies in documentation, the transfer of engineering cognizance is much more problematic [Ref. 24]. A further explanation of the ECP process is presented in Chapter IV, Section D.

In order to obtain Industry's perspective applicable to CM, interviews were conducted with Caterpillar, Freightliner, General Motors, Oshkosh, and Exar (refer to Appendix B for interview questions, Appendix C for interviewees' personal profiles, and Appendix D for company profiles). The information collected from these interviews revealed that three significant differences exist between Industry and Government in CM practices.

The first difference pertains to the maintenance of technical data packages (TDPs). DoD maintains this control through the review and approval of Class I and Class II engineering changes. The key to efficient configuration control is to properly identify the CI and its documentation to the level of supporting uniqueness of the CI [Ref. 20]. Industry believes that DoD requires CM of CIs at too low of a component level and should only be concerned with top assembly drawings. Thus, because of the MIL-STD-973 requirement, drawings and specifications are not only developed for the top assembly drawings, but for the sub-assemblies too. Industry believes that this is not cost efficient since an administrative cost is associated with each CI. [Ref. 59, 60, 61, 62, 63, 67 & 68]

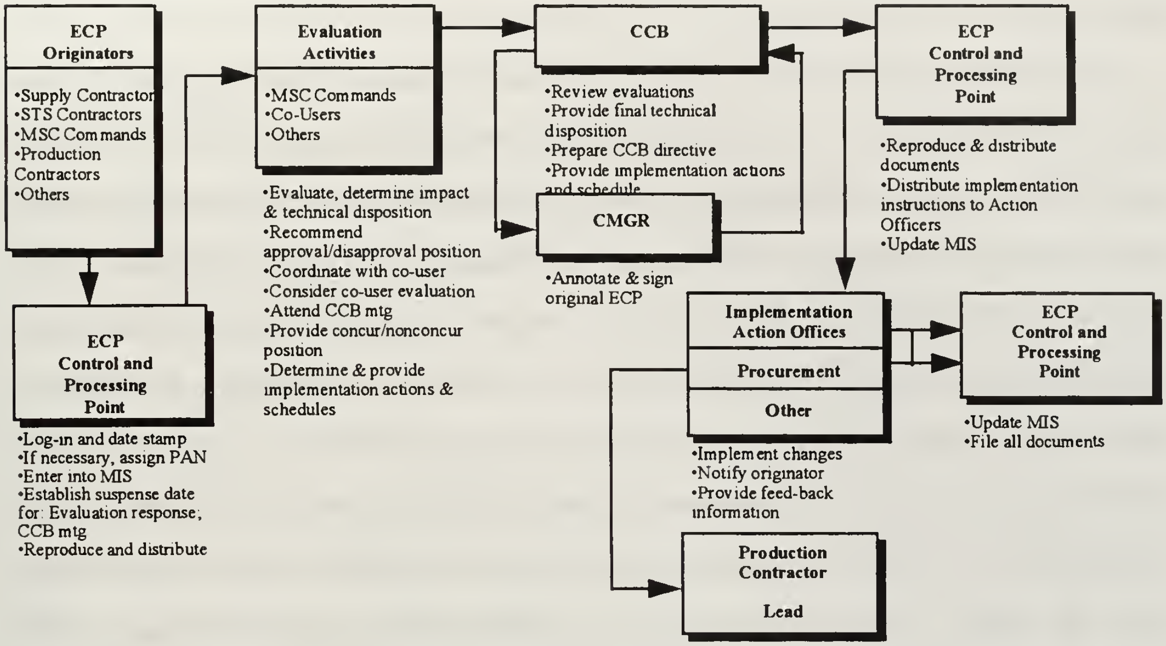

Figure 4. Department of the Army's Engineering Change Proposal Process (Ref. 23)

DoD requires control of sub-level components, which require the generation of drawings and specifications for those components and parts that generates a vast amount of data which requires monitoring and recording. Industry does not agree that this is necessary [Ref. 59, 60, 61, 62, 63, 67 & 68]. Industry states that when a user needs to replace an alternator, he simply needs a new alternator, not the sub-components to that alternator. The Army contends that with the different levels of maintenance, the alternator will be transferred to the next maintenance level for rework. [Ref. 25] At that level, the sub-component drawings are required to assist the trouble-shooting of the alternator.

Another reason for requiring top drawings and specifications and sub-level drawings and specifications, is to allow other buyers or bidders to build from the TDP. This is a significant difference between DoD and Industry. Industry expends all their efforts to manage only top level drawings whereby DoD not only requires top level drawings to procure spare parts, but requires the drawings and specifications several levels below the top level drawing to allow other vendors to manufacture the alternator.

The second difference between DoD and Industry CM viewpoints is the documentation required to maintain a CI. Under Government CM contractual requirements, prime contractors must have the capability of transferring technical data developed during the establishment of the baseline, to the Government. This requires the development of mylars (hard copies), specifications, and electronic data. In many cases, subcontractors and vendors develop component drawings to support top level assembly drawings. These drawings are either Level I or Level II type drawings. To meet contractual requirements, the prime contractor has to convert the Level I or II drawings to conform to Level III drawing format. [Ref. 27:p. 2] Level I or II drawings are envelope drawings that contain little information on the manufacturing processes of that component. However, Level III formatted drawings contain all the necessary information required to allow another entity to produce to the same type of quality and performance parameters of the originator [Ref. 26:p. 3, 4]. DoD substantiates having a Level III drawing requirement by stating that many vendors as well as prime contractor drawings do not convey sufficient information to allow other vendors to manufacturer the component [Ref. 26:p. 3, 4]. According to Industry, contractors devote on average about 50 to 100 percent more time to the preparation of a military drawing than that required for a comparable commercial drawing. One reason is that MIL-STD-100E imposes detailed and defense-unique formats and symbology which are largely incompatible with commercial practices. Industry argues that the Level III drawing requirement does not guarantee that all manufacturing processes and knowledge are conveyed on the drawings or specifications. [Ref. 59, 60, 61, 62, 63, 67 & 68]

The third difference between DoD and Industry is the verification of engineering changes. Under Government contractual agreements, DoD and Industry must perform a visual inspection to verify that the approved change was incorporated into the drawing. This verification is recorded and documented on a DD Form 1694; called the Engineering Review Record (ERR). [Ref. 15:p. 29] Each ERR, which is part of the ECP, shows a graphical representation of the change and the location of the change on the drawing. When approval of the ECP is received, the ERR is returned to the originating contractor for drawing modification. After drawing modification, the contractor notifies the Government representative to review and approve the drawing and ERR. The ERR is then matched with the drawing, and both Government and contractor sign the ERR and the drawing. This completes the engineering change process (refer to Figure 5). Industry considers this procedure time consuming and wasteful. However, DoD considers the check-and-balance a necessary process to ensure changes have been incorporated properly. This is particularly important when the drawing will be required for secondary item procurements, which may not be the same initial developer of the drawing. [Ref. 24]

Another reason for this check-and-balance process is to ensure that the developer/maintainer of the drawing is incorporating changes in a timely manner since there is no guarantee that the next entity will be maintaining the TDP. In several cases, DA has several System Technical Support (STS) contractors whose responsibility is to maintain and update TDPs for the Government. Industry does not spend a significant amount of funding to maintain TDPs in a database. Industry states that in most cases, the TDP does not reflect the actual as-built design that comes-off the assembly line. [Ref. 59, 60, 61, 62, 63, 67 & 68] That is, there can be a three to six month delay in incorporating engineering changes into the drawings and specifications. For instance, the M2M3 high survivability

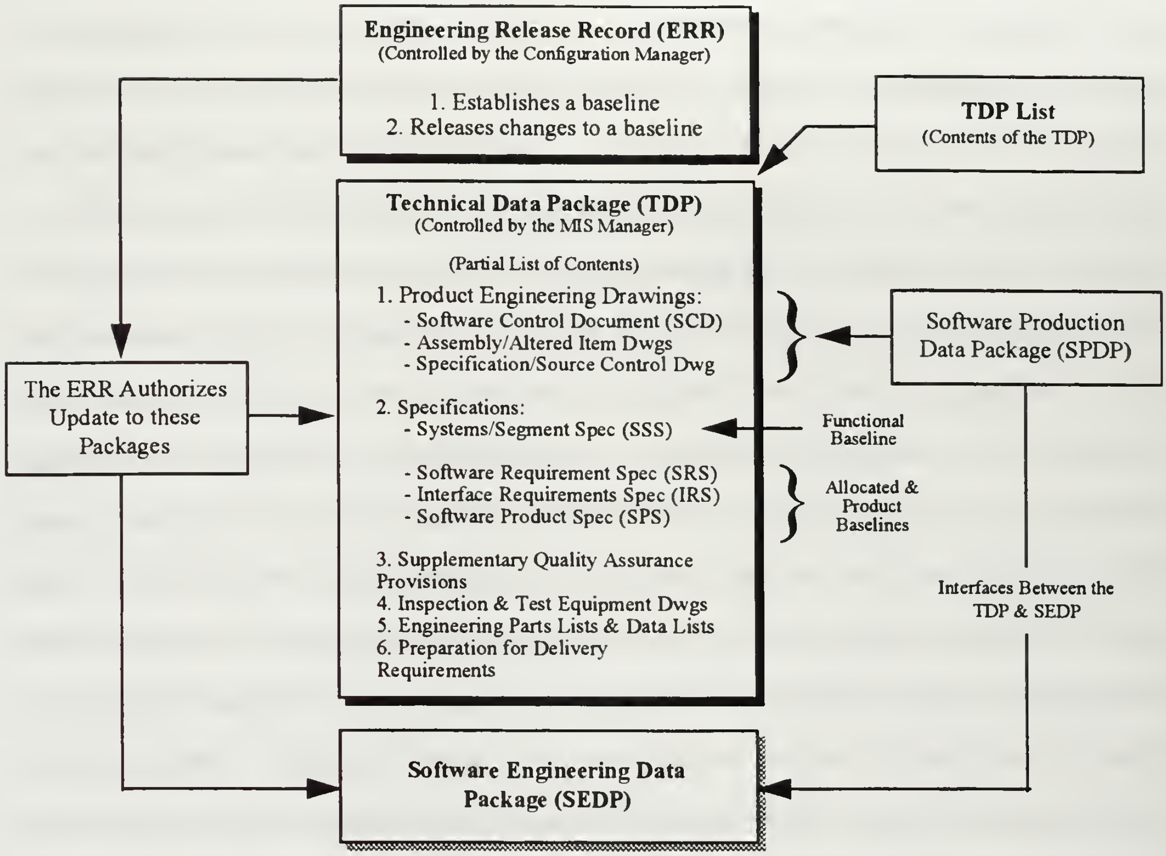

Figure 5. Information that Documents and Releases Baselines & Subsequent Baseline Changes (Ref. 23)

program had a two year Justification and Approval (J&A) for Other Than Full and Open Competition waiver allowing the Contracting Officer to buy spare parts directly from FMC, who was the prime contractor [Ref. 64]. The reason for this justification resulted from the large number of changes to the TDP and the time it took to incorporate those changes into the drawings.

A DoD study performed by Coopers and Lybrand confirms these allegations. The study reported that of the DoD contractual requirements that increased the price paid for goods and services, CM requirements and engineering drawings were two of the top ten cost drivers identified. [Ref. 22:p. 25-26, 31-32]

H. SUMMARY

CM is divided into four elements; identification, control, status accounting, and verification (audit). The objective of CM is to ensure the continuos manufacturing of a part to specific performance, quality, and reliability requirements in future products of the same type. Government and Industry have different viewpoints as to the level of detail. However, with the requirement of using performance specifications in lieu of product specifications, the Government is relinquishing a lot of configuration control to Industry. For further information concerning product versus performance specifications, refer to the Acquisition Reform: Impact of Conversion to Performance and Commercial Specifications/Standards on the Chemical Stockpile Disposal Program, Chapter III, thesis, written by Ms. Sandra S. Crisp, dated June 1996. The next chapter reviews DA's and Industry's spare parts procurement process.

III. SECONDARY ITEM PROCUREMENT

A. BACKGROUND

Since the early 1980s, the Department of Defense (DoD) has undertaken a highly aggressive and successful program directed at reducing secondary item prices and increasing competition among prospective contractors. While recent initiatives have satisfied this overall goal, they have had undesirable side effects. One side effect is to increase Procurement Lead Time, which includes the time required to award a spare parts contract (Administrative Lead Time), and the time to deliver the product (Production Lead Time) [Ref. 29:p. 8]. A 1985 study concluded that Administrative Lead Time (ALT) increased as much as 60 percent at some inventory control points, and has shown dramatic overall growth in all procurement activities. According to the study, it routinely takes almost nine months of administrative processing time to place a spare parts order for wholesale stock. [Ref. 30:p. 1-3]

In a 1989 study that compared Non-DoD and DoD suppliers, two different Procurement Lead Time patterns emerged. For those firms that competed exclusively in Non-DoD markets, Procurement Lead Times ranged from 45 days to approximately one year. ALT of 15 to 30 days were common, while Production Lead Time (PLT) of 30 days to one year were the norm, as indicated in Table 1. For private sector firms that are primarily DoD suppliers, Procurement Lead Times of 150 to 500 days were noted as a typical range. ALT and PLT averaged 90 to 120 days and 150 to 400 days, as indicated in Table 1. In many ways, the DoD suppliers mirrored many of the approaches and practices of DoD. [Ref. 28]

Despite the well-documented benefits of competition and the recent major legislation, ALT has and will continue to increase [Ref. 28]. Price analysis and review, breakout, and other related initiatives, while well-designed and well-intentioned, have clearly increased wholesale ALT and resultant inventory levels

[Ref. 29:p. 10]. The DoD system, in attempting to respond to a multitude of external and internal pressures for improvement in the procurement process has become so cumbersome that lead time management problems have become critical [Ref. 28]. The purpose of this chapter is to define and describe Department of the Army's (DA's) procurement process, identify and describe the various distribution centers and depots, and to analyze DA's and Industry's perspective of secondary item procurements.

	Non-DoD Supplier	DoD Supplier
Mean ALT	30 Days	90 Days
Mean PLT	120 Days	270 Days
Mean Total	150 Days	360 Days

Table 1. Private Sector and DoD Procurement Lead Time Profiles. (Ref. 28)

B. DEFINITIONS

ALT within the Army Materiel Command (AMC) is defined as the time commencing when the Item Manager initiates a Procurement Work Directive (PWD) in support of a secondary item procurement and ends when the contract is signed. It must be noted that the definition for AMC is different from the one espoused by the DoD Office of the Inspector General which believes that ALT should start when the Supply Control Study (SCS) is initiated. [Ref. 31:p. 6] Within the Defense Logistics Agency (DLA), which manages a large quantity of low dollar items, the requirement is generated directly off the automated study and there is seldom any manual intervention or analysis performed. However, within the Army, when a study is prepared, the Item Manager must validate the requirements and asset information in the study. Based on the results of the validated study, the Item Manager will decide whether or not to buy or repair the quantity recommended by the study [Ref. 32]. Many buys identified as required by the SCS are deemed unnecessary during this review process [Ref. 31:p. 6].

ALT consists of two elements: Pre-Procurement Administrative Lead Time (Pre-PALT) and Procurement Administrative Lead Time (PALT). Pre-PALT is that time from initiation of the PWD until received in the office of the Contracting Officer. Pre-PALT, commonly called the "tech loop", encompasses the effort necessary to develop the procurement package for the Contracting Officer. The procurement package consists of the necessary technical data package (TDP) and any additional required data such as packaging and transportation data, testing requirements, technical and requirement justifications (J&As), and statements of urgency. PALT consists of those functions required by the Contracting Officer to put the item on contract, the contract documentation, solicitation, evaluation, and award. [Ref. 31:p. 6]

The Production Lead Time (PLT) begins with the execution of the contract by the Contracting Officer and ends upon receipt of the first significant delivery. Two elements comprise PLT; First Article Test (FAT) and Manufacturing. FAT is not required on every contract but is often required on spare parts and establishes the contractors credentials to manufacture a satisfactory part that meets the requirements of the Government. In most cases, the contractor cannot begin production of the basic quantity until after he has successfully passed the FAT. This element is a significant time factor in delivery of spare parts, which includes the time it takes the contractor to build a minimum quantity to be submitted to the Government, as well as the time required for the Government's testing. [Ref. 31:p. 6]

Forecasting PALT is a key factor in the inventory management process because it helps determine when an order will be placed and the quantity of material [Ref. 28]. As PALT lengthens, safety levels and ordering quantities increase to compensate for the longer processing time that it takes to replenish wholesale inventory stock. The resultant increases in PALT can be viewed as "costs associated with the savings" derived from the process of competition [Ref. 30:p. 11].

C. DEPARTMENT OF THE ARMY'S PROCUREMENT PROCESS

The procurement process, depicted in Figure 6, encompasses all phases related to the acquisition of supplies and services for and by the Army. The process begins at the point when agency needs are established, which includes the description of requirements, solicitation, selection of sources, award of contract, and delivery and distribution of the requested products or services.

The process for identifying the items and quantity of stock originates with the development of the budget request, which is the key to effective inventory management. If too few or none of the items are available to support the forces, readiness suffers and assigned military missions will be jeopardized. On the other hand, if too many items are acquired, then the limited resources available are wasted and unnecessary costs are incurred to manage and maintain the items. [Ref. 32]

The process the Army uses for determining spare and repair parts budget requests is based on data from the budget stratification reports, which show the dollar value and inventory available. When inventory of an item is insufficient to meet the requirements, it is considered to be in a deficit position. [Ref. 32]

The first step in the procurement process is for the Item Manager to develop a comprehensive strategy designed to fill a potential (futuristic) need. This requires that Item Managers pre-determine maintenance requirements and provide a detailed plan to accomplish timely procurements in order to avoid inventory stock depletions. This strategy is called the Supply Control Study (SCS). [Ref. 32] The next phase consists of developing the specification for the requirement, otherwise known as the Procurement Work Directive (PWD). The PWD contains all of the acquisition requirements such as the TDP, potential sources of supply or sole source justifications, proposal evaluation and source selection criteria, contract cost estimates, and the citation of funds to be committed.

