

---

Logistics Management Institute

Metrics for the Apparel  
Research Network

Volume I: The Defense Apparel Business

DL702T1

August 1997

Eric L. Gentsch  
Jack J. Vandenberghe

**DISTRIBUTION STATEMENT A**

Approved for public release;  
Distribution Unlimited

19980601 087

DTIC QUALITY INSPECTED 1

**LMI**<sup>®</sup>

# Metrics for the Apparel Research Network

Volume I: The Defense Apparel Business

DL702T1

August 1997

Eric L. Gentsch  
Jack J. Vandenberghe

Prepared pursuant to Department of Defense Contract DASW01-95-C-0019. The views expressed here are those of the Logistics Management Institute at the time of issue but not necessarily those of the Department of Defense. Permission to quote or reproduce any part except for government purposes must be obtained from the Logistics Management Institute.

LOGISTICS MANAGEMENT INSTITUTE  
2000 CORPORATE RIDGE  
MCLEAN, VIRGINIA 22102-7805

Metrics for the Apparel Research Network  
Volume I: The Defense Apparel Business

DL702T1/AUGUST 1997

## Executive Summary

The Apparel Research Network (ARN) is a consortium, formed in 1994 by the Defense Logistics Agency (DLA), whose purpose is to improve costs, lead-times, and quality in the design, production, and distribution of defense clothing. The ARN comprises 22 universities, technology companies, consultants, and manufacturers. Representatives from government clothing operations guide the research and manage its implementation.

DLA engaged the Logistics Management Institute to quantitatively describe the defense clothing business in order to support the direction and conduct of ARN research. In that regard, we developed performance baselines that the ARN researchers used to evaluate the benefits and costs of proposed research and development projects.

The defense apparel production/distribution system is a complex network of private-sector firms and government organizations. Private-sector manufacturers cut fabric and sew the resulting patterns into finished garments. In FY95, DLA purchased \$766.3 million in clothing and textiles from manufacturers. Of the price paid to apparel manufacturers, 45 percent goes to materials; 39 percent goes to nonproduction labor, other overhead costs, and profit; and 16 percent goes to production labor. DLA procures, stocks, and distributes wholesale inventory. To procure, store, and distribute that material, DLA spent \$227.2 million, including an imputed cost for inventory financing.

The military services perform garment design and also stock and issue retail inventory. A major "channel of sale" for the services is new recruit issues. The services estimate that roughly 300,000 new recruits were inducted in FY96. To issue clothing to new recruits, the military service recruit induction centers (RICs) spent about \$10.6 million, including an imputed cost for inventory financing (but excluding design costs, which we were not able to capture).

Although no single organization has comprehensive financial responsibility for defense apparel production and distribution, we were able to compile a consolidated statement of costs for manufacturing, wholesale distribution, and retail dis-

---

tribution. After apportioning the cost of DLA procurement and wholesale activities, the total cost to issue clothing to recruits in FY95 was \$268.1 million.

The issues that emerged during the course of this study include the following:

- ◆ Lead-times have a major influence on cost. These include administrative lead-time, production lead-time, and logistics response time. Administrative lead-times for clothing items average 193 days and range from 56 days to 310 days. Production lead-times average 158 days and range from 60 days to 240 days. For clothing orders, the overall average logistics response time is approximately 20 days. Orders shipped from DLA depots average 15 days, while orders shipped “direct vendor delivery” take 40 days.
- ◆ Presumably, the customer needs air shipments more urgently than truck shipments, but the logistics response time for air shipments is only 17 percent shorter (about 15 days vs. 18 days by truck) and air shipments cost over six times more per pound.
- ◆ The procedure for reporting quality defects to DLA is somewhat cumbersome and the RICs usually resolve quality problems by performing alterations. Hence, most finished item quality problems encountered at the RICs go unreported.
- ◆ The military services control uniform designs, but the RICs (which are operated by the services but separate from the design bureaus) have noted several areas in which size gradations can be improved to better fit the pool of recruits.
- ◆ While most clothing arrives at recruit centers in good condition, it is sometimes lacking paperwork (due to multiple boxes in an order arriving separately), and it sometimes comes in packaging that does not correspond to issue quantities or that requires extra effort to unwrap and dispose of (without a perceived benefit of protecting the garment).

In summary, ARN research is intended to reduce cost, shorten lead-times, and improve quality in the defense business. With our baseline as an aid, ARN research can be focused on the areas of most importance and the resulting projects can be better evaluated for their net impact.

# Contents

---

Chapter 1 Introduction and Summary .....	1-1
BACKGROUND.....	1-1
SUMMARY.....	1-1
Chapter 2 The Apparel Research Network.....	2-1
PURPOSE AND APPROACH .....	2-1
LMI'S ROLE.....	2-4
Chapter 3 The Defense Apparel Production/Distribution System.....	3-1
OVERVIEW .....	3-1
MANUFACTURERS .....	3-2
DLA DEPOTS.....	3-4
RETAIL DISTRIBUTION: RECRUIT INDUCTION CENTERS.....	3-4
Number of Recruits.....	3-5
Items .....	3-6
Chapter 4 Cost Metrics .....	4-1
MANUFACTURERS' COST PROFILE .....	4-1
WHOLESALE COSTS .....	4-4
RETAIL COSTS.....	4-5
CONSOLIDATED COSTS.....	4-8
Chapter 5 Lead-Time Metrics.....	5-1
PROCUREMENT LEAD-TIME .....	5-1
LOGISTICS RESPONSE TIME.....	5-3
All RICs .....	5-4
Case Study: Fort Jackson .....	5-6
SPECIAL MEASUREMENTS .....	5-10
Chapter 6 Quality Issues.....	6-1
TRADITIONAL QUALITY PROCEDURES.....	6-1

---

QUALITY TRENDS .....	6-1
ADHERENCE TO SPECIFICATION.....	6-2
ADEQUACY OF DESIGN AND FIT .....	6-3
DISTRIBUTION SERVICES.....	6-4
Bibliography .....	Bib-1
Appendix A Recruit Clothing Manufacturers	
Appendix B Military Recruit Clothing Issue Lists	
Appendix C Apparel Industry/Occupation Profile	
Appendix D Acronyms	

## TABLES

1-1. Costs for Recruit Bag Items, FY95.....	1-2
2-1. ARN Partners.....	2-2
2-2. Joint Planning Committee Members .....	2-3
3-1. 1994 DPSC Purchases by Federal Supply Class.....	3-3
3-2. Breakdown of 1994 DPSC Purchases by Type of Business .....	3-4
3-3. Recruit Induction Centers .....	3-5
3-4. Number of Bag Items (Exclusive of Sizes) Issued by Each Military Service for Each Gender .....	3-6
3-5. 1996 Individual Recruit Clothing Value by Military Service and Gender .....	3-7
3-6. The Top Items Issued by RICs.....	3-7
4-1. Census Data for Men's and Boys' Apparel (\$ millions).....	4-1
4-2. Breakdown of Costs for Men's and Boy's Apparel (percent) .....	4-2
4-3. Size of Industries Supporting Defense Clothing and Textiles.....	4-3
4-4. DLA's Clothing and Textile Costs for FY95 .....	4-5
4-5. Labor and Inventory at Army RICs .....	4-7
4-6. Costs for Recruit Bag Items, FY95.....	4-8
4-7. Costs for Army Recruit Dress Uniforms, FY95 .....	4-9
4-8. Costs for Army Recruit Battle Dress Uniforms (Camouflage "Fatigues"), FY95.....	4-9
5-1. Administrative Lead-Time for Army Dress Uniforms .....	5-2
5-2. Production Lead-Time for Army Dress Uniforms.....	5-2
5-3. Administrative Lead-Time for Battle Dress Uniforms .....	5-3
5-4. Production Lead-Time for Battle Dress Uniforms .....	5-3
5-5. Representative Freight Rates .....	5-5
5-6. Special Measurement Order Statistics .....	5-11