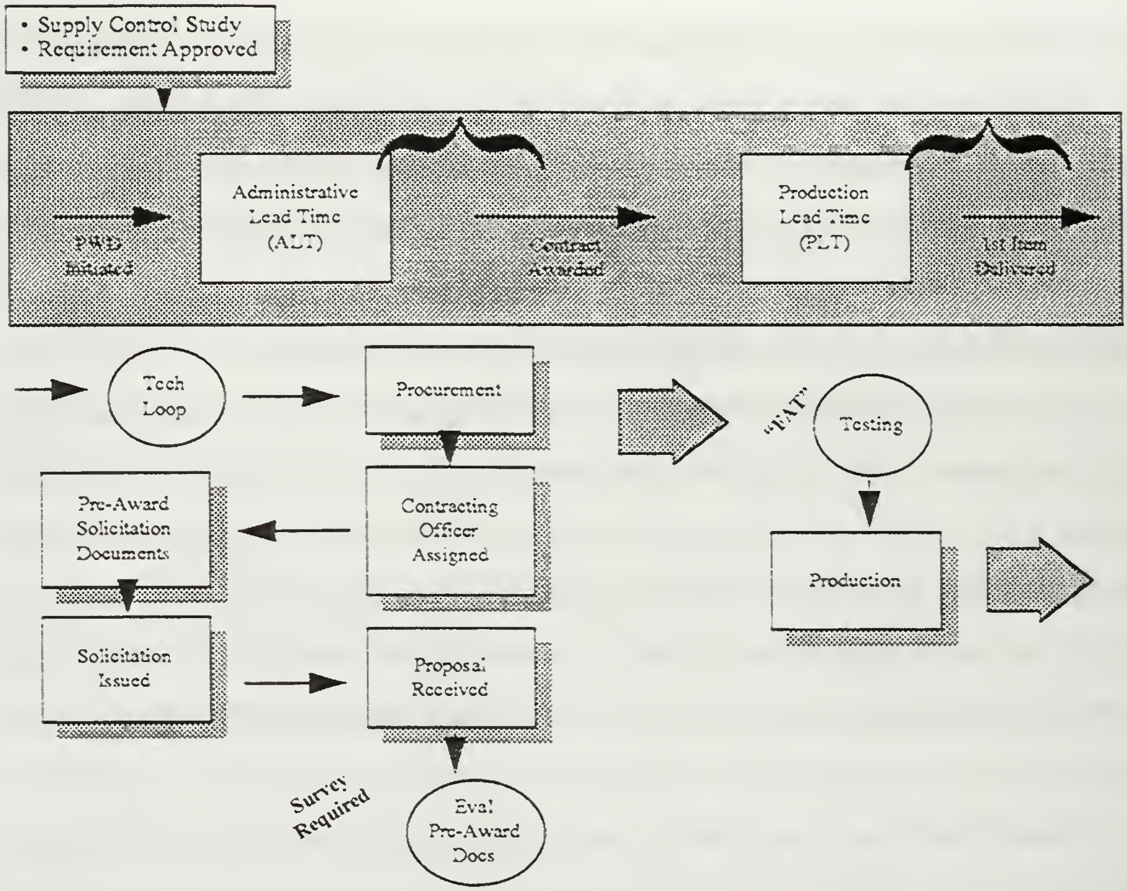

Figure 6. DoA's Secondary Item Procurement Process (Ref. 31)

Once the PWD is received by the Contracting Officer, the procurement plan is developed. Receipt of the PWD marks the beginning of ALT. The PWD is reviewed for accuracy and content and a series of actions performed by the contracting officer's staff to ensure that a product is obtained that meets the requester's needs in a timely manner and at a reasonable cost.

A copy of the PWD is also forwarded to a technical support activity to review and validate the TDP. The purpose of this review and validation is to reduce the risk associated with the transfer of detailed design data from one contractor to another. [Ref. 33] As a minimum, a complete and thorough review and validation consists of:

1. Ensuring that documentation exists for all component parts, subassemblies and end-items.

2. Ensuring documentation conforms to DoD-D-1000 requirements.

3. Identifying sole source, proprietary, and patented items.

4. Performing tolerance analysis to ensure parts manufactured to permissible tolerance extremes fit together.

5. Reviewing material and finish requirements for completeness.

6. Reviewing adequacy of inspection/quality requirements.

7. Identifying restrictive/proprietary processes.

8. Reviewing components for potential obsolescence, high-risk technology, or limited availability. [Ref. 33]

After the TDP has been reviewed and validated, the PWD is forwarded to the Contracting Officer.

At the conclusion of the technical review and detailed planning, the solicitation document is prepared and synopsized in the Commerce Business Daily (CBD). The CBD synopsis is an important part of the process because it announces in advance of the solicitation that the Government is looking for qualified suppliers to fulfill a particular need [Ref. 29:p. 13]. This is the only portion of the procurement process that has a statutory time requirement [Ref. 29:p. 14]. Under current rules, the solicitation document must be published 15 days in advance of its issuance, and the contract cannot be awarded less than 30 days after release of the solicitation document. The solicitation document is issued and reflects all key decisions made in the initial planning stage and culminates in the issuance of either an invitation for bids (IFB) for sealed bid type procurements or request for proposals (RFP) for competitive proposal procurements.

Once the vendors' offers are received, the source selection phase begins. This is the process by which offers from the private sector are weighed by the Government against its stated needs, terms, conditions, and evaluation standards and a contractor is selected. This process includes technical evaluation of the offers, on-site evaluations and pre-award surveys (to determine the technical and financial capabilities of the offerers), and price or cost analysis. [Ref. 37] Under the sealed-bid method of procurement, contractors submit their bids. A public bid opening is held and the responses recorded. Late bids and modifications are handled as appropriate, and the bids are reviewed for mistakes and missing information. [Ref. 37:p. 3-13 through 3-16] The responsiveness of contractors to the IFB is determined, and the lowest priced, responsive, and responsible bidder is identified. Under the competitive proposal procurement method, proposals are received from contractors in response to an RFP. The Contracting Officer determines the competitive range and negotiations take place with the selected offeror for such things as terms and conditions, price, and type of contract. [Ref. 37:p. 4-6 through 4-11] The source selection phase is followed by award of the contract. If the sealed-bid method is utilized, the contract is awarded to the lowest cost, most responsive bidder while under competitive proposal procurement, the contract is awarded to the contractor who proposes the most advantageous offer, price and other factors considered. It is at this point that ALT ends; award of the contract to the successful offeror is synopsized in the CBD, and the contract administration phase of the procurement process commences.

This phase of procurement is not tied to a specific timetable, in that sufficient time must be allowed to enable the prospective contractors to submit bids and proposals and to allow for the orderly processing of the procurement. ALT is an important consideration in the procurement process because excessive administrative time inhibits the contracting officer's ability to award the contract in a timely manner.

Most of the procurement-critical decisions usually occur prior to the start of ALT; since ALT marks the point of transfer of responsibility for the procurement action from the requester (Item Manager) to the Contracting Officer. DLA, Service headquarters, and Inventory Control Points (ICPs) are responsible for managing spare parts inventory. Through their respective Item Managers, DLA and Service ICPs ensure that needed items are available to the operating forces when and where needed. An Item Manager's tasks include determining when to repair or purchase items, positioning them at depots to meet demands and disposing of unneeded items [Ref. 50]. The items managed by DLA and Service Item Managers are stored at depots operated.

When inventory is managed efficiently, enough is stored to meet wartime and peacetime requirements and unnecessary storage costs are avoided. Then the total on-hand and due-in inventory falls to or below a certain level, called the reorder point, ICPs place an order for additional inventory. The reorder point includes items needed to satisfy war reserve requirements and items to be issued during the lead time (the item between when an order is placed and when it is received) [Ref. 50]. In addition, a safety level of inventory is kept on-hand in case of minor interruptions in the resupply process or unpredictable fluctuations in demand. By placing orders when the reorder point is reached, Item Managers ensure that inventory arrives before stock runs out. The next two sections identify and describe the Army's and DLA's secondary item storage and distribution centers.

D. DEPARTMENT OF THE ARMY'S DISTRIBUTION AND DEPOT CENTERS

Department of the Army's (DA's) major command for depot maintenance is the U.S. Army Materiel Command (AMC), located in Alexandria, Virginia. Within AMC, management of specific commodities is performed by major subordinate commands (MSC). The MSCs are Army Aviation and Troop Command (ATCOM), Communications-Electronics Command (CECOM), Missile Command (MICOM), and Tank Automotive and Armament Command (TACOM) (refer to Figure 7). Each MSC translates its depot maintenance requirements and financial resources into organic, interservice, or contractual depot maintenance programs. The MSCs then authorize the Industrial Operations Command (IOC) to execute the maintenance programs in the organic depots. The IOC replaced the former Depot System Command (DESCOM) and the Armament Munitions and Chemical Command (AMCCOM) by merging depots, arsenals and ammunition plants under one MSC. [Ref. 18] Close coordination between the IOC and other MSCs is required to accomplish the planning, budgeting, and execution of maintenance programs.

HQ IOC is located at Rock Island Arsenal (RIA), Rock Island, Illinois. In support of the soldier, IOC depots serve as the direct logistics link to Army units around the world. The maintenance depots have primary responsibility for the maintenance, overhaul, and repair of assigned major Army weapon systems and their components, to include combat vehicles, rotary wing aircraft, tactical/support vehicles, communications-electronics items and ammunition. [Ref. 18]

1. Anniston Army Depot (ANAD)

ANAD is a multi-mission installation which is the only depot capable of performing maintenance on the M1 Abrams and other heavy-tracked combat vehicles. ANAD also performs maintenance on small arms, crew-served weapons, land combat missiles (TOW/TOWII, LCSS, TOW Cobra and Shillelagh) and electro-optics systems. Additionally, Anniston performs maintenance and storage of conventional ammunition, missiles, and chemical munitions which are significant parts of the depot's overall missions and capabilities. [Ref. 35]

2. Corpus Christi Army Depot (CCAD)

This depot is the only aeronautical overhaul and repair facility for the Army. CCAD performs overhaul, repair, modifications, retrofit, and modernization on rotary wing aircraft, engines and components for all U.S. Services and the foreign military sales program. CCAD provides worldwide on-site maintenance services, aircraft crash analysis, lubricating oil analysis, and chemical and metallurgical support. CCAD also serves as the depot training base

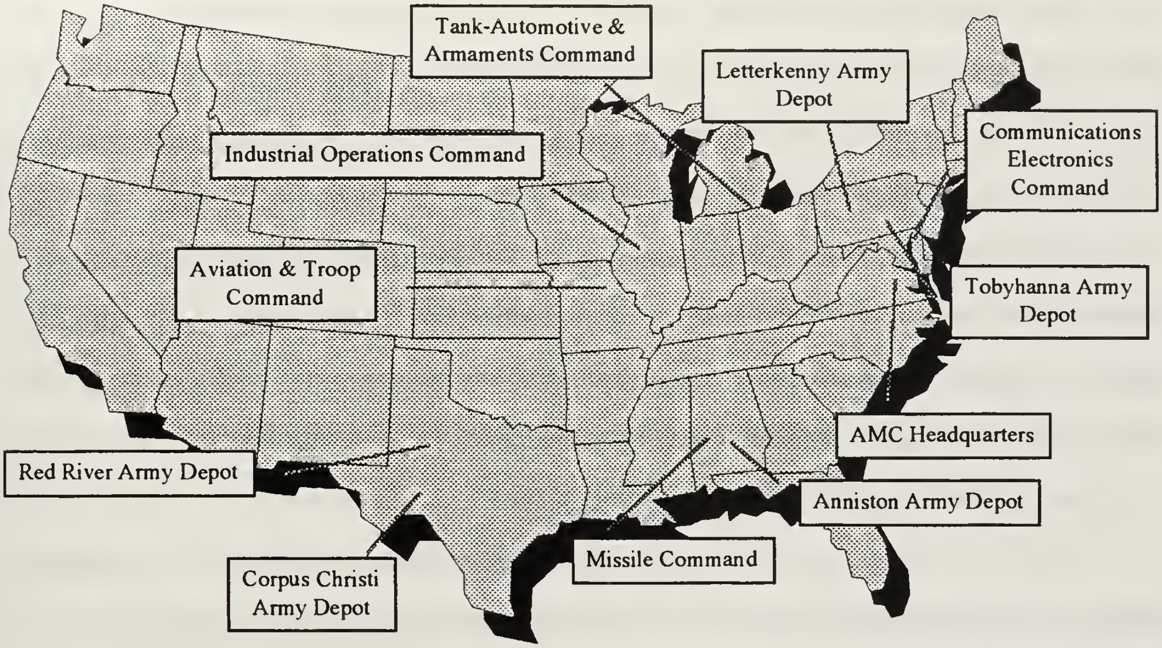

Figure 7. Army Materiel Command's Major Subordinate Commands and Depots (Ref. 35)

for 1,000 active duty, reserve, National Guard, and foreign military personnel annually. CCAD's major weapon system core workload consists of the UH-60A Black Hawk, CH-47D Chinook, AH-64A Apache, OH-58D Kiowa, AH-1W Cobra, SH-60B/F Sea Hawk, and the UH-1 Huey as well. [Ref. 35]

3. Letterkenny Army Depot (LEAD)

The major missions that have evolved at Letterkenny are maintenance, supply, and ammunition. The maintenance mission provides repair, overhaul, and modification and/or conversion of equipment and materiel; modification of tactical missile systems, trucks, combat vehicles, detection systems, muzzle velocity radar, and associated sub-assemblies and support equipment. Other specific responsibilities include HAWK and PATRIOT missile systems, 2 1/2 and 5-ton trucks, self-propelled and towed howitzers, forward area alert radar (FAAR) detection system, and M90 chronograph muzzle velocity radar. [Ref. 35]

The ammunition mission includes receiving, storing, maintaining, and issuing general supplies and ammunition. Depot ammunition operations include all types of class V items from small arms ammunition to large bombs and missiles. Through a Depot Maintenance Interservice Support Agreement, Letterkenny up-rounds Sparrow and Sidewinder missiles and performs wing modifications on Sparrow missiles. Demilitarization of ammunition at LEAD destroys obsolete or hazardous bulk explosives as well as class A, B, and C, ammunition by demolition, burning, or deactivation furnace. [Ref. 35]

4. Red River Army Depot (RRAD)

RRAD is the center for repair and maintenance of much of the Army's tracked and armored fleet of combat vehicles. RRAD also has maintenance and ammunition missions in addition to the responsibility of certifying and monitoring HAWK and Patriot missiles world-wide. The maintenance mission focuses attention on the repair and overhaul of tracked vehicles, with principal programs centered on the M113, the Bradley, and the MLRS. The ammunition mission is located in a 9,000 acre area on the depot which includes more than 700 storage igloos and 17 magazine buildings. Storage activities include both conventional ammunition and various types of missiles, with a value of more than five billion dollars. The depot's HAWK and Patriot mission is conducted by the missile re-certification office, which maintains a field office in Germany and dispatches teams regularly to Army units around the world. [Ref. 35]

5. Tobyhanna Army Depot (TOAD)

TOAD is a communications-electronics maintenance and supply depot. Its mission includes: the receipt, storage, assembly, disassembly, care, preservation, and shipment of materiel as directed by commodity managers; overhaul, rebuild modification, conversion, repair, manufacturing and fabrication of assigned commodities; "quick reaction" fabrication support for the U.S. Armed Forces and other Government agencies; operation of an automatic test and diagnostic equipment programming facility; and mobile maintenance support for the automatic digital network (AUTODIN) facilities in CONUS and overseas. The depot possesses an antenna pattern range, which supports the Army, Navy, Air Force, and Marine Corps radar requirements. As part of its mission the depot also procures transportation and provides storage and related services for movement of DoD household goods of military and civilian personnel in designated areas of Pennsylvania and New Jersey, conducts training for military personnel, and provides support maintenance to satellite organizations and tenant activities. The depot operates a permanent secure 160,000 square foot building to repair, package, ship and store COMSEC materiel. [Ref. 35]

E. DEFENSE LOGISTICS AGENCY'S DISTRIBUTION AND SUPPLY CENTERS

DLA is a combat support agency dedicated to provide worldwide logistics support throughout DoD. Support begins with joint planning with the Services for new weapon system parts, continues through production, and concludes with the disposal of materiel that is obsolete, worn out or no longer needed. [Ref. 34] DLA provides supply support, contract administration services, technical and logistics services to all branches of the military. Headquartered in Fort Belvoir, Virginia, DLA's worldwide logistics mission is performed by 50,700 civilian and military personnel (refer to Figures 8a and 8b).

DLA buys and manages a vast number and variety of items used by all of the military services and some civilian agencies. Commodities include fuel, food, clothing and medical supplies. DLA also buys and distributes hardware and electronic items used in the maintenance of military equipment. [Ref. 34]

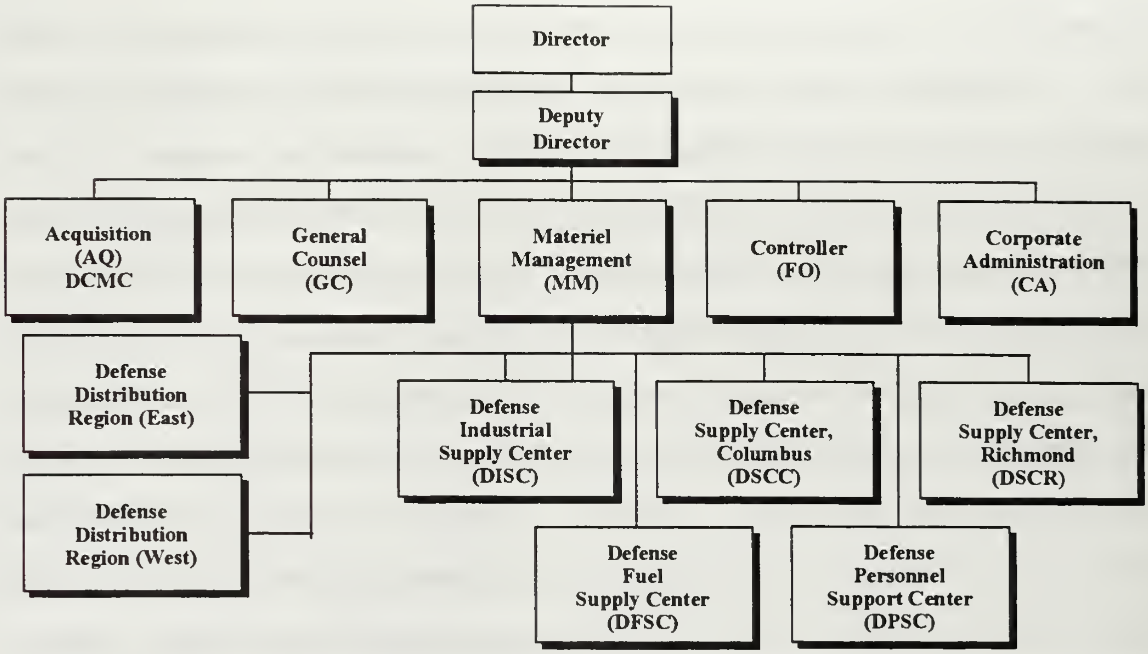

Figure 8a. Defense Logistics Agency Distribution & Supply Centers (Ref. 34)

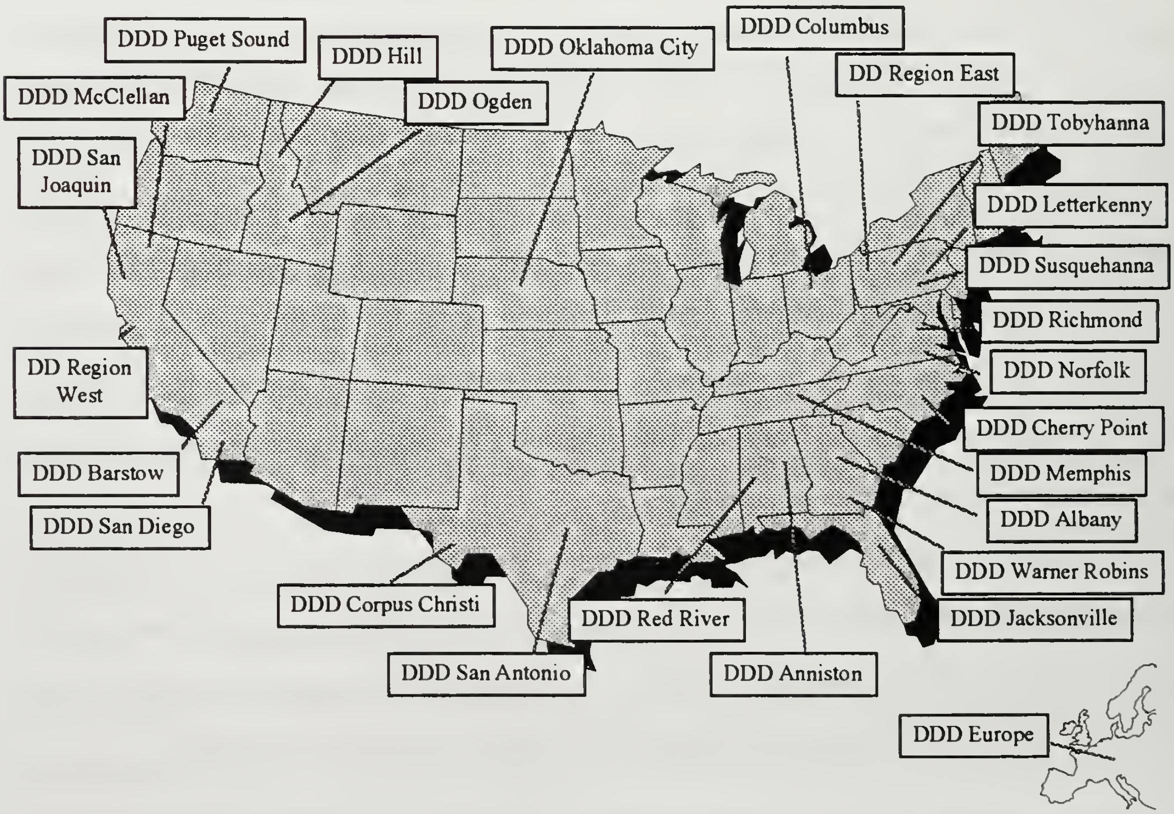

Figure 8b. Defense Logistics Agency Distributions (Ref. 35)

These supply centers consolidate the Services' requirements and procure the supplies in sufficient quantities to meet the Services' projected needs. The function of DLA is critical to maintaining the readiness of all U.S. Armed Forces. The supplies procured by DLA are stored and distributed through a complex of depots. DLA manages supplies in nine commodity areas:

1. Clothing: uniforms, special purpose clothing and clothing-related items such as helmets, canteens and shoes.

2. Construction material: lumber and plumbing accessories to large equipment such as bulldozers and cranes.

3. Electronic supplies: microcircuits, resistors, solenoids, transformers, fiber optic assemblies, radar equipment, remote control systems for guided missiles and electronic countermeasures equipment.

4. Fuel: bulk petroleum, natural gas and coal, fuel via tankers, barge, rail, truck and pipeline used by the Military Services, DoD components and Federal civil agencies.

5. Food: food-fresh, canned, frozen or dehydrated-for use in dining halls and field units and for resale in military commissaries; and must be packaged and transported in a manner that retains its attractiveness and nutritional content.

6. General supplies: material-handling equipment, machine tools, wet-cell batteries and photographic supplies; airborne gyro components and automatic pilot mechanisms.

7. Industrial supplies: bearings, fasteners, rings, metal bars and electrical wire and cable.

8. Medical supplies: drugs and medical, dental and surgical materials used by the military services.

9. Weapon systems support: aircraft and automotive spare parts and components for the armed forces. [Ref. 34]

DLA's five supply centers are the Defense Supply Center, Columbus, Ohio (DSCC); the Defense Fuel Supply Center (DFSC), Fort Belvoir, Virginia; the Defense Supply Center Richmond, Virginia (DSCR); the Defense Industrial Supply Center (DISC), Philadelphia, Pennsylvania; and the Defense Personnel Support Center (DPSC), Philadelphia, Pennsylvania. [Ref. 34]

Consolidation of the distribution functions of the military depots and DLA began in 1990 and completed in March 1992, creating a single, unified supply distribution system managed by DLA. [Ref. 34] The distribution system has two regions; the Defense Distribution Region East, in New Cumberland, Pennsylvania. (DDRE); and the Defense Distribution Region West, in Stockton, California. (DDRW).

The volume of supply items managed by DLA has been growing steadily, in part as a result of new parts used in new weapon systems and because of the Consumable Item Transfer (CIT) program. As directed by Defense Management Report Decision (DMRD) 926, DLA will assume management for one million consumable items from the Military Services. Phase 1 transferred 760,000 between August 1991 and November 1995. Phase 2 projects transfer of up to 152,000 additional items between January 1996 and October 1997. The Office of Secretary of Defense (OSD) transfer decision received 12 July 1994 requires transfer of Phase 2 items be completed by the end of FY 1997.

In November 1989, the Deputy Secretary of Defense directed a review of recommendations for DMRD 926, "Consolidation of Inventory Control Points." One of the recommendations was to transfer all Service managed consumable items to DLA. DMRD 926 maintained DLA could manage the Services' consumable items with less resources than required by the Services, save money, and improve overall efficiency within the Department of Defense. [Ref. 45]

The Services and DLA developed a plan for the transfer of management in two phases. Phase 1 items, an estimated 1 million consumable items, started to transfer in August 1991. By the end of this Phase, in November 1995, 768,000 items were projected to transfer. Phase 1 included routine, less complex consumable supplies and spare parts. The Phase 2 items remained under Service management during Phase 1 because of their application criticality, end item uniqueness or until further evaluation of their intensive management requirements could be accomplished. On 12 July 1994, OSD decided DLA would proceed with Phase 2 of the transfer and take on management of the more technically complex, intensively managed consumable items. Table 2 shows the number of consumable items that have been transferred to DLA the first six months in 1996. When DLA opened its doors, it was managing 1.2 million items. DLA now manages more than 3.2 million of the 4.5 million supply items used by the Military Services. [Ref. 34] When the ongoing transfer of consumable items from the four Military Services is completed, DLA will be managing 90 percent of the military supply items.

Losing Item Manger	**Gaining Supply Center**				
	DSCC Construction Commodity	**DSCC Electronics Commodity**	**DSCR**	**DISC**	**Total**
TACOM	1127	196	1118	1958	4399
MICOM	8	239	74	67	388
AMCCOM	558	486	489	579	2112
CECOM	100	737	385	200	1422
ATCOM	224	188	622	354	1388
OTHER	44	1	143	17	205
Army Total	2061	1847	2831	3175	9914
Air Force Total	4612	2140	23446	2314	32512
Navy Total	4042	279	4695	1693	10709
Marine Total	247	138	226	297	908
Total	10,962	4,404	31,198	7,479	54,043

Table 2. CIT Actual Transfers January - October 1996. (Ref. 39)

Since this thesis concentrates on secondary items, the next three sub-sections describe DLA's centers which support the Army's inventory management efforts.

1. The Defense Industrial Supply Center (DISC)

DISC procures and manages vital industrial hardware items used by U.S. Armed Forces throughout the world. The items purchased by DISC are used in the repair and maintenance of key weapon systems, including the Trident, Patriot and Minuteman III missiles, the Black Hawk and Apache helicopters, the Abrams tank, the Eagle, Hornet and Harrier aircraft, the Ohio and Los Angeles Class submarines, the AEGIS Class cruisers, and the Nimitz Class aircraft carriers, as well as in support of certain National Aeronautics and Space Administration (NASA) programs. [Ref. 34] These include bearings, rope, cable, and fittings, fasteners, hardware, packing and gasket materials, springs and rings, metal bars, sheets and shapes, electrical wire and cable, as well as certain ores, minerals and precious metals. [Ref. 34]

Over one million separate industrial type items are managed and procured by DISC. During FY 1995, over 4.9 million requisitions were received for a monthly average rate of 408,000. Gross sales to the Military Services and other activities during the year were $848 million. DISC made 165,764 procurements awards during FY 1995 for a total value of $479 million. Awards to Small Business totaled $271 million. DISC uses two Defense Distribution Regions that control 24 storage facilities to distribute material to customers worldwide. These facilities distribute material to meet operational readiness needs on a regional and global basis. In FY 1995, 381,000 line items were received at these distribution facilities, accounting for $1.5 billion in inventory.

2. The Defense Supply Center, Columbus (DSCC)

DSCC is now responsible for both the 737,000 line items that DSCC has always managed plus the 1.1 million electronic items that were managed by the

Defense Electronics Supply Center (DESC). These items include items such as lumber, parts, and plumbing accessories to complex repair parts for mechanical and construction equipment, automobiles, military aircraft, ships, submarines, combat vehicles, and missile systems. DSCC is the inventory control point for nearly 700,000 supply items in over 200 commodity classes, with annual sales exceeding $1 billion. [Ref. 34]

3. The Defense Supply Center, Richmond (DSCR)

The product center is the heart of the Defense Supply Center, Richmond organization. Seven product centers were formed as a management team with membership from each of the business directorates--supply, technical, quality and contracting and are located under the Directorate of Business Operations. Each is aligned by commodities and Federal supply classes and contain the first line operational elements responsible for the material management of national stock numbers and accomplishment of the center's basic mission. [Ref. 34]

Product Center One manages 138,700 items in support of military aircraft. Approximately 60 percent of the items managed have been gained for management over the last three years.

Product Center Two manages 115,000 national stock numbers in the following product lines: packaged petroleum products, electrical cable assemblies, shipboard and marine equipment, inspected gages, measuring tools, furniture and utility containers office reproducing, paper and printed sheet products, electrical power and distribution equipment.

Product Center Four manages over 100,000 items in 39 Federal supply classes and 11 Federal supply groups. These items include chemicals and chemical products, electrical and electronic components, safety, fire fighting and rescue equipment. Another major item Product Center Four manages is ozone depleting substances, which include refrigerants, halons, and solvents.

Product Center Five's primary responsibility is batteries and electric motors, but it also handles items such as shipboard and aircraft alarms, railroad signals, electrical brush, and solar powered electric systems.

Product Center Six manages 21 Federal supply classes consisting of various lighting products, food service and refrigeration equipment. With the support of the marketing office, annual sales are project to exceed $5 million.

Product Center Seven is responsible for management of weaponry; material handling equipment; gages-instrumentation; film products; and fabricated products from cradle to grave. This team is actively expanding product lines to support new technologies such as digital imagery in photographic products, lighter but sturdier pallets; and customer brand preference in photographic products and watches.

Product Center Eight manages 69 Federal supply classes in three Federal supply groups; woodworking equipment, metalworking machinery, and specialized industrial equipment, including copiers.

F. INDUSTRY'S INVENTORY AND SUPPLY CENTERS

Appendix D contains a listing of five companies that were used by the researcher to obtain a perspective of Industry's organizational structure that support spare parts. The company's expertise range from automotive to circuit-card manufacturer. The selection was based on the company's ability to manufacture non-defense products that rely upon an integrated logistics system for maintenance and continued operation. Research indicates that each of these companies have complete configuration control of their sub-vendors, as well as their products; require notification of any changes to design or performance; have strict quality standards that are constantly monitored; and have data rights that require either the relinquishments of TDP or identification of other manufactures. Research also indicates that each company has established large inventory and distribution centers to support spare parts requests. Now that the components of the procurement process, the buying agencies, and storage and distribution centers have been identified and defined, the next section discusses Government and Industry viewpoints applicable to spare parts procurements.

G. GOVERNMENT VERSUS INDUSTRY SECONDARY ITEM PROCUREMENT VIEWPOINTS

By comparison to DoD, leading private sector firms places a greater emphasis on time-sensitive procurement and materials management systems. Recognizing the relationship of lead time management to profitability and long-term market success, the just-in-time (JIT) concept has facilitated this effort. The fundamental principle of JIT is the concept of producing products only as needed or on demand [Ref. 54]. This implies that product is not held in inventory, and production is only initiated by demand. Adopting the produce-on-demand concept will ensure that only materials that are needed are processed and that labor will be expended only on goods that will be shipped to a customer. At the end of the production cycle, there would be no excess inventory. The inherent nature of these strategies mandate active lead time management. [Ref. 28]

In 1989, George Stark argued that time represented the next competitive battleground in the international marketplace. Further, he noted that Japanese firms had already begun to emphasize time management in the responsiveness and flexibility of their operating systems and corporate strategies. [Ref. 36:p. 41-51]

Most of the recent policy initiatives in DoD acquisition have focused almost exclusively on specific deficiencies and operating problems in the basic procurement process viewed in isolation [Ref. 28]. The negative impact of these acquisition initiatives on other elements of the DoD logistics system, and on total long-term cost to the taxpayer, has received much less attention. Further, when viewed in the context of the significant revolution in logistics management strategy that has occurred in the private sector during the 1980s, these initiatives are moving DoD in a direction that is essentially opposite to that of most successful private sector logistics systems [Ref. 28]. In these systems, horizontal management philosophies, with joint goal-setting and performance measurement across functions, along with active lead time management, have become a standard. As DoD lead times increase, inventory managers often seek to compensate by increasing the investment in safety levels and to reduce workload by increasing order quantities for inventory replenishment [Ref. 32]. However, with increasing lead times, the risks of higher safety levels and larger order quantities are more substantial because demand forecasting is typically less accurate [Ref. 28]. GAO reports that, "accumulation of unneeded inventories is the inevitable result." [Ref. 32]

Beginning in the 1980's, many private sector firms have been moving aggressively to drive down processing times throughout their logistics systems to reduce operating costs, increase flexibility, and improve customer service. For these firms, Production Lead Time (PLT) represents a key processing element that is central to the effective operation of their materials management system. While private sector trends in PLT have received a good deal of management attention, but DoD lead time trends have been largely neglected [Ref. 28]. Two major factors are related to these trends. First, market conditions for selected items increased production lead times not only for DoD but also for many private sector firms, as indicated in Table 3. This translation means that commodity type influences the Procurement Lead Times experienced by DoD wholesale managers.

	Aviation Parts	Heavy Equipment	Consumables
Mean ALT	276 Days	212 Days	156 Days
Mean PLT	529 Days	459 Days	202 Days
Mean Total	805 Days	459 Days	358 Days

Table 3. DoD Procurement Lead Time Commodity Profiles. (Ref. 28)

Second, substantial growth is clear in the Administrative Lead Time (ALT), and much of this increase can be related to the increased processing requirements of Competition In Contracting Act (CICA) based initiatives. When CICA was approved by Congress and implemented by the four Services in 1984, Procurement Lead Time increased by more than 42 percent, as indicated in Table 4.

	1983	1984	1985	1986	1987	1988
ALT	125	132	160	201	270	255
PLT	392	399	436	448	452	482
Total	517	531	596	649	722	737

Table 4. DoD Procurement Lead Time Trends (Ref. 28)

In addition to the direct inventory investment costs associated with longer or more variable Procurement Lead Times, there is the indirect cost related to the problem of demand forecasting. With administrative lead times of approximately one year and production lead times of one to two years, the typical DoD Item Manager is generally forced to forecast demand for a specific secondary item as it will exist some two to three years in the future. The level of accuracy in such demand forecasts is unlikely accurate and, indeed, most DoD secondary item demand forecasting systems have extreme difficulty in accurately predicting demand over this lengthy time horizon. Poor forecast accuracy further increases inventory investment in safety levels in most systems because it increases the standard error in the demand forecast which is used to develop safety level requirements. [Ref. 28]

As a reaction to long and growing production lead times, many DoD Item Managers have chosen to increase the quantity of material ordered in an effort to reduce the procurement workload [Ref. 28]. Routinely, buying larger quantities of material several years in advance of the projected requirement introduces a significant risk with respect to unusable inventories, when the high degree of demand volatility common to many DoD secondary items is recognized. Finally, lengthy Procurement Lead Times also reduce the ability of the logistics system to respond to other changes, such as reduction in funding, shifts in program priorities, operational changes, emerging technologies, in the support environment.

Companies that have successfully established a lead time management program actively negotiate lead times with prospective suppliers typically making lead time a competitive variable in solicitations. [Ref. 28, 51, 52, 53, 54, & 55] The DoD inventory management and procurement systems, however, typically accept variable Procurement Lead Time as a given, and lead time reduction is seen as the responsibility of neither the Item Manager nor the Contracting Officer [Ref. 28]. In fact, past contract delivery dates are often used to establish required delivery dates for future procurement actions [Ref. 39:p. 127-135]. With extended lead times routinely accepted, and product quality dictated by item specifications, the DoD procurement process thus concentrates almost exclusively on price as the sole factor in award decisions--usually resulting in a higher overall cost [Ref. 28].

Based on a 1995 survey, the objective of many successful private sector firms are to minimize administrative lead times in the reordering process. Suppliers are competitively evaluated as a part of the sourcing process. Once qualified, efficient order processing procedures and systems are established to allow the rapid transmission of routine orders to the qualified suppliers. Business may be rotated on some agreed basis or may be guaranteed to the supplier or suppliers that were selected through competitive sourcing. [Ref. 28]

DoD generally treats each secondary item procurement (PWD) as a “cold start" process and begins action only after the reorder point is reached and a specific buy requirement is identified. In this sequential process, the validation of technical data, sourcing, and award decision all contribute to the long administrative lead times observed.