---

## FIGURES

3-1. The Defense Apparel Production/Distribution System .....	3-1
3-2. Breakdown of New Recruits by Military Service .....	3-5
3-3. Breakdown of New Recruits by Gender .....	3-6
4-1. Manufacturers' Cost Profile, Men's and Boys' Apparel .....	4-2
4-2. Distribution of Major Activities Supporting Clothing and Textile Industries.....	4-4
4-3. Labor Categories, Numbers of Workers, and Portion of Labor Cost at the Fort Jackson Clothing Initial Issue Point.....	4-6
4-4. Inventory and Recruit Accessions at Fort Jackson .....	4-7
5-1. Logistics Response Time for RICs .....	5-4
5-2. Logistics Response Time by Method of Shipment.....	5-5
5-3. Fort Jackson Logistics Response Time for Dress Uniforms.....	5-6
5-4. Fort Jackson Logistics Response Time for Battle Dress Uniforms .....	5-7
5-5. Logistics Response Times for Fort Jackson for Items Flowing Through DLA Depots .....	5-8
5-6. Logistics Response Time for Fort Jackson Items Shipped via Direct Vendor Delivery.....	5-9
5-7. Breakdown of Logistics Response Time for Direct Vendor Deliveries to Fort Jackson.....	5-9
5-8. Comparison of Direct Vendor Deliveries to Depot Shipped Orders .....	5-10
5-9. Distribution of Special Measurement Order Times.....	5-11
5-10. Improvement in Special Measurement Order Times.....	5-12



# Preface

---

The Defense Logistics Agency (DLA) engaged the Logistics Management Institute (LMI) to quantitatively describe the defense clothing business, to assist the Apparel Research Network (ARN) researchers in evaluating the costs and benefits of their individual projects, and to perform an overall financial analysis of the ARN research program. We were asked to describe the defense clothing business because there is no single organization that manages or oversees all the activities and costs involved; therefore, no one entity could provide an overall description. The total picture involves hundreds of private-sector suppliers, DLA, and the military services.

This report comprises two volumes. In Volume I, we provide a summary description of the defense apparel production and distribution business. The bulk of this volume provides cost, lead-time, and quality measures for key aspects of the business. These measures are useful for identifying research targets of opportunity and for evaluating the potential and progress of ARN research projects.

In Volume II, we present an overall financial analysis for the ARN, computing net cash flows and net present values of all the projects combined. That analysis involves more than a simple tabulation of individual project costs and benefits, because some ARN program “overhead” costs need to be allocated (i.e., charged against benefits) and some duplication of benefits across projects necessitates an adjustment to the research projections.

Taken together, the two volumes present a consolidated profile of defense apparel business, describe the research program being contemplated to improve that business, and evaluate the net benefits to the government for its support of that research.

# Chapter 1

## Introduction and Summary

---

### BACKGROUND

The Apparel Research Network (ARN) is a consortium, formed in 1994 by the Defense Logistics Agency (DLA), whose purpose is to improve the design, production, and distribution of defense clothing. The ARN's scope includes all aspects of the apparel life cycle, from concept through manufacturing to issue to members of the military. ARN research seeks to reduce cost, shorten response times, and improve the quality of defense clothing. The ARN comprises 22 universities, technology companies, consultants, and manufacturers. Representatives from government clothing operations guide the research and manage its implementation.

At the direction of DLA, the ARN research concentrates on the clothing issued to new recruits at the recruit induction centers (RICs). Collectively, this clothing is known as "bag items" because of its association with the recruit's duffel bag. Specifically, the ARN is focusing initially on battle dress uniforms (BDUs) and Army men's dress uniforms. BDUs are moderate-cost items with large unit demand; dress uniforms are high-cost items with moderate demand.

### SUMMARY

The defense apparel production/distribution system is a complex network of private-sector firms and government organizations. Private-sector manufacturers cut fabric and sew the resulting patterns into finished garments. In FY95, DLA purchased \$766.3 million in clothing and textiles from manufacturers. Of that amount, \$210.8 million were for items to be issued to recruits. Since 31 December 1994, 93 companies have received contracts for these items. Of the price paid to apparel manufacturers, 45 percent goes to materials; 39 percent goes to nonproduction labor, other overhead costs, and profit; and 16 percent goes to production labor.

DLA procures, stocks, and distributes wholesale inventory. To procure, store, and distribute that material, DLA spent \$150.7 million. If inventory financing costs are included, as they would be in a private enterprise, DLA's expenses jump to \$227.2 million.

The military services design garments and stock and issue retail inventory. The services estimate that 300,000 new recruits were inducted in FY96. Based on that

number of recruits, the military services issued 200 types of items with a total value of \$274,454,835. To issue clothing to new recruits, the military service RICs spent about \$8.2 million in labor. If imputed inventory financing costs are included, the RICs spent about \$10.6 million. We were not able to collect good data on military service clothing design costs.

Although no single organization has comprehensive financial responsibility for defense apparel production and distribution, we were able to compile a consolidated statement of costs for manufacturing, wholesale distribution, and retail distribution. Table 1-1 shows that the total cost to issue clothing to recruits in FY95 was \$268.1 million.

*Table 1-1. Costs for Recruit Bag Items, FY95*

Cost area	FY95 cost (\$ millions)
Manufacturing	210.8
Design (DLA only)	0.1
DLA purchasing and inventory management	19.1
DLA warehousing and transportation	22.2
RIC operations	8.2
Subtotal	260.4
DLA inventory financing (imputed)	5.3
RIC inventory financing (imputed)	2.4
Total	268.1

Lead-times are major determinants of cost in the defense apparel production/distribution system. The two principal lead-times that we consider are procurement lead-time and logistics response time. Procurement lead-time starts when a wholesale inventory manager creates a purchase request and ends with contract delivery. Procurement lead-time has two elements, administrative lead-time and production lead-time. Administrative lead-time is the time from purchase request until contract award, and production lead-time is the time from contract award until delivery. Administrative lead-times for clothing items average 193 days and range from 56 to 310 days. Production lead-times average 158 days and range from 60 to 240 days.

A key focus of the ARN is the period of time between when the retail location orders an item and the retailer receives the item. DoD refers to this as logistics response time. For the 50,000 clothing orders placed in 1996, the overall average logistics response time was approximately 20 days. The roughly 40,000 orders filled by depot inventory averaged about 15 days, while the remaining orders shipped directly from manufacturers took over 40 days. Retail customers assign priorities to their orders, but orders in the three major priority groups (called issue groups) all have about the same logistics response time.

The two most common shipping modes for clothing orders are less-than-full truckload and "air-small package." Presumably, the customer needs air shipments more urgently than truck shipments, but the logistics response time for air shipments is only 17 percent shorter (about 15 days vs. 18 days by truck) and air shipments cost over six times more per pound.

We also examined quality issues related to defense apparel. In the military apparel production/distribution system, the ultimate customer is the soldier. Our assessment of quality is not limited to measures of how many apparel garments fail to meet their product specifications (e.g., defects per garment), but includes the quality of the production/distribution system's service from the customer's perspective.

Traditionally, DoD has administered quality control on clothing and textile procurements by levying military product and quality specifications and standards, such as MIL-I-45208, *Inspection System Requirements*, on contracts with military apparel manufacturers. DoD is phasing out military specifications, such as MIL-I-45208, in favor of commercial standards. Another commercial practice being adopted by DoD is the use of warrantees. These warrantees guarantee a one-for-one replacement of any garment that is defective.

Product quality, which is defined as adherence to specification, is most readily described by examining two points in time: the point at which apparel manufacturers receive textiles and the point at which RICs issue finished garments to recruits. Typically, the number of defects in textiles depends upon the type of fabric, ranging from 1 defect per 100 square yards for dress shirt fabrics to 18 defects per 100 square yards of worsted fabrics. Most textile defects are found by the apparel manufacturers, and the RICs report that "almost all" items arrive in good condition and accurately match orders. However, the procedure for reporting quality defects to DLA is somewhat cumbersome and the RICs usually resolve quality problems by performing alterations. Hence, most finished item quality problems encountered at the RICs go unreported.

Quality issues also exist in the adequacy of designs and fit and in distribution services. The military services control uniform designs, but the RICs (which are operated by the services but separate from the design bureaus) have noted several areas in which size gradations can be improved to better fit the pool of recruits. These areas are principally in the shirt sleeve and coat length of Army and Air Force dress uniforms.

The quality of distribution services relates to the condition, paperwork, and packaging associated with clothing received by the RICs. Whether shipped from DLA depots or manufacturers, material usually arrives in good condition and in the quantity stated. The Army has found that direct vendor delivery (DVD) shipments sometimes arrive without proper documentation, due to the fact that commercial express carriers often split a single order into multiple boxes. Also, some items

---

come with extra packaging that is intended to improve quality but that actually hinders RIC handling efficiency. Examples of this include the hangar pack for dress coats, shoe packaging, and the packaging of dress shirts. These types of packaging result in additional time and cost for unpacking and produce unnecessary packaging material that must be disposed of.