The survey further indicates that unlike their DoD counterpart, private sector firms that have successfully reduced Procurement Lead Times use a wider range of tailored buying methods [Ref. 28]. In some instances, these tailored buying methods are highly automated and standardized and involve the electronic transmission of purchase orders. In other cases, where market structure, technical requirements, and other factors limit the number of potential vendors, the private sector firm may buy from a single supplier under long-term contracts. [Ref. 51, 52, 53, 54, & 55] The common element in all these approaches is that the buying method used is geared directly to the market in which the item is purchased.

The DoD secondary item procurement process generally determines the appropriate buying method based primarily on the dollar-value of the procurement. The use of tailored, innovative buying approaches linked to the market or to the item's characteristics traditionally have been the exception rather than the rule.

Finally, the survey revealed a significant difference in the basic supplier relations practiced in private sector firms that had successfully reduced Procurement Lead Times. Information regarding anticipated demand, maintenance plans, and stocking policies are routinely exchanged in order to reduce uncertainty and to allow efficient material planning by both the supplier and the buyer. Simultaneously, supplier performance is closely monitored and evaluated. In addition, contract incentives are used aggressively to manage suppliers. [Ref. 53, 54, & 55]

In comparison with the private sector, DoD's relationship with suppliers is less open, and is only active during the contract period. At the same time, these relationships are also highly competitive in terms of performance and long-term benefits, especially since the reduction of available resources for DoD acquisitions.

H. SUMMARY

The establishment of an active Procurement Lead Time management program within DoD is vital to effective materials management. The program must incorporate the precept that only through joint action in both inventory management and procurement can any substantive improvements be achieved. Challenging the basic ways of doing business within DoD will require greater flexibility and focus in inventory management and procurement.

In private sector firms where such a lead time management effort has been successful, the single common ingredient is high profile, active involvement by top management. There are a number of central policy and procedural themes that characterize these firms, but it is the motivation and guidance from the executive level that dictates success--not specific program structure. [Ref. 28]

Defense contractors are in business to make a profit. Profit regulated business arrangements necessitate an ongoing search for cost saving methods and efficient manufacturing techniques which include state-of-the-art technology. Efficiency and flexibility are the name of the game for keeping pace with changing priorities. The next chapter reviews Government initiatives adopted by the Army to emulate commercial practices in buying spare parts.

IV. ANALYSIS

A. ANALYSIS METHODOLOGY

The analysis chapter divides into two areas. The first area analyzes the Configuration Management (CM) change process applicable to processing Engineering Change Proposals (ECPs) across the Army Materiel Command (AMC). The purpose is to analyze whether the Major Subordinate Commands (MSCs) CM processes are operating within established operating procedures and standards. Research shows that 90 to 95 percent of ECPs are processed within 60 to 90 days, utilizing an automated CM system that reduces ECP processing time 60 to 75 percent and Technical Data Package (TDP) validation by 67 percent. The research also shows that program events stimulate the submissions of ECPs after a Milestone III (MSIII) decision. The first area of analysis also answers the subsidiary question, "What is CM and its purpose?" The Army Materiel Systems Analysis Activity (AMSAA) and the researcher developed the data used to support this analysis (refer to Reference 40 and Appendix G, Point of Contact List).

The second area analyzes the procurement process of four MSCs and three DLA centers. The purpose is to analyze MSC's procurement process to determine whether acquisition reform and streamlining initiatives can reduce Administrative Lead Time and Production Lead Time (ALT/PLT) and incorporate commercial practices to save dollars. Research shows that ALT/PLT across AMC has been reduced by 47 percent, and that acquisition streamlining initiatives have been implemented to accomplish a 50 percent ALT/PLT reduction by Fiscal Year (FY) 2000. Research also shows the nature of the commodity is the most significant factor in determining the method used to buy a particular item; if the item can be procured competitively, and that the time to procure competitive and non-competitive items are similar. The second area of analysis also provides analysis to answer the subsidiary questions, "What are the policies that govern, shape and dictate secondary item procurements?" and "Are there better ways to support secondary item procurements?" A Process Action Team and the researcher developed the data used to support this analysis (refer to Reference 45 and Appendix G, Point of Contact List).

B. CONFIGURATION CHANGE PROCESS

In June 1996, AMC tasked AMSAA to develop a Functional Area Assessment (FAA) to be presented to the Vice Chief of the Army in February 1997 [Ref. 69]. The FAA's over-arching focus was on three specific processes: contracting, test and evaluation, and science and technology. Relating to this thesis, the FAA is comprised of two issues. The first issue examined the efficiency of the Government review and management process for ECPs, Request For Deviations and Waivers (RFDs/Ws), and the extent of automation utilized in the CM functions. The second issue examined why numerous ECPs are generated against post MSIIIA/III configurations.

The FAA evaluated over 60,000 ECPs/RFDs/Ws processed by the Major Subordinate Commands (MSCs) and Project/Program Manager Offices (PMOs) across AMC. In the interest of this thesis, only ECPs will be discussed.

MSCs generally record ECP information on the weapon system over which they have CM control. Transfer of CM control from the development contractor to the MSC usually begins sometime after the MSIII production decision and often after the first production lot is completed. As a general rule, MSCs receive ECP data from the prime contractor after the start of production [Ref. 40]. These data are the baselines or "blueprints" of the weapon system. These include military specifications and standards; detailed manufacturing drawings; manufacturing processes; and detailed inspection procedures, test equipment and gage designs developed during the Concept, Evaluation and Demonstration (CED), and Demonstration and Validation (Dem/Val) phases of the weapon system. Chapter

II, Section G discussed the importance of ECP classification. However, efforts required to develop an ECP were not discussed.

Product engineers are impacted strongly by MIL-STD-973, as they must devote considerable effort to analyzing and documenting manufacturing or performance problems, including field failures, which may require an ECP. These efforts include the design, implementation, and documentation of special diagnostic tests. Proposed corrective actions are subject to similar analysis and testing. To obtain approval of an ECP, engineers must submit a comprehensive proposal that justifies the proposal change and the corrective action; analyzes its potential impact on other system elements; and estimates the cost implications of the proposed change. Through every step of this process, engineers must interact and consult with on-sight Defense Contract Management Command (DCMC) personnel, who frequently review the ECPs and make recommendations to the PMO. Because of this interaction, manufacturing concepts and design analysis data are recorded, documented, and later transformed into drawings, specifications and standards, which are incorporated into the TDP. Without the strict requirement of MIL-STD-973, manufacturing processes would not be captured which were used in developing the weapon system. Later reconstruction of this information can be either very costly (reverse engineering), or even impossible because of the loss of key company personnel. On 29 June 1994, Defense Secretary William Perry directed the Military Services and the Defense agencies to stop using Military-unique specifications and standards and to rely instead on commercial and performance standards whenever possible. The researcher believes that this is the wrong direction for DoD's CM efforts. In accordance with the Standards Improvement Council, the following is designated as the definition for a performance specification:

> A performance specification states requirements in terms of the required results with criteria for verifying compliance, but without stating the methods for achieving the required results. A performance specification

> defines the functional requirements for the item, the environment in which it must operate, and interface and interchangeability characteristics. [Ref. 56]

DoD objectives in requiring the use of performance specifications are to (1) remove barriers that prevent Industry from making full use of commercial products, practices and processes; (2) eliminate non-value-added requirements which are not essential to the design and/or production of an item; and (3) encourage contractor configuration control of detailed product engineering drawings [Ref. 55]. The justification for the detailed, Government-controlled product TDP has been to assure the quality of the product; to provide configuration control; to achieve part standardization; and to support competitive procurement of the item and its spare parts. Industry argues that this "build to print" philosophy requires a high level of technical and contract administration activity by both the contractor and the Government; offers little opportunity or incentive for the contractor to improve either the product or manufacturing process; and, therefore, limits cost reduction opportunities [Ref. 59, 60, 61, 62, 63, 67 & 68]. As a result of these traditional practices, these product TDPs consume many resources to control and incorporate engineering changes and to operate technical data repositories. The TDPs also represent obsolete technology in many instances. For these reasons, Secretary Perry has shifted DoD's emphasis on acquiring materiel through the use of TDPs based on performance, form, fit and function and avoid the use of detailed product ("build to print") TDPs [Ref. 55]. This approach allows greater flexibility in the design and manufacturing of weapon systems and has proven to provide better, more cost effective products. Further, only data needed for competition are acquired. Commercial drawing formats are encouraged, and the contractor maintains all the technical data throughout the contract, resulting in a cost savings to the Army by reducing in-house resources needed to maintain the TDPs. However, this concept is not part of the strategy Industry uses to operate successful companies. For instance, during a recent visit by Government executives to the Saturn automobile plant, it was clear that the Saturn management relies heavily on tough specifications and standards and supplier oversight to procure and build quality hardware. Their use of stringent specifications and standards, along with good supplier control, has allowed them to produce vehicles that are Customer Satisfaction Index rated only second to the top-of-the-line Lexus and Infiniti. [Ref. 57] Also Exar, a circuit card manufacturer, developed a manual that is given to their suppliers called the "Manual For Supplier Partnerships Towards Excellence." Exar's objective is to achieve the highest quality materials and services delivered on time, with the lowest cycle times and minimum inventory levels, at the lowest total cost of ownership. The company's vision stipulates the following:

> In our relentless drive to zero defects, Exar employees, using a process of continuous improvement, will accept from suppliers and deliver to customers, goods and services that meet or exceed agreed requirements.

General Motors Service Parts Operations (SPO) has complete CM control of their TDPs. That is, all drawings, specifications and standards that describe the form, fit and function of their automobiles are controlled by SPO. SPO establishes alliances with all of their 3,500 suppliers and stipulate that GM TDPs are to be used to support manufacturing and spare parts procurement and are not to be shared with other manufacturers. Engineers follow criteria stipulated in the "Design Book" which describes in detail conditions for accepting any changes received from their supplier that affect GM parts [Ref. 59]. These are the same criteria that the Government uses in approving their changes. All cost changes are elevated to upper management for evaluation and approval. These are only but a few examples where successful companies have developed strict specifications and standards to control their suppliers in providing quality products. This also substantiates that DoD is moving in the wrong direction in allowing Defense contractors the flexibility of manufacturing spare parts for weapon systems. This could be an area of further research.

Another complaint from Industry is that DoD does a bad job processing ECPs in a timely manner [Ref. 59, 60, 61, 62, 63, 67 & 68]. In reviewing this allegation, issues plotted were ECP processing time and classification (Class I or Class II) derived from the FAA. In addition, program event dates were superimposed upon a timeline plot of ECP submissions to identify influxes of ECPs that might be attributable to particular program events.

The current generic ECP process is outlined in MIL-STD-973 and illustrated in Figure 9 (this is a simplified version of the ECP process that was previously depicted in Figure 4). In most cases, ECPs originated by contractors are first evaluated internally to determine their worth and suitability for submission to the Government. If internally approved, they are submitted to the local Defense Contract Management Command (DCMC) office for endorsement and concurrence in classification. They are then sent to the appropriate Government configuration control office and point of contact (POC) to begin Government evaluation and processing. Government generated ECPs also begin processing at this point (refer to Chapter II, Figure 4).

The CM control POC is usually an engineer who performs the initial review of the ECP for completeness, as well as appropriateness of the proposed change. At this stage, an ECP could be rejected or returned to the originator for additional information. Accepted ECPs are forwarded to the item/system Configuration Control Board (CCB) members for functional area review and evaluation. Each ECP is evaluated for implementation costs, resultant benefits, functional area impacts, and system performance impacts. All ECPs are evaluated for both implicit and explicit impacts to system performance. Such impacts could be the cause for rejection. Additional testing may be required to verify that performance requirements are still met.

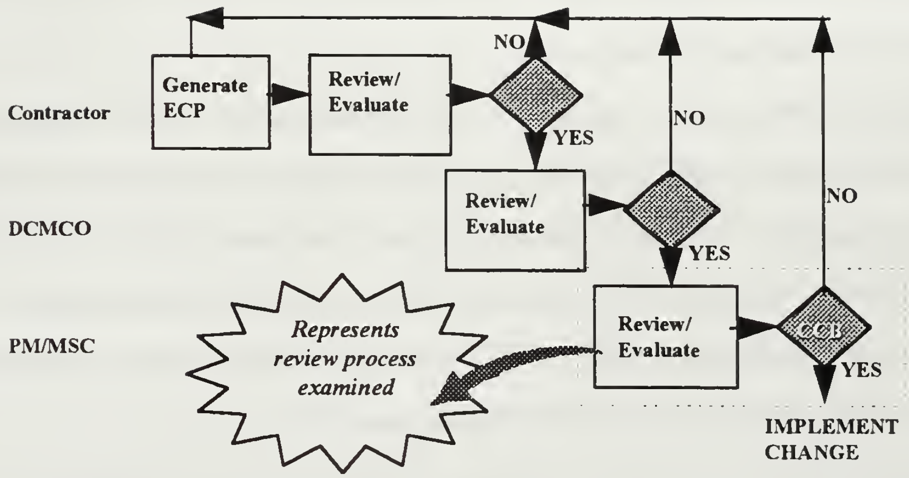

Figure 9: ECP Process

A CCB meeting is held to discuss the proposed change and all members present their views at that time. The CCB chairman has ultimate authority for approval, despite the fact that one or more functional area CCB members may recommend disapproval. A CCB Directive results from the meeting. The Directive records the CCB decision, planned implementation date, implementation actions, and designated parties responsible for taking the required actions. [Ref. 40]

MIL-STD-973 outlines the goals for the timely processing of ECPs. These goals are used by most MSCs and AMC to judge their performance. The MIL-STD-973 goals are summarized in Table 5 along with AMC's performance data. Although the results indicate that AMC generally does not respond as quickly as recommended by MIL-STD-973, they are processing 90-95 percent of their ECPs/RFDs/Ws within a 60-90 day period. Processing time was calculated by subtracting the Government receipt date from the CCB decision date for each action.

These data do not substantiate Industry's complaint of ECPs not being processed in a timely manner. In addition, the FAA results show that 51 percent of the ECPs reviewed are Class II. The researcher recommends that formal Government review of Class II ECPs be eliminated. There is little benefit gained by reviewing these types of actions through a formal CCB since they should not affect form, fit, function or performance. PMOs should rely on DCMC authority for review and approval of these actions.

Therefore, in summarizing the Configuration Change Process and relating all the data and analysis that have been gathered, CM is the process that identifies, controls, reports and records, and verifies a TDP that describes the form, fit and function of an item. Its purpose is to develop TDPs that identify the configuration to the lowest level of assembly to ensure continuos performance, quality, and reliability in future products of the same. The Government must either have strict Military specifications and standards in place to guarantee the development and control of data required to procure spare parts or relinquish that control to the contractors. The researcher feels that if MIL-STD-973 is not stipulated in Defense contracts, CM functions will not be adequate to produce the data required to support secondary item procurements.

Change Type	Priority Code	Avg. Processing Time (days)	MIL-STD-973
ECP	Emergency	24.1	48 hrs
	Urgent	39.8	30 cal days
	Routine	41.1	90 cal days

Table 5. Summary of AMC's Processing of ECPs (Ref. 15)

C. AUTOMATION OF CONFIGURATION MANAGEMENT FUNCTIONS

Most MSCs use some type of Personal Computer-based system to track ECP processing. All MSCs use a manual process for the review and evaluation of ECPs during the CCB process, and two MSCs (MICOM and TACOM-ARDEC) are developing software to automate some or all of this process. [Ref. 40]

MICOM has developed the Multi-User Engineering change proposal Automated Review System (MEARS) and ARDEC is in the process of creating ECP Tracker. Both systems allow for on-line creation, submission, CCB review and evaluation, and decision recording of ECPs. The greatest potential savings to be realized from these systems are reductions in submission and CCB review/evaluation times. [Ref. 40]

MICOM's MEARS system has been implemented by selected PMs and it is forecasted that a 60-75 percent processing time reduction will be realized. PM Patriot has reported a $250,000 savings just through elimination of paper in the first year alone. [Ref. 40] The ARDEC ECP Tracker system will interface with TD/CMS once development is completed. In addition, ARDEC utilizes other automated CM systems such as the Computer Aided Requirement which has reduced processing of TDPs from 180 to 30 days, reduced their manpower required to process TDPs by 55 percent, and reduced the error rate from 33 percent to .08 percent. [Ref. 40] See Figure 10 for a summary of these automated systems and associated efficiencies.

Data show that automation enhances the ECP process by updating drawings, specifications and standards in a real-time scenario. This gives Government and Industry engineers the capability to assess ECPs against configuration baselines to ensure all interface installations and assemblies (electrical and mechanical) have been properly identified and accounted for. This results in TDPs being properly updated to reflect changes and allows the consistency of maintaining quality assurance between product baseline changes. This also ensures that TDPs used to buy spare parts are to the latest version and reflect what is being produced on the production line. This is critical since assessments made on changed items includes the determination of whether to use the part until exhausted or whether to replace the part completely. This analysis is

✓ **Current ECP/Waiver/Deviation process utilized by most of the MSCs is manual.**

✓ **Two MSCs (MICOM & TACOM-ARDEC) currently using or planning to use automation for ECP tracking.**

✓ **No consistency or standard among commands**

MICOM (MEARS)

- **Automates the generation, submission, review, and decision for ECPs/Waivers/Deviations**
- **Implemented at selected MICOM PM offices (Patriot, MLRS, ATACMS/BAT, TMDE & Air to Ground Hellfire)**
- **50% to 70% reduction in-house review time.**
- **Patriot reported first year savings of $250,000 in paper elimination alone.**

TACOM-ARDEC

- **Computer Aided Requirement System - interactive system which routes, updates, tracks TDP through Configuration Process .**
    - **Reduced TDP processing time - 180 to 30 days**
    - **Reduced Tech data manpower required to process TDP - 195 to 103**
    - **Error rate reduced - 33% to .08%**
- **CM Status Accounting (CMSAS) - database which augments TD/CMS-E by providing a means to generate supplementary MS tracking.**
- **ECP Tracker - being developed. Provides all functionality presently furnished by CMSAS while functioning as a completely interactive ECP generation, routing and tracking system.**
- **Tech data CM System (TD/CMS) - tailored DataBase system designed to facilitate the generation bid package file and its continuous verification.**

Figure 10: Manual versus Automation of CM Functions

critical since ECP approvals impact spare parts inventory. The Government has implemented a standardization program that prevents the introduction of new parts that perform the same function. However, the use of performance specifications to buy spare parts would reverse the intent of this program. Since performance specifications only emphasizes the form, fit and function of a specified requirement, there is the chance that several different parts can be purchased that meet the same specific requirement. This translates to the possibility that the inventory logistics system could be inundated with the tracking and managing of numerous parts that function the same. When asked, "How to do logistics support when buying to performance specifications?" and "How to limit proliferation of spare parts that meet the same performance requirements?", the Standards Improvement Council simply state that logistic support should be inserted in procurement contracts as a performance requirement, thereby placing the burden on the contractor [Ref. 56]. This is the wrong approach in resolving logistics issues and is simply “passing the buck”. One way that this may work is if the contractor is given total logistics support responsibility. This includes all levels of maintenance and spare parts support. This is an area for further research.

D. ECPs SUBMITTED AGAINST PRODUCTION BASELINES

In order to examine and analyze the impacts of production baseline ECP application to secondary item procurements, one must first review the previous DoDI 5000.2 policy and compare it to the new DoD 5000.2-R policy called the Mandatory Procedures for Major Defense Acquisition Programs (MDAPs) and Major Automation Information System (MAIS) Acquisition Programs.

DoDI 5000.2 outlined the general acquisition development process for weapon systems. The Early User Test and Evaluation (EUTE) is performed during Program Definition and Risk Reduction on early prototypes to gather early operational assessment data to support the Milestone (MS) II decision. [Ref. 40] Following the EUTE, a series of Developmental Tests (DTs) and Operational Tests (OTs) are performed during Engineering and Manufacturing Development (EMD), as well as the Initial Operational Test and Evaluation (IOTE) utilizing EMD prototypes. IOTE is performed to assess all system components under realistic conditions with typical users. Product Qualification Tests (PQTs) usually are performed during Low Rate Initial Production (LRIP). A Follow-on Operational Test and Evaluation (FOTE) is performed early in Production to verify correction of deficiencies discovered during IOTE or additional data are gathered. [Ref. 40]

Five programs were examined and the findings indicated that ECPs submitted during early production are normally caused by one of two reasons:

- Correction of deficiencies found during IOTE/FOTE and/or PQT
- Producibility/Cost Reduction improvements

Figure 11 shows a typical weapon system during its life cycle development. ECPs generated against this particular system were superimposed on a timeline of events. The graph in the figure indicates a large number of ECPs were generated against the system after the LRIP (MSIIIA) decision. The PMO attributed these occurrences largely to the fact that Serial Engineering as opposed to Concurrent Engineering was utilized [Ref. 40]. Concurrent Engineering allows simultaneous development and prove-out of production processes with design development. To accomplish this goal, up-front program funding is required. The declining program budgets of recent years have forced PMOs to perform Serial Engineering in order to fit available funding profiles, instead of Concurrent Engineering.

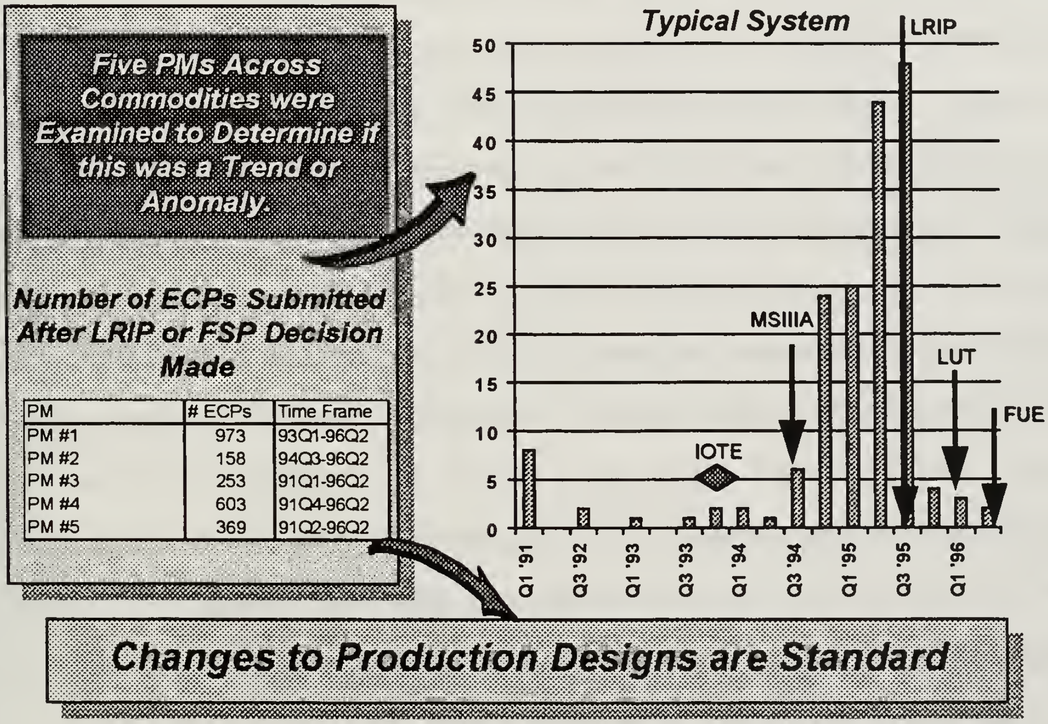

Figure 11: ECP Submittals After MSIII

In re-examining Figure 11, one has to ask the question, “What is the impact of having a large number of ECPs generated after a MSIII decision?” This impact relates to Industry’s viewpoint that Government controlled TDPs do not reflect "as-built" configuration items. The researcher concurs with Industry. However, the Government is not to blame. The Government starts CM control after the MSIII decision point and only when the prime contractor delivers the TDP baseline. The Government receives the TDP that still has a substantial amount of outstanding ECPs that have not been incorporated into the TDP. The impacts of not having an updated TDP to support First Unit Equipped (FUE) vehicles affect technical manuals (not reflecting actual vehicle configuration), cataloguing (list reflecting obsolete part numbers and hardware), spare parts provisioning (not able to provide spare parts to support maintenance operations or readiness), and inventory levels. DoD 5000.2-R replaces DoDI 5000.2 and addresses the problem associated with configuration changes made to production designs.

DoDI 5000.2 acted as a catalyst to engineering changes made to Production Baseline designs. Under this policy, correction of deficiencies could not occur until after IOTE/FOTE and PQT were completed (refer to Figure 12). Producibility/Cost Reduction ECPs were caused by a lack of emphasis on item producibility and unit production costs during EMD. To comply with success oriented schedules and reduced budgets, PMOs and contractors placed attention toward achieving item performance goals. Productionization of the design was delayed until LRIP, or later when more money is available. This was a particularly popular strategy when LRIP was considered part of the Production phase and funded by Procurement Appropriations. [Ref. 40] But the researcher believes that DoD 5000.2-R will minimize this problem since PQT and IOTE are required on LRIP units. This will force PMOs to place emphasis on performance goals as well as the producibility of the system in a cost effective way (refer to Figure 13). Listed are excerpts from DoD 5000.2-R which substantiate this assumption:

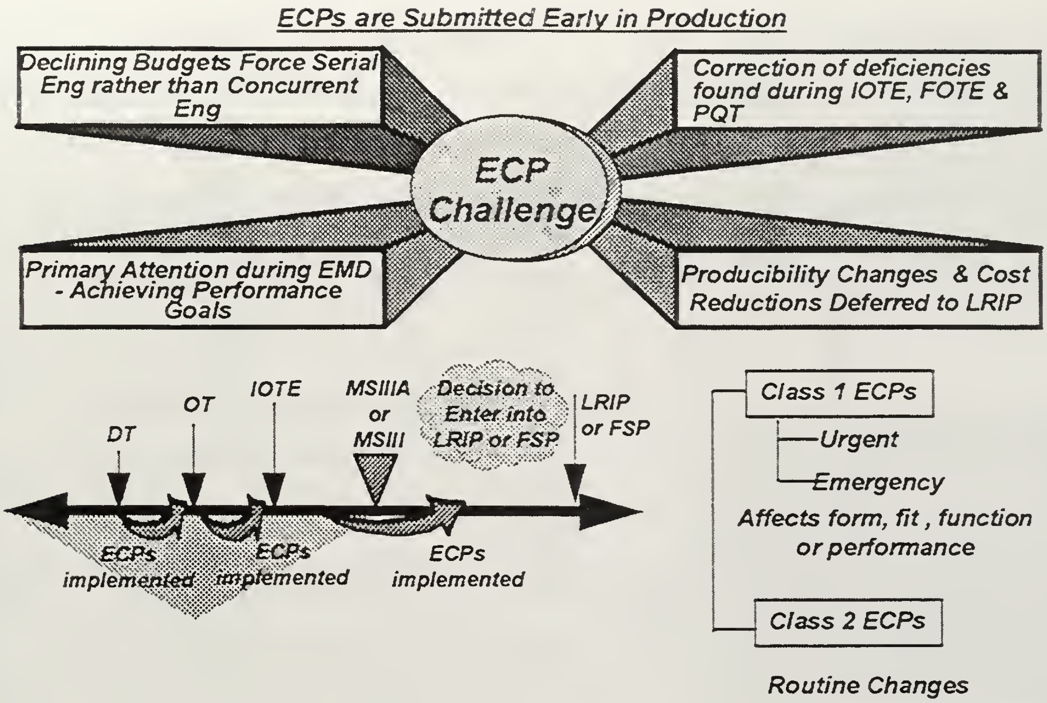

Figure 12: ECP Submittals Before MSIII

- The independent operational test activities shall use production or production representative articles for the dedicated phase of OT&E that supports the full-rate production decision.
- Conduct an OT&E before full-rate production to evaluate operational effectiveness and suitability as required by 10 USC 2399 for ACAT I and II programs.
- Production qualification test and evaluation shall be completed prior to the full-rate production decision.
- LRIP occurs while the Engineering and Manufacturing Development phase is still continuing as test results and design fixes or upgrades are incorporated. [Ref. 42]

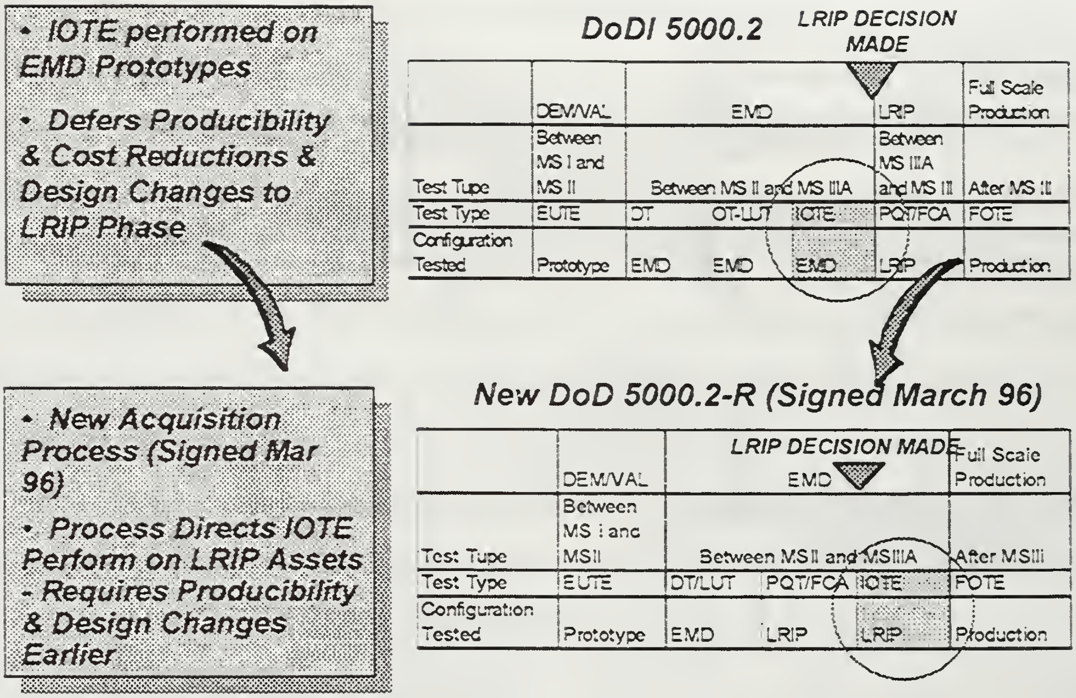

Figure 13: DoDI 5000.2 versus New DoD 5000.2-R. (Ref.42)

E. SECONDARY ITEM ALT/PLT REDUCTION STUDY

In September 1990, the Army committed to reduce Procurement Lead Time by 25 percent within five years. However, the Army only accomplished a three percent reduction overall and several MSCs had actually increased. In September 1994, the General Accounting Office (GAO) issued a report that was highly critical of AMC's efforts to control ALT/PLT [Ref. 43]. The report indicated that the Army had failed completely in its 1990 initiative to reduce Procurement Lead Time by 25 percent. At the AMC Executive Steering Committee meeting in November 1994, General Salomon tasked the MSC Commanders with National Inventory Control Points (NICPs) to reduce ALT by 10 percent and PLT by 20 percent [Ref. 45]. In December 1994, a Department of Defense Inspector General (DoDIG) report evaluated the actual number of days it took Government agencies to award contracts [Ref. 44]. This report indicated that AMC's five commodity commands were rated at the bottom of DoD agencies and DLA. Table 6 shows that of the four MSCs listed, the average Procurement Lead Time was reduced 5.3 percent, far below AMC's goal. As a result, AMC chartered a Process Action Team (PAT) in February 1995 to review the acquisition process of secondary

		1990	1991	1992	1993	1994
AMCCOM	ALT	474	468	432	423	441
	PLT	348	360	342	357	351
	Total	822	828	774	780	762
ATCOM	ALT	279	252	234	213	
	PLT	535	519	412	319	
	Total	814	771	646	532	447
CECOM	ALT	216	237	255	255	264
	PLT	429	423	420	402	402
	Total	645	660	675	657	666
TACOM	ALT					
	PLT					
	Total	531	596	649	722	737

Table 6. MSCs' Procurement Lead Time Trends (Ref. 28)

items and make recommendations to reduce ALT and PLT. The next four subsections discuss details of the PAT's report concerning procurement problems and inefficiencies, organizational structure, procurement statutes and regulations, recommendations, and provide analysis to answer the subsidiary question, "What are the policies that govern, shape and dictate secondary item procurements?"

1. Problems and Inefficiencies

Based on the GAO and DoDIG audit reports, the PAT analyzed all five MCSs with ICPs to identify and determine the causes for the increase in ALT and PLT. The following were their findings:

- Inflated and inaccurate ALT and PLT values were reflected in the Budget Stratification (STRAT) Database.
- Only one MSC had an effective tracking system and consistent performance measures (metrics at the segment level) that measured an acquisition as it moved toward award and held people accountable for delays.

- Congress continued to add statutes which caused AMC to implement more policies and regulations, which adversely impacted the acquisition process.
- Management emphasis on reduction in lead times was not consistent across the MSCs.
- The team commitment that has become so prevalent within DLA organizations was not apparent within AMC.
- Use of flexible, long term contracts was not common across the MSCs and were only beginning to be used.
- There were only minimal automation initiatives within AMC procurement activities.
- Production lead time was not normally a significant issue in either the acquisition or negotiation process unless specifically identified as a supply availability (urgency) issue. [Ref. 45]

The PAT also determined that the single most significant contributing factor to the inefficient acquisition process across AMC was the "sorry state of automation." This lack of a modern, automated acquisition system exhibited itself in two ways. First, management lacked an on-line, segmented tracking system which would give a manager instant status of all in-process procurement actions in both the tech-loop and in the procurement phase. This lack of status prevents a manager from taking corrective action until the award date is "well past" and a manager learns of a problem that should have been identified in the pre-solicitation phase. Without automation, senior management is prevented from having the necessary tools to hold buyers, item managers, and supervisors accountable where continuous delays occur. Second, the antiquated manual method of actions adds significant time to ALT and assures that all actions are completed in a heel-to-toe process. [Ref. 45]

The PAT recommended that a fully automated acquisition management system be identified and fielded throughout AMC. This system would eliminate the need for paper documentation and allow for the automated development of procurement packages (PWDs). The PAT also recommended that AMC be aggressive in moving toward Electronic Commerce/Electronic Data Interchange systems and CD-ROM capability be made a standard to allow faster access to drawings. [Ref. 45]

The researcher concurs with these recommendations. However, caution needs to be made to management in regards to developing and implementing a tracking system. Standard Operating Procedures (SOPs) should be developed to focus functional level groups on command-wide objectives and goals. This will prevent the sabotage of tracking Procurement Work Directives (PWDs) progress and allow senior management officials to make proper assessments and decisions. As a standard, senior management officials create tracking systems and associated operating procedures, then tie employee performance standards to those SOPs to hopefully stimulate employees' performance in meeting functional goals. In most cases, however, this creates an environment where timelines become more important than quality. Senior management officials and employees need to work in an environment where the objectives and goals reflect overall quality of a product which will prevent additional processing time required to correct deficiencies created from meeting aggressive schedules. Also the generation of unnecessary reports needs to be curtailed. Requiring too many reports focused employees' attention on assuring the reports look correct and that senior management officials are only concern with meeting schedules instead of a quality product. The next section provides remedies to prevent these situations.

2. Organizational

At the present time, the MSCs are organized along functional lines. They have functional directorates with specialized responsibilities that are matrixed throughout the command. However, each directorate has its own goals and objectives, which differ slightly from the overall command mission of providing readiness to the troops. Although directorates do some limited ad hoc teaming to support mission accomplishment, their primary focus differ as shown:

- The requirer's need for quality, timely parts to support areas where shortages exist, and the need to minimize excess assets.
- Contracting's need to ensure a fair and reasonable price, timely contract closeout, liquidation of obligations, and obligation goals.
- The Competition and Advocacy Management Offices' desire to expand competition even with increased lead time.
- The legal position that acquisition should be substantially structured to minimize protests, by ensuring actions meet the most conservative interpretations. [Ref. 45]

In providing a recommendation to AMC, the PAT was not able to reach a consensus on the organizational structure for teaming. The report stated that most of the contracting personnel strongly believed in the separation of requirement decision authority and contracting decision authority but recognized the need for improved communication processes. The logistics personnel generally believed there would be increased mission focus if contracting was included in the organizational teaming structure. Teaming is currently evolving at all Commands. The report indicated that there was evidence of multi-functional teaming seen at each Command. Some structured organizational teaming has been implemented. Other teaming organizational structures are being tested in pilot programs at various Commands. Still other types of teaming have been initiated through management actions such as multi-functional work-in-process reviews or collocation of different functional activities.