## Chapter 2

# The Apparel Research Network

---

### PURPOSE AND APPROACH

DLA's Manufacturing Science and Technology Program, whose mission is to advance the state of the art of manufacturing technology and facilitate technology implementation, funds and administers the ARN. The ARN's scope includes all aspects of the apparel life cycle, from concept through manufacturing to issue to the end user. End users are members of the armed services. ARN research seeks to reduce cost, shorten response times, and improve the quality of defense clothing. The potential technical areas include materials, computer-aided design, sewing technology, electronic data interchange, computer-integrated manufacturing, production control, work methods, equipment development and automation, and quality assurance techniques.

The research and development (R&D) contemplated by the ARN would benefit both the defense clothing industrial base and government clothing operations. The defense clothing industrial base includes not only apparel manufacturers, but also supporting industries such as sundry item (e.g., button) producers, equipment makers, and textile mills. Government clothing operations include garment design, test, procurement, and distribution.

The ARN membership consists of "partners," who perform research, and representatives from government clothing operations, who help guide the research and manage its implementation. As shown in Table 2-1, the ARN partners include universities, industrial consultants, equipment and software companies, and an apparel manufacturer.

Additional apparel manufacturers are participating informally. The government representatives working with the ARN include representatives from DLA's Defense Personnel Support Center (DPSC) and the military service clothing design and distribution operations.

The ARN represents a novel approach to government R&D. Traditionally, R&D is organized in one of two ways. In one way, the government defines the research it wants done and then solicits proposals. In the second way, individual researchers develop ideas and sell them to the government via unsolicited proposals. Under the ARN, DLA first pays the partners "seed money" to collectively define the research agenda and then solicits R&D proposals from individual partners or teams of partners. The key differences are that both the researchers and the government participate in R&D planning, and that researchers from different organizations

Table 2-1. ARN Partners

Anthropology Research Project	The HAAS Tailoring Company
Auburn University	Jet Sew Technologies
Beecher Research Company	National Institute of Standards and Technology
California State Polytechnic University, Pomona	North Carolina State University
Charles Gilbert Associates	Ohio University
Clarity Fit Technologies	Philadelphia College of Textiles and Sciences
Clemson Apparel Research	Rensselaer Polytechnic Institute
Cyberware	Southern Polytechnic State University
EDI Integration Corporation	University of Southwestern Louisiana
Florida International University	University of Wisconsin–Stout
Georgia Institute of Technology	Wizdom Systems

Source: Apparel Research Network World Wide Web site at <http://mtiac.hq.itri.com/arn/>, 16 April 1997.

collaborate to a much greater degree. The result is a research agenda that more closely matches the needs of the government and that draws on the best capabilities of each of the individual researchers.

The projected duration of the ARN is 7 years (beginning in 1994), including a 3-year base period followed by two 2-year options. The ARN statement of work calls for the ARN partners to work together to identify broad objectives for 3-, 5-, and 7-year time periods. The principal product of the initial collaboration is a technical plan identifying opportunities and defining projects for technology improvement through the base contract period and its option periods. The technical plan must describe the problems being addressed, the methodology or technical approach to be used, and the anticipated benefits after implementation.

Two demonstration sites augment the ARN research projects. These sites, California State Polytechnic University, Pomona, and Clemson Apparel Research, manufacture limited quantities of military garments and assist with the transition of new technology from research to actual operations. The sites also perform education and training, and measure the effect of ARN research. Because the demonstration sites perform actual production (their garments are worn by soldiers), and because they must interface with industry suppliers (e.g., for fabric and sundries) and the government (e.g., for orders and billing), they develop a very realistic understanding of the challenges and opportunities in the defense clothing business. Also, because they operate within a university research setting, free from the competitive pressures of dedicated apparel producers, they also enjoy the opportunity to explore and apply novel solutions to the problems they identify.

A government joint planning committee oversees the ARN partners' work and that of the demonstration sites. The committee members provide expertise in related technical areas, help select and prioritize candidate projects, and monitor progress. Table 2-2 lists the organizations supplying committee members.

Table 2-2. Joint Planning Committee Members

Defense Personnel Support Center	U.S. Coast Guard Clothing Activity
U.S. Air Force Clothing Division	Headquarters, U.S. Marine Corps
U.S. Army Natick Research, Development, and Engineering Center	U.S. Navy Clothing and Textile Research Facility
Office of the Deputy Chief of Staff for Logistics	Navy Exchange Service Command

Source: Apparel Research Network World Wide Web site at <http://mtiac.hq.iitri.com/arn/>, 16 April 1997.

In addition to the committee members, representatives of the RICs provide technical assistance to the ARN partners.

The ARN partners have created three "focus groups" to coordinate their efforts. These groups are

- ◆ design and development,
- ◆ preproduction and production, and
- ◆ ordering and distribution.

Design and development activities include garment concept, pattern generation, and testing. Preproduction and production includes production management, marker making, cutting, and sewing at apparel manufacturers. Ordering and distribution includes the storage, transportation, and issuing of clothing at manufacturers, wholesale warehouses, and retail sites. These ARN focus groups foster the cooperative development of project ideas and research proposals. Complementary projects that support, or lead to, the improvement of a specific operation within a focus group are combined to form a "supertask."

At the direction of DLA, the ARN research is concentrating on the clothing issued to new recruits at the RICs. Collectively, this clothing is known as "bag items" because of its association with the recruit's duffel bag. Specifically, the ARN is focusing initially on BDUs and Army men's dress uniforms. BDUs are moderate-cost items with large unit demand; dress uniforms are high-cost items with moderate demand.



---

## LMI'S ROLE

DLA engaged LMI to quantitatively describe the defense clothing business, to assist the researchers in evaluating the costs and benefits of their individual projects, and to perform an overall financial analysis of the ARN research program. We were asked to describe the defense clothing business because no single organization exists that manages or oversees all the activities and costs involved. The total picture involves hundreds of private-sector suppliers, DLA, and the military services. What reduces cost at one of these organizations might increase cost at another, and our role is to help explain the tradeoffs involved.

We were asked to help the researchers in evaluating the net benefits of their individual projects. The ARN researchers are experts in their respective fields, but are not necessarily aware of the impact of their proposed innovations on upstream and downstream activities. In addition, we have sought to impose a standard method of financial analysis that facilitates the compiling of individual project costs and benefits to discern the overall ARN payback.

Finally, we were asked to perform the overall financial analysis for the ARN, computing net cash flows and net present values of all the projects combined. That analysis involves more than a simple tabulation of individual project costs and benefits, because some ARN program "overhead" costs need to be allocated (i.e., charged against benefits) and some duplication of benefits across projects necessitates an adjustment to the research projections.

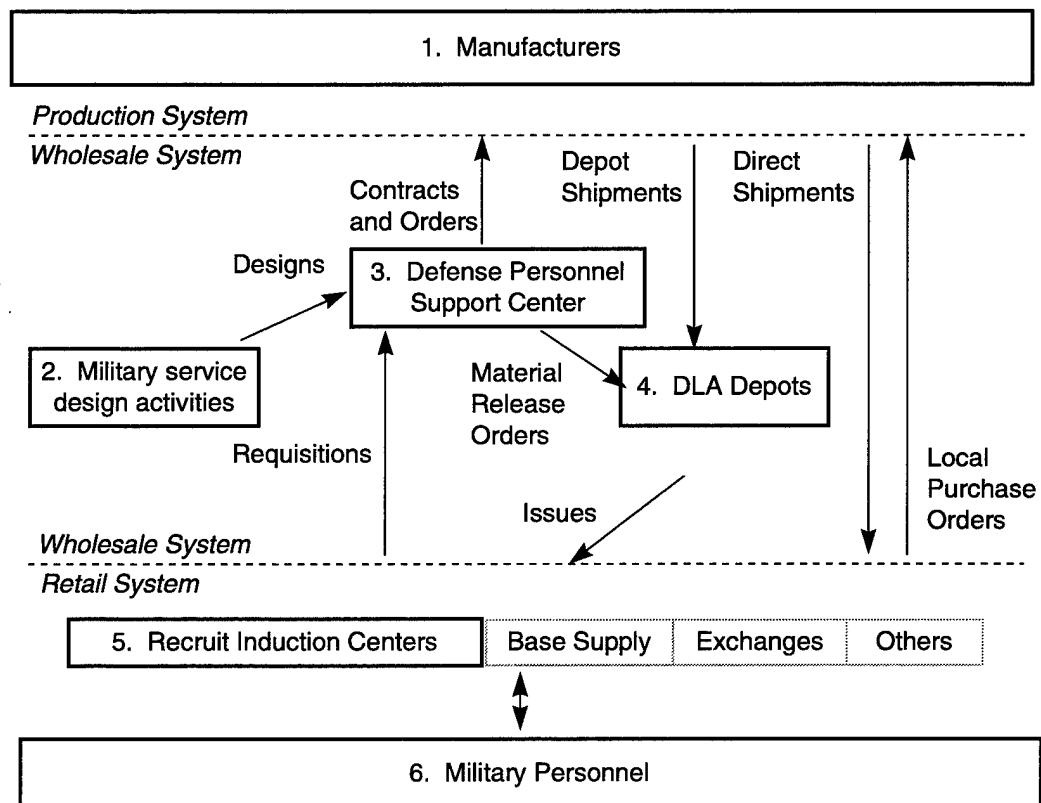
# Chapter 3

## The Defense Apparel Production/Distribution System

### OVERVIEW

The defense apparel production/distribution system is a complex network of private-sector firms and government organizations. Figure 3-1 shows the elements of the system that are pertinent to the ARN. Private-sector manufacturers (box 1) cut fabric and sew the resulting patterns into finished garments. Also part of the production system, but not shown in the figure, are textile mills, cutting and sewing equipment manufacturers, and sundry item manufacturers.

*Figure 3-1. The Defense Apparel Production/Distribution System*



---

The defense distribution system is actually two systems, a wholesale distribution system and a retail distribution system.<sup>1</sup> The wholesale system includes operations of the military services and DLA. Each military service operates its own clothing design activity (box 2). Those activities specify materials and dimensions and produce clothing patterns and size gradations. The services pass the resulting designs to the DPSC (box 3) Clothing and Textiles Directorate.

DPSC performs procurement and inventory management. It establishes wholesale stock levels and reorder points. It selects manufacturers and tells them how much to produce and when to produce it. The exact flow of information and materials in the wholesale system varies, but the figure shows the two most common: depot flow and DVD. In depot flow, manufacturers ship to a DLA depot, or warehouse (box 4). In DVD, manufacturers ship directly to a retail site, bypassing the wholesale warehouse.

Retail locations place orders on the wholesale distribution system by sending requisitions to DPSC. In depot flow, DPSC then transmits a material release order to the relevant depot, which in turn picks, packs, and ships the clothing to the retail customer. In DVD, DPSC transmits a delivery order to the manufacturer, which then ships directly to the retail customer.

The retail distribution system is run by the military services and the military exchanges and includes several channels of sale. Work and dress clothing for new recruits is distributed through the RICs (box 5); this is the retail activity upon which DLA has directed the ARN to focus. "Organizational" clothing, such as flight suits and protective chemical gear, is distributed through the services' base supply operations. The military exchanges sell replacement clothing,<sup>2</sup> and other minor channels of sale also exist. In each case, however, the ultimate customer is the soldier, sailor, airman, or marine that wears the clothing (box 6.)

## MANUFACTURERS

In 1994 the DPSC purchased \$551 million in clothing and textile items for issue to all of its retail customers. Table 3-1 shows the breakdown of purchases by federal supply class.

For that year, DPSC issued 663 contract actions to 229 companies. As shown in Table 3-2, over two-thirds of DPSC's purchases went to small businesses and organizations for the blind and handicapped.

---

<sup>1</sup> We use the terms wholesale and retail for analogy with commercial clothing operations; the terms are not in the official DoD lexicon.

<sup>2</sup> The exchanges operate autonomously of the wholesale distribution system shown here; they buy some goods from DPSC but others directly from manufacturers (and not necessarily the same manufacturers serving DPSC).

Table 3-1. 1994 DPSC Purchases by Federal Supply Class

Federal supply class	Description	Contract awards (\$)	Portion of total awards (%)
8415	Clothing, special purpose	216,312,796	39
8340	Tents and tarpaulins	115,509,770	21
8405	Outerwear, men's	95,791,697	17
8430	Footwear, men's	30,563,833	6
8465	Individual equipment	19,339,032	4
8470	Armor, personal	17,399,606	3
8410	Outerwear, women's	14,779,082	3
8420	Underwear and nightwear, men's	9,629,655	2
8440	Hosiery, handwear, and clothing accessories, men's	8,538,924	2
8305	Textile fabrics	7,908,805	1
8460	Luggage	7,049,948	1
8455	Badges and insignia	5,126,674	1
8345	Flags and pennants	1,647,897	0
8315	Notions and apparel findings	663,623	0
8445	Hosiery, handwear, and clothing accessories, women's	491,283	0
8330	Leather	42,880	0
Total		550,795,505	100

Source: Federal Prime Contracts on CD-ROM, Fiscal Year 1994, Vienna, VA: Eagle Eye Publishers, Inc., 1994.

Table 3-2. Breakdown of 1994 DPSC Purchases by Type of Business

Type of business	Number of contractors	Contract awards (\$)	Portion of total awards (%)
Small business	124	284,522,332	52
Large business	33	158,742,899	29
Workshop for the blind or other severely handicapped	54	60,300,528	11
Small disadvantaged business	16	38,821,436	7
Nonprofit	1	8,082,148	1
Foreign concern/entity	1	326,162	0
Total	229	550,795,505	100

Source: Federal Prime Contracts on CD-ROM, Fiscal Year 1994, Vienna, VA.: Eagle Eye Publishers, Inc., 1994.

---

A subset of these firms supplies the clothing of interest to the ARN, the recruits' bag items. Since 31 December 1994, 93 companies have received contracts for these items.<sup>3</sup> Appendix A lists these companies and their locations.

## DLA DEPOTS

DLA stores its wholesale clothing inventory in regional warehouses. The principal DLA depots storing clothing are in

- ◆ Atchison, KS,
- ◆ Columbus, OH,
- ◆ Mechanicsburg, PA,
- ◆ Memphis, TN,
- ◆ Ogden, UT
- ◆ Richmond, VA, and
- ◆ Stockton, CA.

Memphis was scheduled for closing in 1997 by the 1995 Base Closure and Realignment Commission.

## RETAIL DISTRIBUTION: RECRUIT INDUCTION CENTERS

DLA has directed the ARN to focus its efforts on defense clothing issued by the RICs. The military services (including the Coast Guard) operate 11 such centers, listed in Table 3-3.

Each center is operated by employees of the military service, except Fort Sill, which a contractor operates. The Base Realignment and Closure Commission has designated Fort McClellan for closure in 1998.

At these centers, recruits receive their initial bag items and undergo basic training. Basic training lasts 8 weeks for all services except the Marines, whose basic training is 11 weeks. Each center issues the clothing bag in two phases. Phase one takes place upon the recruit's arrival and includes work and exercise uniforms. Phase two takes place 3 to 4 weeks into training and includes dress uniforms.

---

<sup>3</sup> Based on procurement history for the "lead NSN" of each bag item, obtained from Information Handling Services' *Haystack* electronic database, 21 April 1997. The lead NSN represents the first of a group of sized items and is used by the services to designate the contents of the issue bag.

Table 3-3. Recruit Induction Centers

Service	Recruit induction center	State
Air Force	Lackland Air Force Base	Texas
Army	Fort Benning	Georgia
Army	Fort Jackson	South Carolina
Army	Fort Knox	Kentucky
Army	Fort Leonard Wood	Missouri
Army	Fort McClellan	Alabama
Army	Fort Sill	Oklahoma
Coast Guard	Coast Guard Training Center	New Jersey
Marines	Recruit Depot Parris Island	South Carolina
Marines	Recruit Depot San Diego	California
Navy	Great Lakes Naval Training Center	Illinois

### Number of Recruits

The services estimated inducting 300,000 new recruits for FY96.<sup>4</sup> Figure 3-2 shows a breakdown of recruits by military service.