The report indicated that each Command should take a different approach toward teaming. The researcher agrees with the PAT and AMC should allow flexibility in the Command's organizational structure. This would allow senior management officials at each Command to design a teaming structure that is best suited for that particular command. The researcher also believes that this will eliminate "rice bowls" that have been created by function areas working in a vacuum and give ownership towards achieving command objectives and goals in lieu of functional level interests. However, senior management officials must develop a strategic plan to ensure a systematic approach and sequencing of events are developed before implementing action to reorganize the functional groups into multi-function groups.

3. Procurement Statutes and Regulations

During the 1970s and 1980s, procurement laws and regulations were greatly expanded. Those laws and regulations resulted in added time to the acquisition process. Procedures involving regulations that were recommended by the PAT for revision or elimination are enumerated in Appendix E. The researcher agrees with the PAT recoomandations. The regulation that has the most significant impact to the growth in ALT is related to the processing requirements of CICA based intiatives. The intent of CICA was to protect the Government from waste, fraud and abuse and to obtain fair and reasonable prices for secondary item procurements. Principal contractors are rapidly becoming a conglomeration of airframe and electronics forms. This diminshing number of principal vendors of systems and subsystems are affecting numerous subcontractors in the U.S. industrial base, as the make or buy decisions of the prime contractors will lead to far fewer suppliers in the Nation for spare parts. Thus, the researcher believes that the economy has outgrown the usefulness of CICA based initiatives. Many of the acquistion reform and streamlining initiatives allow Contracting Officers the means to circumvent CICA requirements.

4. Other PAT Recommendations

The PAT also recommended the following changes:

- Greater use of long term contracts wherever practical.
- Continue the efforts to make data available on CD-ROM.
- Technical and acquisition communities at each MSC should collectively determine secondary item acquisition strategies, and provide planned procurement lists to the acquisition community as early in the process as possible.
- Educate the workforce regarding the impact of lead time on the budgetary process.
- Delivery schedules must be a primary item in pre-negotiation strategy.
- Use of best value principles in spares procurements.
- Partnering with industry.
- Contractors use Direct Vendor Delivery (DVD) to reduce lead and order ship time to prevent inventory growth. [Ref. 45]

The researcher believes that these intiatives must be incorporated in Army policies to allow Contracting Officers the flexibility of tailoring Government contracts to reflect commercial practices. This action will ensure that the MSCs will achieve AMC's ALT/PLT reduction goals and objectives.

F. STATISTICAL DATA REVIEW

This section provides a comparative analysis of statistical data obtained from four MSCs and three DLA centers. Research shows that the "commodity" is the most significant factor in determining the purchase process of an item; if the item can be procured competitively or not, and that time associated with competitive and non-competitive procurements are similar. The four MSCs and three DLA centers statistics will be analyzed first, followed by AMC's ALT/PLT goals, and successes of Government agencies using commercial practices. Also, the next three subsections provide analysis to answer the subsidiary question, "Are there better ways to support secondary item procurements?"

1. Secondary Item Procurement Statistics

The research identified trends associated with procuring commodities with electronic, aircraft, and missile componentry. Analysis of Table 7 and Appendix F shows that since their commodities are electronics, CECOM and ATCOM have similar types of buys with respect to competitive versus non-competitive procurements. Because this is a specialized field that necessitates stringent performance requirements, inexperienced manufacturers with unproven quality processes are prevented from competing against more experienced, ISO 9000 qualified manufacturers. This is in line with ATCOM, since the TDPs they manage are over 80 percent source-controlled (Level I and II drawings) which contain insufficient technical information and thereby prevent the transfer of manufacturing techniques to inexperienced vendors. The researcher believes that procurement polices can be established that will take advantage of stringent performance requirements by having long term contract relationships with manufacturers who have proven that they can produce products that meet or exceed Government quality and performance standards. This could result in the award of a contract to a contractor to supply spare parts for the complete life cycle of the weapon system or product. However, caution should be taken to protect the Government from contractors who may default their contract obligations. Contract provisions can be included that require the contractor to either relinquish the technical data that describe how to manufacture the product, or make recommendations or assist the Government in qualifying other vendors to product the same product that either can meet or exceed the quality and performance standards. This Government initiative would stimulate industry to reinvest their dollars to improve the manufacturing process especially if there is a chance that they will get a return on their investment and win other life-time logistic support contracts.

	% Competitive	% Non-Competitive	ALT Comp/Non	Commodity
AMCCOM	75	25	not available	Munitions
ATCOM	32	68	not available	Aircraft
CECOM	37	63	not available	Communications/ Surveillance
TACOM	60	40	146/126	Automotive
DISC	94	6	not available	All
DSCC	52	48	not available	All
DSCR	80	20	not available	All

Table 7. Secondary Item Procurement Breakout

Analysis of Table 9 and Appendix F show the majority of procurements at AMCCOM (TACOM-ACALA) and TACOM are competitive. TACOM and AMCCOM buys are similar since their commodity is basically low-tech and the TDP used for solicitation is stable. However, reviewing TACOM's ALT reveals that competitive buys take just as long as non-competitive buys. This can be attributed to the fact that Justifications and Approvals (J&As) for Other Than Full and Open Competition are a requirement for non-competitive procurements, as well as market surveys. With these statutory requirements, a non-competitive buy can take just as long as a competitive buy. The researcher recommends that J&As and market surveys performed on items should be applied throughout the lifecycle of that item and not required for each buy. J&As and market surveys should only be performed if other manufacturers can provide valid test analysis that proves that their product either meets or exceeds the quality and performance standards of the procurement item.

At the three DLA centers, the majority of the procurements are competitive. Where TDPs are more stable in design, competition is more prevalent as indicated in Table 9 and Appendix F with DISC and DSCR. The commodities that these

DLA centers buy are generally low-tech with few ECPs generated that impact the TDPs. The data indicated in Table 7 substantiate the statement that the commodity type dictates the procurement process. The survey performed by James Perry mentioned in Chapter III, Section G further substantiates this statement. Procurement lead times for aviation versus heavy equipment and consumable commodities were 43 percent longer. Therefore, the nature of the technology dictates not only the procurement process, but the procurement lead time. In order for the Army to take advantage of this information, the CICA initiatives should be either tailored or eliminated for commodities that are complex in nature and where it has been established that competition is not available. The limited resources used for market research and the development of J&As can be better spent on other Army interests. This also relates to the CM control of these commodities. Simply stated, the Government has little CM control of these products because (1) the TDP is not available to allow the transfer of technical data to other manufacturers to increase the industrial base, or (2) there is not enough commercial demand to support the justification for industry to develop this item. This means that Military funding is required to support a military unique item, and thereby, may not be cost beneficial to develop a TDP for other manufacturers to provide just to increase the industrial base or promote competition.

2. ALT/PLT Reduction Goal Statistics

Subsequent to the GAO report, AMC established ALT/PLT goals to keep the MSCs competitive with DLA, and will reduce their overall ALT/PLT by 50 percent by 1999 (refer to Table 8). To accomplish this, each of the MSCs must implement the recommendations identified from the PAT report, the researcher, as well as utilize as many Acquisition Reform and Streamlining Initiatives. In answering the subsidiary question, "Are there better ways to support secondary item procurements?", the next section identifies several agencies that have successfully implemented commercial practices in procuring secondary items.

		FY 1995	FY 1996	FY 1997	FY 1998
AMCCOM	**ALT**	320	197	161	125
	PLT	296	289	253	215
	Total	616	486	414	340
ATCOM	**ALT**	not available	153	125	97
	PLT	not available	220	203	184
	Total		373	328	281
CECOM	**ALT**	165	129	106	83
	PLT	279	243	195	166
	Total	444	372	301	249
MICOM	**ALT**	not available	193	158	123
	PLT	not available	324	284	241
	Total		517	442	364
TACOM	**ALT**	171	74	74	74
	PLT	241	191	191	191
	Total	412	265	265	265

Table 8. MSCs' Procurement Lead Time Trends (Latest)

3. Success Stories

a) Air Force Uses Boeing's Commercial Spares Practices

Oklahoma Air Logistics Center (OC-ALC) and the Boeing Company are using commercial practices to get spare parts to the repair site in a shorter time period. Saving administrative expenses and dramatically improving the efficiency of depot maintenance. Average delivery time has been reduced to 18 days from 79 days. Boeing's administrative/overhead costs were reduced to $0 from $500,000; and the Air Force's 5-year spare parts acquisition costs potentially reduced to $11.3 million from $42.3 million. A Basic Ordering Agreement (BOA) has been initiated for commercial spares for use on the E-3 aircraft. Application of a General Terms Agreement (GTA) on the BOA, along with the new commercial practices defined in FASA, permitted the elimination of many prior Government requirements and enabled the Air Force to capitalize on commercial practices. In the past, all spares orders had to go through the Boeing Military Defense Group because Boeing's commercial group did not meet the military requirements. This entitled Boeing to ship spares to their division in Wichita, Kansas in order to have the parts packaged to meet military specification requirements. The elimination of these military specification packaging requirements saves 30 days or more per transaction. Another advantage of the BOA is that by using commercial spares, OC-ALC is able to take advantage of commercial catalog pricing making price justifications simple. The commercial agreement maximized use of the Boeing Commercial aircraft parts inventory and their computerized ordering system. OC-ALC can now on-line, check availability off-the-shelf to place an order (if funds are available) instantly. The part is then shipped the next day via the transportation method requested by OC-ALC, with priority shipping available for urgent situations. Other areas which have been streamlined include customer inspection and acceptance which eliminates the extra DD 250 step and commercial warranty. [Ref. 47]

b. Air Force Corporate Contract with General Electric

Oklahoma Air Logistics Center and General Electric, have established a single requirements contract incorporating many commercial provisions for a multitude of sole-source spare parts streamlining the overall acquisition process. Use of this contract still preserves the Government's right to pursue competition for items when appropriate. Also, ISO 9000 provisions were included rather than the Mil-I inspection requirements. The contract contains 46 different line items for spare parts. Competition for these parts may be initiated based on OC-ALC knowledge of the market. An order on this contract can be issued almost immediately upon receipt of a funded purchase request. The average order lead time is three days. Previous lead times for these same spares have been 60-180 days and longer. The existence of this requirements contract, along with the commerciality of the parts, eliminates the need for individual J&As, detailed audits, and negotiations for each requirement. Instead OC-ALC can rely on the established negotiated prices. The streamlined approach of this contract was demonstrated immediately when $18 million worth of orders were processed on the day of award. [Ref. 47]

c. *Air Force Uses Commercial Engine Overhaul*

San Antonio Air Logistics Center (SA-ALC) determined that the repair and overhaul of a General Electric engine is in fact commercial type work. This determination enabled the award of three indefinite quantity fixed-price mostly commercial contracts that were only 16 pages each. There were a number of commercial features included in these contracts which streamlined the ordering process and shortened the overall repair/overhaul time. In the payment area, Government representatives and GE were able to agree to an arrangement whereby GE would submit commercial invoices for payment rather than the standard Government invoicing procedures. The procedures for inspection and acceptance on these contracts follow GE's customary commercial practices. These commercial practices also shorten the overall repair process. The Government accepts packaging and marking standards consistent with GE commercial procedures. Because GE is not required to follow the detailed requirements of Government packaging, the costs are reduced. By using catalog, commercial prices which include GE's usual factory testing, inspection and packaging, the Government saves time and lowers costs of negotiating prices and obtaining certified cost and pricing data. Finally, GE is providing turn-around times much shorter than stated in its commercial catalog. [Ref. 47]

d. *DLA & Air Force to Use PartNet*

DLA and the Sacramento Air Logistics Center have entered into a strategic partnership to use PartNet technology to develop new business processes and technology for consumable item management. Using the PartNet information system, U.S. Department of Defense engineers and procurement officers will use the Internet to access product information databases of items in commercial distribution as well as items stocked and managed by the DLA. PartNet will give users the ability to search for parts using a variety of attributes and specifications, and place orders directly from their desktop computers. PartNet began in 1992 as a research project at the University of Utah's Department of Mechanical Engineering. A DLA study of parts sourcing procedures found that, on average, it took a Department of Defense engineer 34 days to locate technical and purchasing information and an additional 104 days to acquire the part after it had been located. PartNet research was supported in an effort to shorten the parts sourcing cycle. A recently completed pilot project using PartNet reduced the parts identification process to minutes, and shortened the total acquisition cycle to a matter of days. Engineers and designers used PartNet to perform parametric searches for parts, and in many cases, download CAD models, data sheets, and GIF images of parts to help them make purchasing decisions. [Ref. 47]

e. Electronic Commerce

The Contracting and Acquisition Management Office of the U.S. Army Space and Strategic Defense Command (USASSDC) issued its first competitive solicitation via the Internet for 14 specially configured computers. With the use of the Internet, the requirement was issued, evaluated, and awarded within 36 days after the contracts office received the action. The pre-solicitation synopsis notified potential offerors of the USASSDC World Wide Web (WWW) address for downloading the solicitation and the estimated release date. The WWW availability eliminated the need to mail solicitations. Proposals were submitted either by mail, facsimile, or express mail. Strong interest spurred by releasing the requirement over the Internet is thought to be a factor in the cost savings of 30 percent less than the Government estimate. [Ref. 48]

f. Alpha Contracting

Alpha Contracting is a technique that uses a team approach to prepare, evaluate and award proposals in substantially less time than the traditional approach. The Alpha technique involves working with the contractor, DCAA, DCMC, PEO staff, and the contracting and pricing personnel to develop, evaluate, and negotiate in a more concurrent manner. Using this technique on the recent HEMMT-LVS vehicle family acquisition, TACOM reduced PALT by 50 percent, saving approximately 120 days of cycle time. TACOM has successfully used Alpha Contracting with other programs. On the Improved Recovery Vehicle buy, PALT was reduced to 4 months from 22 months. Orders for the Responsive Urgent Services Handling (RUSH) project are being issued in less than one month instead of the normal 5 to 7 months. [Ref. 48]

g. Night Window Assemblies for the Bradley Fighting Vehicle System

MICOM successfully implemented a team effort involving contractors, buying personnel, item management, and personnel of Anniston Army Depot to award a contract for Night Window Assemblies for the Bradley Fighting Vehicle System. The solicitation included incremental quantity, delivery evaluation factor provisions, best value source selection, and option provisions for three years. This contract has an immediate cost avoidance of approximately $900,000 and a potential of approximately $1.5 million. In addition, there is a reduction of administrative lead time for future requirements (approximately 30 days), avoidance of production lead time growth due to the issue of scarce resources, and avoidance of the environmental impact of disposal of low-level radioactive waste. [Ref. 48]

G. SUMMARY

In summarizing Chapter IV, research shows that the MSCs are processing 90-95 percent ECPs within a 60-90 day period. This contradicts industry's viewpoint that the Government does a poor job in processing ECPs in a timely manner. Also, with initiatives to centralized the TD/CMS database, AMC will improve on the ECP processing time. Analysis shows that Government CM policies and objectives are similar to industry, where strict specifications and standards are in place to ensure suppliers produce quality products. However, the researcher believes that with DoD's new direction of requiring performance specifications in lieu of product specifications, will prevent competitive procurements and overwhelm the parts provisioning list with duplicate parts. Research also shows that with the approval of 1994 and 1995 Congressional legislation, the Army has initiated acquisition reform and streamlining initiatives that implement commercial practices to support the procurement of spare parts. These initiatives are nothing but work-arounds to side step CICA intitiatives. However, these streamlining initiatives are necessary and also consistent with a report generated by the Department of Marketing and Logistcs at Michigan State University. The report titled "Global Logistics Best Practices," identified perceptions and characteristics of best logistics practices. The initiatives to achieve a sucessful logistics organization are summarized as the following:

- Performance Measurement: Use internal and external activities to gauge level of logistics performance.

- Technology: Make investments in hardware, software and network design to facilitate routine processing and exchange of data.

- Information Sharing: Emphasize the willingness to exchange key technical, financial, operational, and strategic data.

- Connectivity: Design the capability to effectively exchange data in a timely, responsive, and usable format.

- Simplification: Re-evaluation and/or re-engineering work procedures to improve efficiency and effectiveness.

- Standardization: Establish common policies and procedures to facilitate day-to-day logistics operations.

- Compliance: Adhere to policies and procedures in a day-to-day logistics operation. [Ref. 46]

The final chapter of this thesis provides conclusions from this research in the context of the primary and subsidiary research questions and makes recommendations based on analysis of the information received. The chapter concludes with areas for further research.

V. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

Acquisition reform has dramatically impacted the environment in which military logistics operates. In the not too distant future, the current logistics system will be barely recognizable as a peculiarly military system. The environment has been affected by several significant changes. Commercial business practices have undergone major modifications as companies have concentrated their focus on quality, productivity, and international competitiveness, and logistics processes have benefited as well from greater emphasis on customer service, leaner organizations, and the formation of strategic alliances. [Ref. 51]

During World Wars I, II, and the post war period, when Defense relied on industry to produce their weapon systems, stringent quality and performance specifications and standards were required since commercial products did not meet the standards of quality, reliability, and maintainability that the weapon systems required. Recently, however, quality techniques such as "value added" have led to a re-examination of business practices and the re-engineering of processes. In a study of firms rated excellent for their logistics practices, P. M. Byrne and W. J. Markham observed that logistics excellence is a management imperative for the future. The benefits of logistics excellence are improved quality and service levels, faster cycle times, greater efficiency, increased productivity, and improved customer-company relations. [Ref. 52] This concept has meant developing win-win relationships with suppliers, carriers, and customers. Adopting such a scheme means that the U.S. must extend the concept of an integrated logistics system beyond the traditional barriers of the military logistics system to include vendors, manufacturers, and the ultimate users. Many authors have commented on the need to form strategic logistics alliances or coalitions. [Ref. 53:p. 36-45]

Military logistics uses a wide variety of unique systems, data, and materiel to support its customers. These unique systems result in redundant information systems in multiple sectors, additional time and handling of materiel, duplicate bar coding and item identification, loss of in-transit visibility, and difficulty in identifying equivalent parts or items due to the conversion from national stock numbers to manufacturers' part numbers. The system of the future must be fully integrated with the commercial sector which will allow any Government agency or Military Service to obtain status of inventory information directly from the commercial supplier.