Figure 3-2. Breakdown of New Recruits by Military Service

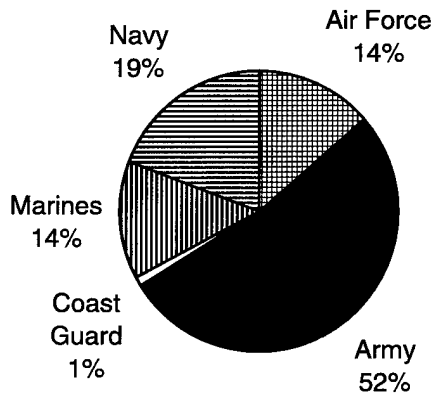
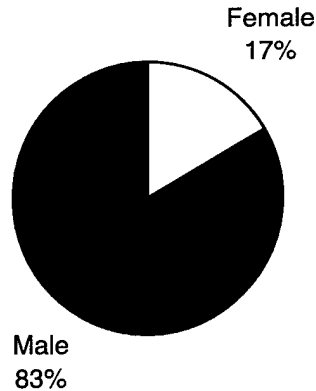


Figure 3-3 shows a breakdown of new recruits by gender.

The breakdown by military service is important because each service issues a somewhat different list of items; the breakdown by gender is likewise important because females receive different items than males.

<sup>4</sup> Based on figures provided by the various services' headquarters.

*Figure 3-3. Breakdown of New Recruits by Gender*



## Items

Based on the projected number of recruits for FY96, the military services issued 200 types of items with a total value of \$274,454,835. If only sewn clothing items are considered, the services issued 165 types of items with a value of \$231,235,879. Sewn products exclude footwear, belts, buckles, and insignia.

We derived these figures from the military services' lists of basic issues. The lists vary by service and by gender. Table 3-4 shows the number items issued by each service for each gender.

*Table 3-4. Number of Bag Items (Exclusive of Sizes) Issued by Each Military Service for Each Gender*

Description	Number of items
Air Force females	37
Air Force males	36
Army females	32
Army males	35
Coast Guard females	29
Coast Guard males	28
Marine Corps females	30
Marine Corps males	36
Navy females	41
Navy males	36

Many clothing items are sized. For example, the “Shirt, Poplin, Cotton/Poly, SS, White,” issued to Navy females, comes in 18 sizes. For purposes of demand forecasting and inventory management, it is the number of sizes that matters, not the number of items. National Stock Number (NSNs) for clothing refer to the specific size of an item. In another example, the “Coat, Camouflage Temperate (BDU),” issued to both genders in the Air Force and Army, comes in 22 sizes. NSN 8415-01-084-1639 is the XSXS size of that coat. Frequently, the smallest size of a garment is referred to as the lead NSN, or representative NSN of that item. Appendix B lists the items (sewn and otherwise) issued by each service to each gender, including lead NSN, item description, quantity issued per person, and FY96 DLA unit price. Table 3-5 lists the value of the bag items issued by each service.

*Table 3-5. 1996 Individual Recruit Clothing Value by Military Service and Gender*

Military service	Gender	Value of bag (\$)
Air Force	Females	919.25
	Males	893.75
Army	Females	985.25
	Males	941.85
Coast Guard	Females	854.80
	Males	742.75
Marine Corps	Females	932.85
	Males	896.75
Navy	Females	1,000.20
	Males	828.80

Based on the services’ projections of recruits and on their bag item lists, demand for clothing items is concentrated: out of 165 clothing items with \$231 million in demand, 13 items account for 50 percent of dollar demand and 42 items account for 80 percent of dollar demand. Table 3-6 shows the top 10 clothing items issued by RICs.

*Table 3-6. The Top Items Issued by RICs*

Item	Unit demand	Dollar demand	Cumulative demand (\$)	Cumulative percent
Coat, Cold Weather	314,200	19,448,980	19,448,980	8.4
Trousers, Enhanced HW BDU	600,359	14,738,813	34,187,794	14.8
Coat, Cam, Enhanced HW BDU	600,359	14,588,723	48,776,517	21.1
Coat, Men's Poly/Wool AG 489	127,800	13,361,490	62,138,007	26.9
Coat, Camouflage Temperate (BDU)	395,864	8,610,042	70,748,049	30.6



*Table 3-6. The Top Items Issued by RICs (Continued)*

Item	Unit demand	Dollar demand	Cumulative demand (\$)	Cumulative percent
Coat, All Weather, Mens Double Breasted	127,800	8,479,530	79,227,579	34.3
Trousers, Men's Poly/Wool AG 489	255,600	7,169,580	86,397,159	37.4
Trousers, Camouflage	314,200	7,022,370	93,419,529	40.4
Overcoat, Melt, W1 B1 (Peacoat)	48,583	5,067,207	98,486,736	42.6
Gloves, Leather, Blk, Unisex	299,748	4,765,993	103,252,729	44.7

## Chapter 4

# Cost Metrics

---

In this chapter, we present the cost metrics for the major elements of the defense apparel production distribution system: the manufacturers, wholesale distribution, and retail distribution. We also present a consolidated cost profile of the entire system and for Army dress uniforms and BDUs issued through RICs. In reviewing these data, recall that no single organization has overall management or accounting responsibility for the entire system. With no consolidated financial statements readily available, we assembled an approximate profile of the overall system by collecting data from the most recent years available. Except where noted, our cost data reflect activity in FY95.

## MANUFACTURERS' COST PROFILE

In FY95, DLA purchased \$766.3 million in clothing and textiles from manufacturers. Of that amount, \$210.8 million was for items to be issued to recruits.<sup>5</sup> To illustrate the cost breakdown at the manufacturers, we collected data from the 1992 *Census of Manufactures* for the standard industrial classifications (SICs) for men's and boys' apparel. Table 4-1 shows overall economic activity (defense and civilian production) in five SICs.

*Table 4-1. Census Data for Men's and Boys' Apparel (\$ millions)*

SIC	2311	2321	2325	2326	2322	
Costs	Suits and coats	Shirts	Trousers and slacks	Work clothes	Underwear and nightwear	Total
Materials	1,028.4	2,830.5	2,856.3	706.4	363.7	7,785.3
Production wages	534.9	927.8	886.3	313.4	146.7	2,809.1
Total payroll	722.2	1,201.9	1,103.9	405.7	169.3	3,603.0
Value added	1,366.4	3,165.2	3,631.8	862.6	391.2	9,417.2

Source: U.S. Department of Commerce, *Census of Manufactures*, 1992.

Based on the data in Table 4-1, we can calculate the basic manufacturing cost profile for these industries. The results are portrayed in Table 4-2. Total cost (and profit) equals the cost of materials plus value added. Nonproduction labor is the total payroll less production wages. Other costs and profit equals the value added less total payroll. The table shows that, of the price paid to apparel manufacturers,

<sup>5</sup> The \$210.8 million bought in FY95 is less than the \$274.5 million issued in FY96, primarily due to the reduction of wholesale inventory.

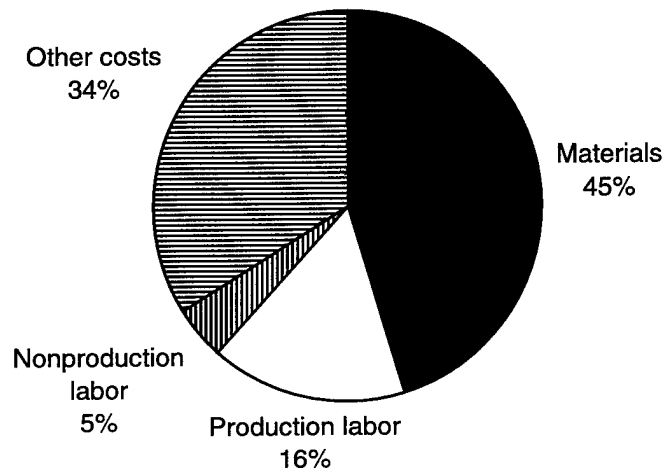
about 45 percent goes to materials; about 39 percent to nonproduction labor, overhead costs, and profit; and 16 percent to production labor. Figure 4-1 graphically portrays these findings.

*Table 4-2. Breakdown of Costs for Men's and Boys' Apparel (percent)*

SIC	2311	2321	2325	2326	2322	
Description	Suits and coats	Shirts	Trousers and slacks	Work clothes	Underwear and nightwear	Total
Materials	43	47	44	45	48	45
Production labor	22	15	14	20	19	16
Nonproduction labor	8	5	3	6	3	5
Other costs and profit	27	33	39	29	29	34
Total	100	100	100	100	100	100

Source: Derived from U.S. Department of Commerce, *Census of Manufactures*, 1992.

*Figure 4-1. Manufacturers' Cost Profile, Men's and Boys' Apparel*



Because so much of apparel manufacturers' costs goes to materials, which themselves have labor content, we sought the profile of the entire apparel supply chain. LMI has a model that projects the distribution of workers, by occupation, used to produce the output of a given industry. The distribution of workers includes not only the labor used by the end-product industry, but also that labor used by supporting industries (subcontractors and suppliers). The model can be run for the economy as a whole, for the defense sector only, or for the nondefense sector. The model draws on a database of 287 occupations in 91 major industries.

To estimate the size of an industry's defense sector (number of workers and labor costs), the model uses estimates from DoD's Defense Economic Impact Modeling System (DEIMS). DEIMS projects the portion of each industry's output that goes to defense. The model calculates the distribution of workers by using industry/occupation data—number of workers and wage rates—supplied by the Department of Labor.

Table 4-3 shows the model's projected size for the major industries from which the Defense Personnel Support Center, Clothing and Textiles Directorate, buys.

*Table 4-3. Size of Industries Supporting Defense Clothing and Textiles*

End-product industry	Estimated number of defense workers <sup>a</sup>	Estimated defense labor cost <sup>b</sup> (\$ millions)
Weaving, finishing, yarn, and thread mills	618	12.8
Knitting mills	586	10.7
Miscellaneous textile goods	1,023	23.4
Apparel	5,466	86.7
Miscellaneous fabricated textile products	6,681	133.8
Total	14,374	267.4

<sup>a</sup> Includes all supporting industries' workers necessary to produce the given industry's output.

<sup>b</sup> Median earnings, exclusive of benefits (1991 dollars).

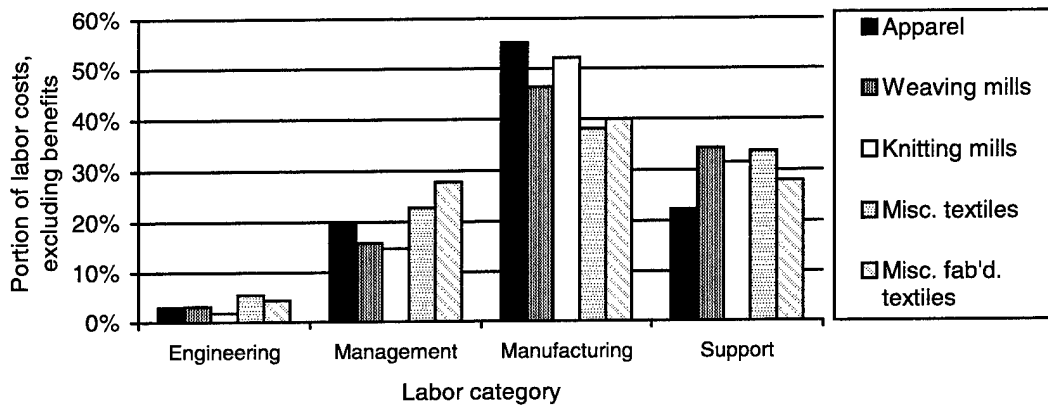
Note that the total estimated labor cost, \$267.4 million, represents only base wages and is considerably less than the \$766.3 million projected by the LMI baseline cost estimate. The two numbers are not directly comparable, and several reasons explain most of this apparent discrepancy. The \$766.3 million represents the total value of work done by industry to manufacture clothing and textiles for defense. According to the Department of Labor, we can expect that labor would consume about 70 percent of that, or \$536.4 million (the remainder being capital costs and profit). Next, the labor costs in Table 4-3 do not include benefits and other nonwage labor costs, such as Social Security taxes, unemployment taxes, vacations, and health insurance. Social Security and health care alone add 30 percent to the base wage cost of a typical worker. Estimating nonwage labor costs at 35 percent of base wages, we divide \$536.4 million by 1.35 and get \$397.3 million as the estimate of base wages, in 1995 dollars. Deflating this to 1991 dollars, using an annual inflation rate of 4 percent, we get \$339.6 million. For purposes of comparison then, DLA's buying of \$766.3 million in clothing and textiles in 1995 translates into \$339.6 million in base wages paid to labor, expressed in 1991 dollars.

After these adjustments have been made, the total estimate of defense labor in Table 4-3, \$267.4 million, is \$72.2 million below what we would expect it to be, given DLA's actual purchases in 1995. We can only attribute this to errors in the

DEIMS estimates of industry work provided to defense and to errors in the Department of Labor's estimates of the number of people in each industry and the wages they earn.

For each of the industries in Table 4-3, we calculated the distribution of workers by occupation. Appendix C contains a representative detailed distribution for the apparel industry. In Figure 4-2, we present a summary distribution by major activity group.

*Figure 4-2. Distribution of Major Activities Supporting Clothing and Textile Industries*



We present the distribution of workers in each industry as percentages. These percentages can be converted to dollars by using the data provided in Table 4-3, or by using other appropriate baselines. For example, if one believed that the production of dress uniforms followed a profile that is somewhat typical of the apparel industry, the distribution of apparel industry workers (in percent) could be multiplied by the dollar value of dress uniform production to estimate the dollar contribution of each labor category.

## WHOLESALE COSTS

In this section we present the costs associated with the wholesale portion of the defense production/distribution system. These costs are largely derived from DLA's Defense Business Operating Fund statements, commonly known as the "Net Operating Report-1307" and "unit cost" reports, for DPSC's Clothing and Textiles Directorate.

Table 4-4 shows wholesale costs for design, purchasing and inventory management, warehousing, and transportation.

Table 4-4. DLA's Clothing and Textile Costs for FY95

Cost area	Millions of FY95 dollars	Portion of \$766.3 million manufacturing cost (percent)
Design (DLA only)	0.5	0.1
DLA purchasing and inventory management	69.6	9.1
DLA warehousing and transportation	80.6	10.5
Subtotal	150.7	19.7
DLA inventory financing (imputed)	76.5	1.0
Total	227.2	20.7

Design costs should include specification-writing, pattern-making, and fit tests. Many of these activities are conducted by the military services. We were only able to quantify design costs charged directly to DPSC by the Army's Natick Research, Development, and Engineering Center. We were unable to quantify other costs attributable to the military service design activities, and therefore the design cost shown in the table is low.

DLA purchasing and inventory management reflects operations at the DPSC's Clothing and Textile Directorate. The number also includes a \$10 million DLA headquarters "corporate" cost charged to DPSC. The DLA warehousing and transportation cost includes \$71.5 million for defense depot material handling and storage and \$9.1 million for transportation to retail locations.

The \$150.7 million subtotal represents costs that can be directly related to government financial statements. This subtotal represents 19.7 percent of the \$766.3 million price DLA paid for manufactured goods in FY95. This 19.7 percent figure compares well with the 20.2 percent markup that DLA charged its retail customers in FY95.

Government financial statements, however, do not capture the entire cost of the wholesale business. At the end of FY95, DLA held \$1,369.7 million in wholesale inventories. We impute a financing cost for that inventory cost by using the 6.7 percent rate that was offered on 30-year Treasury notes in FY95. The resulting cost, \$76.5 million, is an estimate of what it cost the government to finance that inventory for the year. Although that cost is not captured on DLA financial statements, it represents a cost to the government and would be recognized in an equivalent private-sector business.