The use of third-party suppliers of logistics has become commonplace in the private sector in the 1990s. This concept means that the logistics services that have traditionally been an organic part of the Military Service will be replaced by private enterprise services. This movement toward privatization will affect all Military Services, and as a common logistics structure will be sought to support the reduced DoD organizational structure.

In answering the primary research question of whether to adopt a commercial system, the researcher believes that a commercial cataloguing system is a valid goal in restructuring the Army's CM system for secondary item procurements. Industry's most successful companies have in place strict specifications and standards to which their suppliers must conform to ensure the manufacturing and delivery of quality products. Research and analysis show that DoD has specifications and standards in place to control supplier's product quality that support secondary item procurements. However, with Secretary Perry's direction of requiring performance specifications in lieu of product specifications, CM control will be lost. Caution must be taken in transitioning to these new procedures. The Army can ill-afford tomorrow to have reduced the reliability of weapon systems in its attempt to save a few million dollars by using cheaper, less reliable parts and processes. The next sections provides recommendations for CM and the procurement process, answers the subsidiary questions, and concludes with areas of further research.

B. RECOMMENDATIONS

Based on the above conclusions, the following recommendations are made:

1. Eliminate formal Government review of Class II ECPs. Rely on DCMC authority for review and approval of these actions.

2. Use automation in all CM functions. An AMC-wide standard automated CM system should be developed and implemented. Set up a Task Force to investigate potential automated CM functions that currently exist, and identify a best solution that will serve as a standard suite-of-tools for all AMC.

3. Use of long term contracts wherever practical. Also delivery schedules must be a primary item in pre-negotiation strategy.

4. Use DVD to reduce lead and order ship time to prevent inventory growth.

Many other recommendations concerning CM and the procurement process have been made and presented throughout this thesis.

C. ANSWERS TO SUBSIDIARY QUESTIONS

1. What is CM and What is its Purpose?

CM is the identification, control, status accounting, and verification of data; which includes drawings and specifications, that describes the form, fit, and function of an item. The purpose of CM is to ensure the continuos manufacturing of a part to specific performance, quality, and reliability requirements in future products of the same type. Hence, CM is simply the maintenance of TDPs. Traceability of configuration items is essential for both the customer and supplier regardless of the control point. It is essential that the Government is fully apprised of the configuration of baselines for critical and spare items for the purpose of contract incentive, value engineering improvements, cost baselines, troubleshooting in the event that failures occur, and for use in second source procurement. Further explanation is given in Chapter II of this thesis.

2. What are the Elements of CM?

The basic elements of CM are identification, control, status accounting, and verification (audit). Identification documents the functional and physical characteristics of configuration items. Control monitors and regulates changes to configuration items and their related documentation. Status accounting records and reports information needed to manage configuration items effectively, including the status of proposed changes and implementation status of approved changes. Audit verifies configuration items and ensures conformance to specifications, drawings, interface control documents, and other contract requirements. The instrument used to implement change is the ECP. The classification of ECPs can be either a Class I or II and is essential since this determines the level of CM identification, control, status accounting, and verification. Further explanation is given in Chapter II of this thesis.

3. What are Department of the Army and Industry Viewpoints Toward CM?

DA requires sufficient configuration control to allow the purchasing and maintenance of system and subsystem componentry throughout the life cycle of the weapon system. Detailed drawings and specifications must be developed and available to support secondary item procurements as well as maintenance level organization. TDPs must be complete (Level III TDP), available, and in the proper format to allow the transfer of technical data to vendors to broaden the industrial base and encourage competition among manufacturers so that fair and reasonable prices can be obtained. However, industry desires primary control of technical data to remain with them. This translates to time and money expended in the administration of CM, which lacks expediency and often reflects obsolete configurations. An extraordinary amount of data are generated as a result of contractual requirements. Unfortunately, while the Government pays a substantial amount of money for these data, much of the information is not utilized. In fact, a great deal of the technical data package is obsolete before it is even reviewed. Industry objectives are to meet/exceed quality standards, obtain the fastest turn-around time, obtain a competitive price, and establish long-term vendor relationships. Even under the Perry initiatives, as they are called, the use of the TDP for insight and technical dialogue purposes--in the support of integrated product teams and to support second source procurements is necessary but can be tailored to meet business decision and life cycle needs. But, the use of performance specifications in lieu of product specifications results in the Government relinquishing configuration control to industry.

4. What are the Policies That Govern, Shape and Dictate Secondary Item Procurements?

CICA is still the driving force in dictating the expedience of procuring spare parts. The passage of FASA and FARA are work-arounds that allow Government agencies to streamline many CICA requirements. For instance, not having to conduct market surveys for commercial items, using earned-value and past-performance in determining competitive range, including delivery time as part of evaluation criteria, performing concurrent processes in creating PWDs to support secondary item procurements, and setting achievable goals to direction organization values toward streamlining ALT and PLT are all result of the Army's intent to emulate commercial practices. Because of FASA and FARA, the Government is adopting industry objectives which allow many Government agencies to procure spare parts using commercial practices.

Long term relationships with many Government suppliers are resulting in streamlining contracting requirements, direct vendor deliveries, less Government oversight (because of adopted commercial quality standards and procedures) and the sharing of technical data and information which shortens the change process to ensure the latest configuration item.

5. Are there Better Ways to Support Secondary Item Procurements?

By incorporating lessons learned from other commands that have implemented streamlining procurement procedures, Government agencies can shorten procurement lead times, thereby freeing resources that can be utilized to acquire other projects. Further examples are given in Chapter IV, Section F, and throughout this thesis.

D. AREAs FOR FURTHER RESEARCH

About 48,000 civilian and military personnel are engaged in supply and distribution activities. Overhead costs for goods delivered by these personnel average 70 to 90 percent of the value of the goods themselves. The transportation, storage, and administrative costs associated with buying and distributing spare parts is roughly $5 billion per year, which does not include the cost of the parts. [Ref. 51] The application of dual-use technologies will become increasingly critical to future logistics support due to the costs associated with specialized parts. Some military unique logistics technologies have proven costly and difficult to field, and pose significant problems when interfacing with other Military Services or the civilian sector. The Military has also grown increasingly reliant on business logistics for the movement of materiel, and logistics processes must be able to "plug and play" with the civilian distribution systems in order to ensure visibility and reduce cycle-time and cost. Many private-sector companies have developed advanced inventory management and distribution systems that could substantially cut these costs (refer to Appendix D). Follow-on research may be desired in the following areas:

1. Determine cost of maintaining an item in TD/CMS to include part number management, NSN assignment, and tracking.

2. Determine the cost of changing a drawing or specification, to include the review process, change verification, and dissemination of the corrected drawing or specification.

3. Determine the handling and storage costs of spare parts. Compare these costs with industry to determine whether to privatize.

4. Determine potential benefits of greater Military/Industry Integrated Logistics Support (ILS) for organizational maintenance and spare parts allocation.

APPENDIX A

List of Abbreviations and Acronyms

AAE	Army Acquisition Executive
ALT	Administrative Lead Time
AMC	Army Materiel Command
AMCCOM	Armament Munitions and Chemical Command
AMSAA	Army Materiel Systems Analysis Activity
ANAD	Anniston Army Depot
ANSI	American National Standards Institute
ASPA	Armed Services Procurement Act
ATCOM	Army Aviation and Troop Command
ATE	Automatic Test Equipment
AUTODIN	Automatic Digital Network
BOA	Basis Ordering Agreement
CAD	Computer Aided Design
CALS	Computer-aided Acquisition and Logistics Support
CAM	Computer Aided Manufacturing
CBD	Commerce Business Daily
CCAD	Corpus Christi Army Depot
CCB	Change Control Board
CDRL	Contract Deliverable Requirement List
CECOM	Communications-Electronics Command
CI	Configuration Item
CICA	Competition In Contracting Act
CIM	Corporate Information Management
CM	Configuration Management
CMIS	Configuration Management Information System
CSA	Configuration Status Accounting
DCMC	Defense Contract Management Command
DDRE	Defense Distribution Region East
DDRW	Defense Distribution Region West
DESC	Defense Electronics Supply Center
DESCOM	Depot System Command
DFSC	Defense Fuel Supply Center
DISC	Defense Industrial Supply Center
DLA	Defense Logistics Agency
DLSIE	Defense Logistics Studies Information Exchange
DA	Department of the Army

DoD	Department of Defense
DoDI	Department of Defense Instruction
DoDIG	Department of Defense Inspector General
DoE	Department of Energy
DPSC	Defense Personnel Support Center
DSCC	Defense Supply Center, Columbus
DSCR	Defense Supply Center, Richmond
DSREDS	Digital Storage and Retrieval Engineering Data System
DT	Developmental Test
DVD	Direct Vendor Delivery
ECP	Engineering Change Proposal
EDCARS	Engineering Data Computer-Assisted Retrieval System
EDMICS	Engineering Data Management Information and Control System
EIA	Electronics Industries Association
EMD	Engineering and Manufacturing Development
ERR	Engineering Release Record
EUTE	Early User Test and Evaluation
FAA	Functional Area Assessment
FAAR	Forward Area Alert Radar
FARA	Federal Acquisition Reform Act of 1995
FASA	Federal Acquisition Streamlining Act of 1994
FAT	First Article Test
FOTE	Follow-on Operational Test and Evaluation
FPASA	Federal Property and Administrative Services Act
FY	Fiscal Year
GAO	General Accounting Office
GTA	General Terms Agreement
ICD	Interface Control Drawing
ICP	Inventory Control Point
IFB	Invitation For Bid
IOC	Industrial Operations Command
IOTE	Initial Operational Test and Evaluation
ISO	International Organization for Standardization
J&A	Justification and Approval
JIT	Just-In-Time
JEDMICS	Joint Engineering Data Management Information and Control System
LEAD	Letterkenny Army Depot
LRIP	Low Rate Initial Production
MAIS	Major Automation Information System
MDAP	Major Defense Acquisition Program
MEARS	Multi-User Engineering change proposal Automated Review

	Systems
MICOM	Missile Command
MS	Milestone
MSC	Major Subordinate Command
NASA	National Aeronautics and Space Administration
NDI	Nondevelopmental Item
NGS	Non-Government Standard
NICP	National Inventory Control Point
NPS	Naval Postgraduate School
OT	Operational Test
PALT	Procurement Administrative Lead Time
PAT	Process Action Team
PCA	Physical Configuration Audit
PLT	Production Lead Time
PM	Program/Project Manager
POC	Point of Contact
PQT	Production Qualification Test
PWD	Procurement Work Directive
RFD	Request for Deviation
RFP	Request for Proposal
RFW	Request for Waiver
RIA	Rock Island Arsenal
RRAD	Red River Army Depot
SCS	Supply Control Study
SOW	Statement of Work
TACOM	Tank-Automotive Command
TDP	Technical Data Package
TOAD	Tobyhanna Army Depot
WWW	World Wide Web

APPENDIX B

Thesis Interview Questions

Primary: Is a commercial cataloguing system a valid goal in restructuring the Army's Configuration Management (CM) system for secondary item procurements?

Subsidiary Questions 1, 2 and 3: What is CM and what is its purpose? What are the elements of CM? What are Department of the Army (DoA) and Industry viewpoints toward CM?

Interview Questions

1. What organization is responsible for CM?
2. What are the policies and regulations applicable to implementing CM?
3. What type of CM system do you have?
4. How many items/parts do you manage?
5. What is the composition of the data base; Level I/II/III drawings?
6. What is the frequency of change to these items/parts; Engineering Change Proposals(ECPs), Request For Deviations(RFDs), and Request For Waivers(RFWs) submittal?
7. Who generates the changes? Are they internal as well as external organizations or companies? If external, who are they?
8. Who is responsible for the review and approval of engineering changes; Configuration Control Board? What is the approval rate? How long does it take to review and approve a change?
9. What are the factors involved with the approval of a engineering change; quality, cost, logistics, or performance?
10. How much does it cost to maintain CM of an item/part?
11. Does the CM systems provide drawings to other companies or government agencies?

Subsidiary Questions 4 and 5: What are the policies that governs, shapes and dictates secondary item procurements? Are there better ways to support secondary item procurements?

Interview Questions

1. How does the CM system support spare part procurements?

2. What are the criterion for generating spare part requirements?

3. What are the procurement process steps in supporting Technical Data Packages (TDPs) for spare parts?

4. What is the Acquisition Lead Time (ALT)?

5. What is the Production Lead Time (PLT)?

6. How are the TDPs generated, verified, and validated to support the procurement process? What are included in the TDPs to buy spare parts?

7. What are DoD policies and procedures that prohibits using commercial practices and standards in procuring spare parts?

APPENDIX C

Interviewees' Profile
(in alphabetical order)

Mr. John Furman is an Associate Director, responsible for the leadership, oversight, and mentoring of various product and/or service teams engaged in Research, Development and Engineering (RD&E). His expertise includes engineering data, technical, program, and project management with special emphasis on Configuration Management, Data Management, and Technical Documentation. With over 30 years of civil service experience, Mr. Furman has held a wide variety of positions ranging from Project Engineer through Associate Director. As a Mechanical Engineer, he has worked primarily on automatic test equipment, helicopter weapon systems, fire control, and ground combat vehicle systems. Mr. Furman's life cycle experience has been primarily in Full Scale Engineering Development, Production, and Fielding.

Mr. Phillip Gilbert is the Chief/Section Leader for Configuration Management at Javelin Project Office, Redstone Arsenal, Alabama. As part of the Missile Commands System Engineering and Production Directorate (SEPD) Configuration Management team, he has 12 years with civilian service, with expertise in the areas of Logistics, Configuration Management, Value Engineering and Spare Parts. Completed engineering at the University of Alabama in Birmingham and the Maintainability Engineering program at the School of Engineering and Logistics at Red River. His present endeavors are in the area of performance based Acquisition and Electronic Engineering Data Management.

Mr. Paul C. Hollowell is the Executive Vice President of Oshkosh Truck Corporation (Oshkosh), responsible for all aspects of the company's defense business. Mr. Hollowell joined Oshkosh and was elected Vice President of Defense Products in 1989. In February 1994, the Oshkosh Truck Board of Directors elevated Mr. Hollowell to his present position with the major focus of acquiring new international and defense business for the corporation. Mr. Hollowell has an undergraduate degree from Ohio University, and a Masters Degree in Business Administration. Before joining Oshkosh Truck, Mr. Hollowell was with General Motors Corporation. He also served in the U.S. Army. Mr. Hollowell's various defense involvement includes the Association of the United States Army, Air Force Association, National Guard Association, and Chairman of the Tactical Wheeled Vehicle Steering Committee of the American Defense Preparedness Association. He has been awarded the ADPA silver medal in recognition of his service to furthering aims of the organization. Mr. Hollowell was also appointed to President Clinton's and Mubarak's United States Egyptian President's Council.

Mr. Lawrence Howard is Manager of Government Programs at Freightliner Corporation for the last 10 years. Mr. Howard's responsibility includes management, direction, and supervision of all functions related to the sales, implementation, and product support of military and public sector customers. Mr. Howard is part of the Freightliner Export Sales Department and as of April 1st, 1997 reports directly to the Director, Government Vehicles. His military service includes 22 years' active duty in the U.S. Army, where he retired at the rank of Chief Warrant Officer 2. Mr. Howard attended the City College of New York.

Mr. E. Bayly Orem is Manager of Washington, DC Operations for Defense and Federal Products Department of Caterpillar. Mr. Orem joined Caterpillar in 1965 as management trainee. From 1968 to 1973, Mr. Orem was the Regional Sales Manager for Caterpillar in the areas of Southern South America and later Central America. In the period of 1973 to 1975, he was Training Manager for Caterpillar Brazil. On his return to the U.S., Mr. Orem was placed in charge of Training the Domestic Caterpillar Dealer sales force. In 1979, Mr. Orem transferred to his present position as. Mr. Orem has a Bachelor of Science in Industrial Management from the University of Maryland.

Mr. Tim Raupp is a Program Manager, responsible for development, implementation and management of the Oshkosh Fleet Aftermarket Support Team (FAST) program for the U.S. Army and Marine Corps FHTV fleet. In addition, he is project manager for the Electronic Commerce for Oshkosh Truck Suppliers (ECOTS) supply chain management project sponsored by ARPA. Mr. Raupp joined Oshkosh Truck Corporation in 1978 as a technical writer, and has had various responsibilities related to product support since joining the company. In 1983, Mr. Raupp was named Technical Services Manager, responsible for technical publications development, provisioning, corporate printing and publications distribution. In 1992, Mr. Raupp was named Parts Distribution Manager, responsible for parts sales administration and distribution. In 1995, Mr. Raupp was named Product Support Manager, responsible for parts sales, distribution, product training and service administration for the company. Mr. Raupp was named FAST Program Manager in April 1996. Mr. Raupp has an undergraduate degree in business administration from Marian College, and a master's degree in management from Cardinal Stritch College. Mr. Raupp's involvement in professional activities include being a member of the Society of

Logistics Engineers, National Defense Transportation Association, Association of the U. S. Army, and the Air Force Association.

Ms. Lori C. Remeto is an Assistant to the Director of Strategic Planning and Programming Office at the Army Materiel Systems Analysis Activity (AMSAA). Ms. Remeto began her Federal Career in August of 1989 as a Quality Assurance Engineer for the U.S. Army Armament, Munitions and Chemical Command. She was hired in July 1991 as a Mechanical Engineer for the AMSAA located at Aberdeen Proving Grounds, Maryland. Ms. Remeto provided independent system evaluations of major air defense systems to top level Pentagon officials in support of defense acquisitions. In 1993, Ms. Remeto was selected to participate in a Federal Women's Executive Leadership Program. She served two internships; one at the Simulation, Training and Instrumentation Command in Orlando, Florida, and the other at the Army Materiel Command in Alexandria, Virginia. Mr. Remeto graduated from the University of Maryland with a bachelor of Science Degree in Mechanical Engineering, and a Master Degree in Mechanical Engineering from Johns Hopkins.

Mr. James W. Rickenbaugh is Chief of the Configuration Management Office at the U.S. Army Aviation and Troop Command. Mr. Rickenbaugh is responsible Configuration and Data Management of Aviation and Army Aircraft Modification Applications. His experience, 5 years industry and over 30 years civil service, includes Logistics Planning and Management, Supply, Maintenance and Procurement activities. Mr. Rickenbaugh has participated as the Army representative in various DoD, and Joint Services initiatives to include: Development of DoD Standard for Provisioning, DoD Standard for Logistics Support Analysis, Assignment of Joint Services Single Mangers for Spare and

Repair Parts, Army Just in Time Inventory, Government and Industry Single Process Initiatives, Development of the DoD Business Process Model and Standard for Configuration Management, Acquisition Reform Initiatives, and the development/improvements of numerous automated systems for management of technical data. He has provided expertise in all phases of the life cycle from preparation/coordination of Mission Need Statements through modification of fielded equipment.