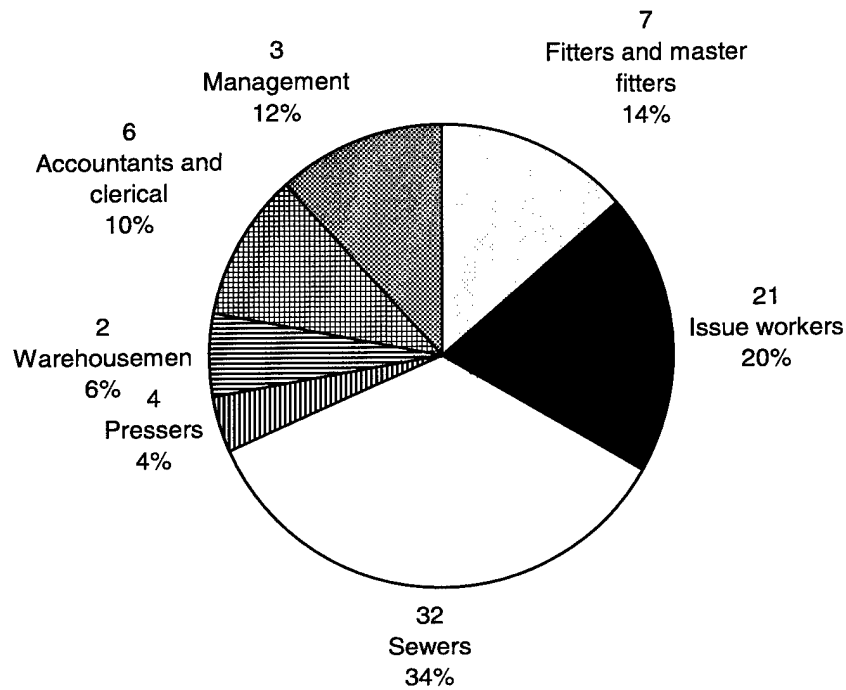
## RETAIL COSTS

We portray retail costs by way of a case study of the Army's Clothing Initial Issue Point at the Fort Jackson RIC. The principle costs to operate the issue point are

labor and inventory. In addition to these categories, additional costs are incurred for building space and equipment. Because the building space and equipment are part of a larger base pool, we were unable to quantify their costs.

For the 12-month period between June 1995 and May 1996, Fort Jackson issued clothing to approximately 32,000 recruits: 21,000 males and 11,000 females. During that period, Fort Jackson incurred approximately \$1 million in labor costs to issue clothing to recruits. Figure 4-3 shows the labor categories, number of workers in each category, and portion of total labor cost represented by each category (the activity by sewers represents alterations to uniforms).

*Figure 4-3. Labor Categories, Numbers of Workers, and Portion of Labor Cost at the Fort Jackson Clothing Initial Issue Point*



For the period June 1995 through May 1996, the average on-hand inventory at Fort Jackson was \$5.9 million. Figure 4-4 shows how inventory varied by month, along with the arrival of recruits.

To extend these findings to other RICs, we collected data from the Army Training and Doctrine Command. Table 4-5 shows labor costs for FY95 and a snapshot of on-hand inventory on 30 September 1995.

Figure 4-4. Inventory and Recruit Accessions at Fort Jackson

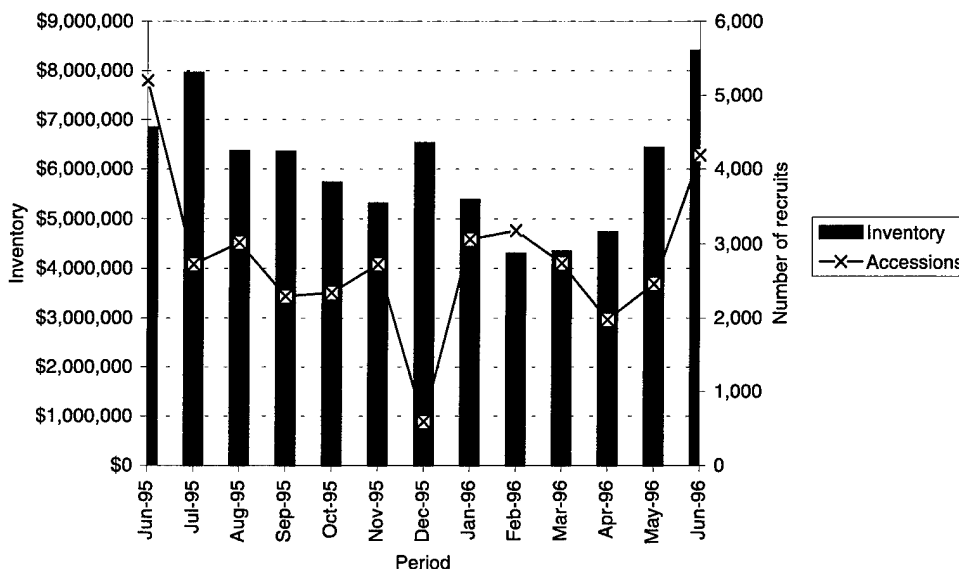


Table 4-5. Labor and Inventory at Army RICs

RIC	FY95 labor costs (\$)	Inventory value, 30 Sep 1995 (\$)
Fort Benning	918,268	2,293,000
Fort Knox	940,935	2,556,000
Fort Jackson	956,184	6,365,000
Fort Leonard Wood	1,017,000	3,955,000
Fort McClellan	Not available (small)	400,000
Fort Sill	495,507	2,855,000

We were unable to collect complete labor data for other military service RICs, so to estimate the total RIC labor cost we extrapolate the Army data based on sales. The Army used \$4.3 million in labor to issue \$133.7 million in bag items. All services issued approximately \$252.2 million.<sup>6</sup> We therefore estimate that the labor cost to issue bag items to recruits for all services in FY95 was [ $\$4.3 (\$252.2 / \$133.7)$ ] million, or \$8.2 million.

To estimate the average total on-hand inventory at RICs, we used a theoretical value based the inventory policy of carrying 30 days of safety stock and ordering an average of 45 days of supply. The average inventory on hand under such a policy is then the safety stock plus one-half the order quantity, or 52.5 days of supply. This estimate works well for the Army, giving an on-hand projection of

<sup>6</sup> We use the 1995 issues of \$252.2 million rather than the 1996 issues of \$274.5 million to be consistent with the Army labor data we collected.



\$19.2 million vs. the reported value of \$18.4 million. Overall, our estimate for all RICs is \$36.3 million. This is considerably lower than the inventories reported to us by the services—\$68.9 million—but that figure includes inventory issued to personnel other than new recruits. Based on the Treasury rate presented above, we estimate it cost the government \$36.3 million times 6.7 percent, or \$2.4 million, to finance the inventory stored in RICs in FY95. As with the cost of financing government wholesale inventory, this retail cost is not captured on military service financial statements, but would be in an equivalent private-sector business.

## CONSOLIDATED COSTS

In this section, we combine the costs incurred by manufacturers, wholesale distribution, and retail distribution to form a consolidated picture of the cost of issuing clothing to military recruits. Some costs, like manufacturing, come from service bag item lists and recruit estimates. Others, like wholesale operations, are prorated. Table 4-6 shows that the total cost to issue clothing to recruits in FY95 was \$268.1 million. As in previous tables, the design cost represents only DLA's cost and not the military services' and is therefore low.

*Table 4-6. Costs for Recruit Bag Items, FY95*

Cost area	Millions of FY95 dollars
Manufacturing	210.8
Design (DLA only)	0.1
DLA purchasing and inventory management	19.1
DLA warehousing and transportation	22.2
RIC operations	8.2
Subtotal	260.4
DLA inventory financing (imputed)	5.3
RIC inventory financing (imputed)	2.4
Total	268.1

Two garments of particular interest to the ARN are Army dress uniforms and BDUs. By prorating costs based on sales, we can estimate the consolidated costs for these items. Table 4-7 shows the estimated costs associated with issuing only Army dress uniforms to recruits at the Army initial issue points.

Table 4-8 shows the estimated costs associated with issuing only BDUs to recruits at the Army initial issue points.

Table 4-7. Costs for Army Recruit Dress Uniforms, FY95

Cost area	Millions of FY95 dollars
Manufacturing	22.3
Design (DLA only)	Less than 0.1
DLA purchasing and inventory management	2.0
DLA warehousing and transportation	2.3
RIC operations	0.9
Subtotal	27.5
DLA inventory financing (imputed)	0.6
RIC inventory financing (imputed)	0.3
Total	28.4

Table 4-8. Costs for Army Recruit Battle Dress Uniforms (Camouflage "Fatigues"), FY95

Cost area	Millions of FY95 dollars
Manufacturing	22.8
Design (DLA only)	Less than 0.1
DLA purchasing and inventory management	2.1
DLA warehousing and transportation	2.4
RIC operations	0.9
Subtotal	28.1
DLA inventory financing (imputed)	0.6
RIC inventory financing (imputed)	0.3
Total	29.0

## Chapter 5

# Lead-Time Metrics

---

Lead-times are major determinants of cost in the defense apparel production/distribution system. Lead-times affect what inventory must be stocked and where. Along with demand uncertainty, lead-time uncertainty increases the amount of safety stock that must be carried to ensure a desired level of customer service.<sup>7</sup> The longer the lead-time, the more difficult it is to forecast demand. The two principal lead-times we consider are procurement lead-time and logistics response time. We also address the lead-times for special measurement orders, which are orders for outsize, made-to-order military clothing.