Mr. Kerry White is a Integrated Logistics Support and Configuration Manager of Government Vehicle at Freightliner for the last 8 1/2 years. Mr. White reports directly to the General Manager of Freightliner Manufacturing. Before joining Freightliner, Mr. White held positions at Lockheed and General Dynamics. He also served in the Army as a Commissioned Officer. Mr. White received a Masters' Degree in Public Administration from Golden Gate University.

APPENDIX D

Company Profiles
(in alphabetical order)

CATERPILLAR:

Headquartered in Peoria, Illinois, Caterpillar Incorporated is the world's largest manufacturer of construction and mining equipment, natural gas engines and industrial gas turbines, and a leading global supplier of diesel engines. It is a Fortune 50 industrial company with more than $16 billion in assets. Caterpillar is one of only a handful of U.S. companies that leads its industry while competing globally from a principally domestic manufacturing base.

Global sales of earthmoving equipment average 200,000 to 300,000 units per year. The machines stay in service for 10 to 12 years on average. Many operate for 20 to 30 years. Caterpillar's mission is to convince customers that the company and its distribution organization is the best one to keep their equipment running in top condition.

Two-thirds of Caterpillar's dealers are located outside North America, and the vast majority are privately held companies. Caterpillar has developed the fastest and most comprehensive parts-delivery system in any industry. Although they guarantee delivery of any part anywhere in the world within 48 hours, dealers now provide more than 80 percent of the parts a customer wants immediately. And Caterpillar ships more than 99 percent of the parts that a dealer does not have on-hand the same day the order is placed. Compared to the automotive industry, the average wait for a part that a dealer does not have in-stock is likely to be from two to seven days.

Caterpillar maintain 22 parts facilities around the world, with more than 10 million square feet of warehouse storage. They service 480,000 line items of which 320,000 are in stock. Caterpillar's and its suppliers' factories make the remaining 160,000 on demand. They ship 84,000 items per day, or about one per second every day of the year. In addition, the dealers whom typically stocks between 40,000 and 50,000 line items, have made huge investments in parts inventories, warehouses, fleets of trucks, service bays, diagnostics and service equipment, sophisticated information technology, and highly trained people. This translate to both Caterpillar and its dealers currently total of about $2 billion worth of parts in their inventories.

Caterpillar's future endeavors include an information system that will permit delivery of a part before a customer realizes the need. The system will monitor machines remotely and notify the local dealer when a part is beginning to show signs of an impending failure so that we can arrange to replace it before it fails.

EXAR:

EXAR is focused on the design, manufacturing, and selling of mixed signal ICs for the communications, consumer and computer markets. Nearly 80 percent of the company's revenue are generated from sales to these markets.

EXAR's new headquarters is located in Fremont, California. Under the new organization, the Communications and Computer Division; the Industrial Office and Consumer Division; and Silicon Microstructures, are housed in the company's recently opened 151,000 square foot facility in Fremont, CA.

EXAR Corporation, has become one of the first semiconductor companies in the world to achieve QS-9000 registration. With the "Big Three" auto makers having mandated that their first tier suppliers be QS-9000 registered by December 31, 1997, it is estimated that presently less than 5 percent of all suppliers to the are registered.

FREIGHTLINER:

Over 50 years ago, Freightliner revolutionized the industry by introducing aluminum to truck building. Today, Freightliner continues to push the limits of technology and customer support, earning a reputation as " the company that does things right" for its customer.

Through the assistance of Mercede-Bentz and its world-wide distribution network, Freightliner entered markets in Mexico and several Central and South American countries, in the Philippines, Asia and the Middle East and became the leading U.S. truck exporter by the close of 1992.

With the support of its 300 highly-qualified North American truck dealers, Freightliner has also taken the lead in applying new tools, systems, and service for its customers' greater success. Its SpecPro software helps assure that all truck buyers specify the optimum vehicle configuration for their needs. They can analyze drive-train factors such as startability and gradability, display calculations like turning radius and weight distribution, and much more. The PartsPro electronic parts catalog speeds up and simplifies dealer identification and ordering of required parts. It covers all Freightliners produced since 1978, as well as components of all major manufacturers. Fleet Assistance software lets customers easily schedule maintenance and warranty claims, analyze repair costs and fuel economy, manage parts inventory, and track vehicle life cycle costs. ServicePro puts instant expert diagnostic assistance, vehicle history, relevant service bulletins and warranty information at the finger tips of the service advisor and mechanic.

Freightliner parts distribution centers are open around the clock, as a toll-free Customer Assistance Center, which is dedicated to getting customers whatever assistance and information they need. They have more than 500,000 different items in its commercial database, along with 4,900 military unique items. Freightliner can supply 95 percent of its spare parts to any customer within 48 hours worldwide. Freightliner's present vendor base is more than 1,000 companies.

Truck manufacturing plants are located in Portland, OR; Mt. Holly, NC; Cleveland, OH; and St. Thomas, Ontario, Canada. Parts manufacturing plants are located in Portland and Gastonia, NC. Dealers are supported by regional sales and service offices and by six state-of-the-art parts distribution centers (PDCs).

GENERAL MOTORS SERVICE PARTS OPERATIONS:

General Motors Service Parts Operations (SPO), headquartered in Flint, with offices in Detroit, markets automotive replacement parts and accessories worldwide under the GM and ACDelco brand names. SPO also provides inventory consultation and recommendations for improvement in parts, accessories and service merchandising under the GM Goodwrench Service banner.

SPO's vision is to make sure our customers receive the right part at the right time and right price. ACDelco supplies replacement parts to the independent aftermarket through the traditional warehouse distributor channel as well as the consumer-related segment serviced by mass merchandisers and large auto retailing chains. GM Parts handles the parts and service needs of GM dealers. SPO's International activity sells and markets GM parts for North American built vehicles sold outside North America and sells and markets ACDelco products from the United States and other international sources in GM Overseas Distribution Corporation territories and plant countries. It also manages the Canadian and Mexican GM Parts and ACDelco aftermarket operations.

SPO has more than 12,500 hourly and salaried employees, 30 warehousing facilities and 46 sales offices in 19 U.S. states, Puerto Rico, six Canadian provinces, Mexico and 10 overseas countries. With suppliers numbering 3,500 inside and outside GM, SPO ships an average of 36,000 tons of automotive replacement parts per month at the rate of 400,000 order lines per day to meet the needs of nearly 10,000 GM dealers and 2,500 distributors and retailers worldwide. ACDelco ships 36,000 tons of auto replacement parts each month.

Virtually every type of part for GM cars and trucks produced in North America--from exterior sheet metal and interior trim to axles and wheels--is available through GM dealers. ACDelco product lines include spark plugs, batteries, filters, shock absorbers, lamps, thermostats, brake parts, chemicals, bearings, fuel controls, ignition and starting controls. Remanufactured products such as starters, generators, alternators, power steering pumps, air conditioning compressors and engines are also available. Ultimately, ACDelco parts flow to the consumer through outlets such as auto parts and general discount stores, service stations and auto repair facilities. The parts get to repair shops through distribution channels comprised of independently owned small and large warehouses.

OSHKOSH:

Oshkosh has built a reputation as being the premier severe-duty truck provider for the U.S. military. Annual sales for heavy-duty defense trucks are stable at $200 to $250 million, with significant growth opportunities in other areas. The company was among the first worldwide truck manufacturers to earn ISO 9001 certification, and earned the AQP Organizational Excellence Award in 1996. In 1996, Oshkosh Truck's fiscal sales exceeded $600 million. The company employs approximately 2600 people and is headquartered in Oshkosh, Wisconsin. Additional manufacturing facilities are located in Texas and Florida. Regional and international service centers work in unison with an international network of representatives to ensure fast, knowledgeable service and parts support for customers. Oshkosh has overseas offices in eight countries and representatives in more than 40 countries that can provide excellent sales and service support for the Pierce product line.

Oshkosh Truck is a driving force in three key business segments: fire and emergency, defense, and commercial. Pierce and the Oshkosh airport business will form one unit, serving the growing fire and emergency support market. The commercial business will remain focused on the vocational specialty market, particularly construction where the company has achieved steady market share growth in recent years. Defense will continue to be a critical business for Oshkosh, where it is the premier supplier of heavy-duty trucks to the U.S. Department of Defense.

Oshkosh Truck has a major new initiative called the FAST program. Under FAST, Oshkosh has proposed to streamline the Defense procurement process by implementing commercial life-cycle support practices to the full range of product support activities, including configuration management and parts procurement. Oshkosh believes DoD can improve their equipment readiness and reduce support costs by implementing their program. The program includes providing toll-free number source for parts and local dealer support for parts and service to major Army installations, and providing direct technical support through company field service representatives who assist with technical/troubleshooting support and product training.

Another initiative we have started with the Army is development of electronic parts catalogs that will be tied into our configuration management and provisioning files to provide a streamlined method of keeping all support documentation updated, consistent and readily available. CD ROM catalog will be distributed to the field to allow on-line ordering to their dealers.

The Oshkosh Truck Integrated Logistics Support Department (ILS) is responsible for configuration data management for our Defense Product lines. We have a commercial technical services group that performs similar duties for our commercial product lines. Due to the size of the fleets and potential logistics support cost impacts, our defense product configuration control is slightly more involved and more formal than our commercial product procedures; however, the overall process is similar. The following explanation and numbers are based on our defense product process.

The ILS group maintains CM files that were designed to satisfy provisioning data and technical manual deliverable requirements associated with our vehicle contracts with the Department of Defense. Typically, there are military specifications which dictate the formats and requirements for this data. Oshkosh Truck has designed it's own software program for managing configuration files. Our program enables us to maintain a complete configuration file for a specific truck model/contract. Changes are processed which affect the vehicle configuration. These changes come from Engineering changes, component supplier changes, and service part changes initiated through our parts and service personnel. All changes are routed through an internal configuration control board prior to implementation. This board is comprised of engineering, ILS, service and contract administration personnel. It is their job to determine the validity and cost effectiveness of suggested changes, and to determine a practical implementation date.

Our CM computer files track changes by vehicle serial number. Through our master file, we are able to download information to provisioning files and to parts catalog files. Provisioning files include supply management codes which are used by the Government and Oshkosh Truck to manage spare parts inventory. The parts catalog files become electronic printing masters for catalog printing. The average cost to process changes and update the related files and manuals is approximately $50 per change. We currently manage about 50,000 numbers in our CM files. New part numbers introduced are sent to a parts analyst within our product support group, who determines which parts to put in stock in our central parts warehouse to support fielded vehicles. This same analyst monitors ECNs and other changes to determine parts that require scrap or rework depending on the nature of the change.

Our company has one central warehouse and approximately 30 dealers that stock parts in their regional locations. We currently maintain a spares inventory of 30,000 line items valued at approximately $9,000,000. Our average order process/shipment time for in-stock items is 4 to 6 hours. Our average ALT is 6 weeks and average PLT is 12 weeks.

APPENDIX E

<u>Process Action Team Statute and Regulation Recommendation List</u>

- Eliminate Principal Assistant Responsible for Contracting (PARC) approval for award to CRSA required by AMC FARS.
- Eliminate Spare Part Breakout Program screening requirements for actions under the simplified acquisition threshold:
- Allow concurrent release of the J&A and the transmission of the synopsis notice.
- Eliminate DD Form 1423 and document summary lists for data requirements.
- Increase the threshold for Congressional Notification to $10M.
- Tailor Uniform Contract Format structure and Modify Uniform Contract Format to allow more simplified Contract Line Item number (CLIN) structure.
- Allow the Contracting Officer to approve a J&A up to $500,000.
- Require legal review of solicitations and contracts only over $500,000.
- Delegate approval of J&As over $10M to the HCA instead of the Secretary of Army for Research, Development and Acquisition (SARDA).
- Lower approval levels required to authorize class deviations from the Federal Acquisition Regulation (FAR) and Defense Federal Acquisition Regulation Supplement (DFARS).
- Eliminate approval level for subcontracting plans with less than five percent goal for small disadvantaged business.
- Waive BCM in formal source selections.
- Waive BCM for commercial items.

- Eliminate requirement for Foreign Military Sales (FMS) customer to justify sole source (DoD 5105.38M).

- Eliminate higher level approvals for BCMs.

- Eliminate HCA approval for award and funding of letter contracts.

- Eliminate inconsistency between AR 380-10 and acquisition regulations (solicitations with foreign firms).

- Change AFARS approval levels for Acquisition Plans to be consistent with DFARS.

- Implement Federal Acquisition Streamlining Act and associated increase in simplified acquisition threshold.

- Lower approval levels required to authorize requests for additional Best and Final Offers.

- Eliminate requirement for preparation of Independent Govemment Estimates.

- Delegate authority to HCA to waive requirements for submission of cost and pricing data.

- Eliminate AMC reviews for RFP streamlining. [Ref. 45]

APPENDIX F

Secondary Item Procurement Statistics

FY	Command	Dollar Amount	Category	# of PWDs	Dollars	ALT
1993	ATCOM		Competitive	6,876	1,063,100,587	
			Non-Competitive	16,470	2,490,006,054	
			Total	23,346	$3,553,106,641	
	CECOM	Small	Competitive	21	256,507	
			Non-Competitive	52	459,753	
		Large	Competitive	46	33,282,180	
			Non-Competitive	74	54,995,491	
			Total	193	$88,993,931	
	TACOM	Small	Competitive	842	5,599,783	119
			Non-Competitive	629	3,064,354	102
		Large	Competitive	516	94,879,376	212
			Non-Competitive	331	91,263,760	183
			Total	2318	$194,807,273	
1994	ATCOM		Competitive	4,812	768,313,918	
			Non-Competitive	11,534	1,693,592,353	
			Total	16,346	$2,461,906,271	
	CECOM	Small	Competitive	40	444,667	
			Non-Competitive	95	977,148	
		Large	Competitive	61	39,304,280	
			Non-Competitive	117	55,098,663	
			Total	313	$95,824,758	
	TACOM	Small	Competitive	1,584	8,756,974	109
			Non-Competitive	969	4,762,527	101
		Large	Competitive	504	99,877,906	191
			Non-Competitive	314	92,776,308	130
			Total	3,371	$206,173,715	
1995	AMCCOM	Small	Competitive	1064	6,369,070	
			Non-Competitive	305	2,160,934	
		Large	Competitive	276	76,451,505	
			Non-Competitive	202	40,219,834	
			Total	2001	$113,623,332	
	ATCOM		Competitive	4,127	945,053,574	
			Non-Competitive	8,250	1,834,662,418	
			Total	12,377	$2,779,715,992	
	CECOM	Small	Competitive	42	364,929	
			Non-Competitive	80	793,879	
		Large	Competitive	68	51,096,849	
			Non-Competitive	91	53,152,126	
			Total	281	$105,407,783	
	TACOM	Small	Competitive	1226	7,735,953	99
			Non-Competitive	851	4,909,594	89
		Large	Competitive	465	83,203,566	183
			Non-Competitive	313	70,466,863	179
			Total	2855	$166,315,976	
1996	AMCCOM	Small	Competitive	1171	7,521,637	
			Non-Competitive	252	2,070,367	
		Large	Competitive	393	69,428,422	
			Non-Competitive	185	34,602,906	
			Total	1847	$131,201,344	
	ATCOM		Competitive	4,054	798,585,624	
			Non-Competitive	5,682	1,877,238,911	
			Total	9,736	$2,675,824,535	
	CECOM	Small	Competitive	47	544,438	
			Non-Competitive	67	690,401	
		Large	Competitive	65	32,606,258	
			Non-Competitive	99	38,500,068	
			Total	278	$72,341,165	
	TACOM	Small	Competitive	1433	8,621,519	92
			Non-Competitive	855	5,100,138	84
		Large	Competitive	660	94,043,316	165
			Non-Competitive	512	180,042,861	138
			Total	3460	$287,807,834	

MSCs' Secondary Item Procurements

Fiscal Year	DLA Center	Category	# of Solicitations	Dollars ($M)
1993	DISC	Competitive	24,773	218,253
		Non-Competitive	996	12,918
		Simple-Purchase	112,627	115,622
		Total	138,396	$346,793
	DSCR	Competitive	140,158	
		Non-Competitive	36,141	
		Total	176,299	
1994	DISC	Competitive	26,247	235,082
		Non-Competitive	1,095	21,229
		Simple-Purchase	116,262	125,382
		Total	143,604	$381,693
	DSCC	Competitive	166,099	573,032
		Non-Competitive	160,590	108,713
		Total	326,689	$681,745
	DSCR	Competitive	183,635	
		Non-Competitive	38,953	
		Total	222,588	
1995	DISC	Competitive	29,135	273,055
		Non-Competitive	1,741	36,497
		Simple-Purchase	145,160	134,411
		Total	176,036	$443,963
	DSCC	Competitive	205,251	645,620
		Non-Competitive	193,506	122,369
		Total	398,757	$767,989
	DSCR	Competitive	210,210	
		Non-Competitive	66,018	
		Total	276,228	
1996	DISC	Competitive	31,949	279,783
		Non-Competitive	3,227	84,051
		Simple-Purchase	192,009	153,788
		Total	227,187	$517,622
	DSCC	Competitive	248,518	623,538
		Non-Competitive	218,435	127,257
		Total	466,953	$750,795
	DSCR	Competitive	241,145	
		Non-Competitive	56,933	
		Total	298,078	

DLA's Secondary Item Procurements

APPENDIX G

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60. Mr. James Coy, Exar Corporation, Materials Manager, 48720 Kato Road, Fremont, California 94538, conducted 4 December 1996.

61. Mr. Paul C. Hollowell, Oshkosh Truck Corporation, Post Office Box 2566, Oshkosh, WI 54903-2566, conducted 26 January 1997.

62. Mr. E. Bayly Orem, Caterpillar Incorporated, General Manager, Defense and Federal Products, Post Office Box 470, Mossville, Illinois 61552-0470, conducted 27 January 1997.

63. Mr. Lawrence J. Howard, Freightliner Corporation, Program Manager, Government Vehicles, 4747 North Channel Avenue, Post Office Box 3849, Portland, Oregon 97208-3849, conducted 27 January 1997.

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