## PROCUREMENT LEAD-TIME

Procurement lead-time starts when a wholesale inventory manager creates a purchase request and ends with contract delivery. Procurement lead-time has two elements, administrative lead-time and production lead-time. Administrative lead-time is the time from purchase request until contract award, and production lead-time is the time from contract award until delivery. For items covered by indefinite-type contracts (featuring one contract award and many delivery orders placed against that contract), there are actually two possible definitions of production lead-time. The first definition includes the manufacturer's startup time from "cold" contract award, including the time to order and procure raw materials (in this case, fabric, thread, and other sundries). This is the definition used by DPSC. The second definition only includes the manufacturer's factory throughput time and applies to delivery orders.<sup>8</sup>

Tables 5-1 through 5-4 show the administrative and production lead-times for Army dress uniforms and BDUs. The data were taken from the DLA item header file for the first quarter of FY96. DLA calculates these times using a weighted moving average of procurement history, with the most recent procurement receiving a two-thirds weight. The average administrative lead-time is 193 days. Notice the range of administrative lead-times for BDUs, similar items that presumably would take a similar amount of time and effort to place on contract. The administrative lead-time ranges from 56 days for Procurement Group Code (PGC)

---

<sup>7</sup> Customer service is typically measured by the portion of customer demands filled within a given time period. A customer service goal might state "Fill 99% of dress uniform orders within 3 weeks."

<sup>8</sup> For sized items procured on a single contract, DPSC records delivery when 51 percent of the items have been received. For details, see DLAM 4140.2, *DLA Supply Operations Manual*, Volume II, Part 1, Chapter 32, Section 232212, "Administrative and Production Leadtime," Defense Logistics Agency Publishing System, July 1996.

02252 to 310 days for PGC 01695. Also, compare the “cold start” production lead-times for BDUs (over 200 days, according to the DLA file) with the “warm start” throughput time, provided to LMI by a major uniform manufacturer, of about 35 days.<sup>9</sup> The average production lead-time in the DLA file is 158 days.

*Table 5-1. Administrative Lead-Time for Army Dress Uniforms*

PGC	Item	Number of NSNs in PGC <sup>a</sup>	Average ALT	Minimum ALT	Maximum ALT
01672	Shirt, Man's	12	240	240	240
02120	Shirt, Man's	39	240	240	240
02132	Shirt, Woman's	50	150	150	150
02135	Shirt, Woman's	37	60	60	60
02162	Coat, Man's	61	280	240	300
02195	Trousers, Men's	55	142	142	142
02196	Slacks, Women's	55	180	180	180
02197	Skirt, Woman's	57	243	240	300
02198	Coat, Woman's	65	243	240	300

Note: ALT = administrative lead-time.

<sup>a</sup> The PGC links NSNs representing different sizes of a like item.

*Table 5-2. Production Lead-Time for Army Dress Uniforms*

PGC	Item	Number of NSNs in PGC <sup>a</sup>	Average PLT	Minimum PLT	Maximum PLT
01672	Shirt, Man's	12	180	180	180
02120	Shirt, Man's	39	189	180	240
02132	Shirt, Woman's	50	143	120	165
02135	Shirt, Woman's	37	148	135	150
02162	Coat, Man's	61	137	120	225
02195	Trousers, Men's	55	113	60	120
02196	Slacks, Women's	55	123	120	180
02197	Skirt, Woman's	57	120	120	120
02198	Coat, Woman's	65	165	165	165

Note: PLT = production lead-time.

<sup>a</sup> The PGC links NSNs representing different sizes of a like item.

<sup>9</sup> This throughput time reflects a line producing approximately 5,000 garments per week using the bundle method.

Table 5-3. Administrative Lead-Time for Battle Dress Uniforms

PGC	Item	Number of NSNs in PGC <sup>a</sup>	Average ALT	Minimum ALT	Maximum ALT
01695	Coat, Camouflage Pattern	22	310	310	310
01703	Trousers, Camouflage	21	127	127	127
01862	Trousers, Camouflage	21	118	118	118
01863	Coat, Camouflage Pattern	22	172	172	172
02252	Trousers, Camouflage	21	56	56	56
02253	Coat, Camouflage Pattern	22	210	210	210

<sup>a</sup> The PGC links NSNs representing different sizes of a like item.

Table 5-4. Production Lead-Time for Battle Dress Uniforms

PGC	Item	Number of NSNs in PGC <sup>a</sup>	Average PLT	Minimum PLT	Maximum PLT
01695	Coat, Camouflage Pattern	22	203	165	225
01703	Trousers, Camouflage	21	210	210	210
01862	Trousers, Camouflage	21	210	210	210
01863	Coat, Camouflage Pattern	22	225	225	225
02252	Trousers, Camouflage	21	210	210	210
02253	Coat, Camouflage Pattern	22	226	210	240

<sup>a</sup> The PGC links NSNs representing different sizes of a like item.

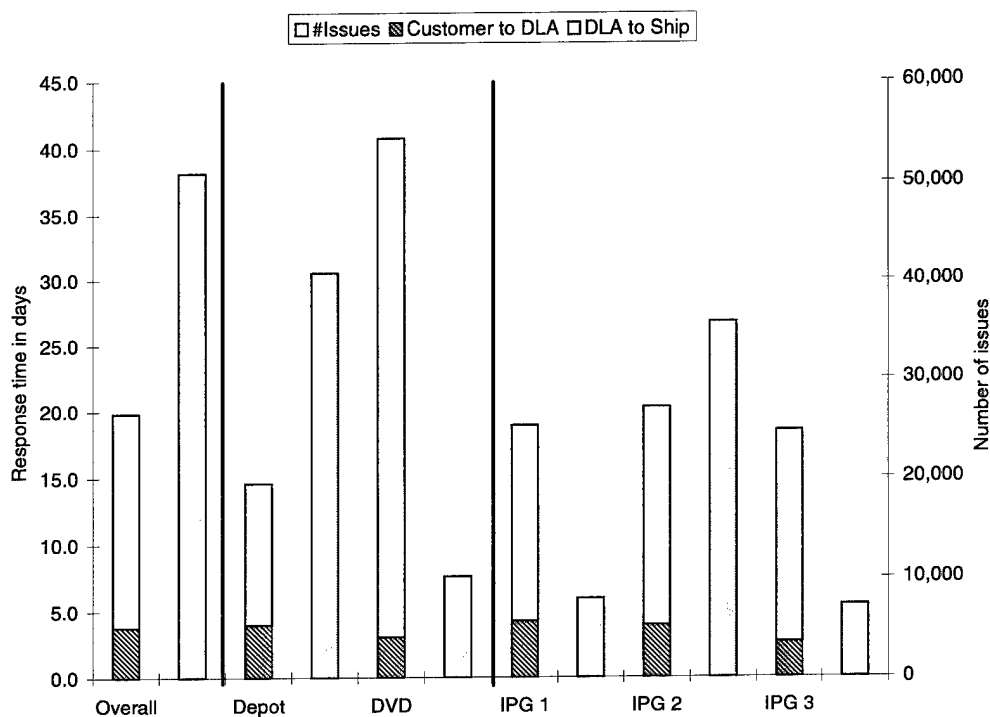
## LOGISTICS RESPONSE TIME

A key focus of the ARN is the period of time between when the retail location orders an item and the retailer receives the item. DoD refers to this as logistics response time. LMI has investigated the logistics response time associated with all clothing and textile orders from all RICs for calendar year 1996 and orders for selected military apparel items made by the Army RIC at Fort Jackson. The 1996 data were compiled and provided by the DLA Operations Research Office (DORO), while the Fort Jackson data were taken from the Army Standard Automated Intermediate Logistics System (SAILS) database. It should be noted that the DORO 1996 data do not include the shipping time from DLA to the customer, while the SAILS data do include that time.

## All RICs

Figure 5-1 illustrates that for the over 50,000 clothing and textile orders tracked, the overall average logistics response time was approximately 20 days. That time included 4 days for the order to get from the customer to DLA, and 16 days for DLA to process the order (to the point of shipment). The over 40,000 orders filled by depot inventory averaged approximately 15 days, while the DVD orders took over 40 days. The priority given to an order seems to have little effect on logistics response time. For issue priority groups 1, 2, and 3 (priority 1 being the highest), the average time was relatively constant at approximately 20 days.

Figure 5-1. Logistics Response Time for RICs

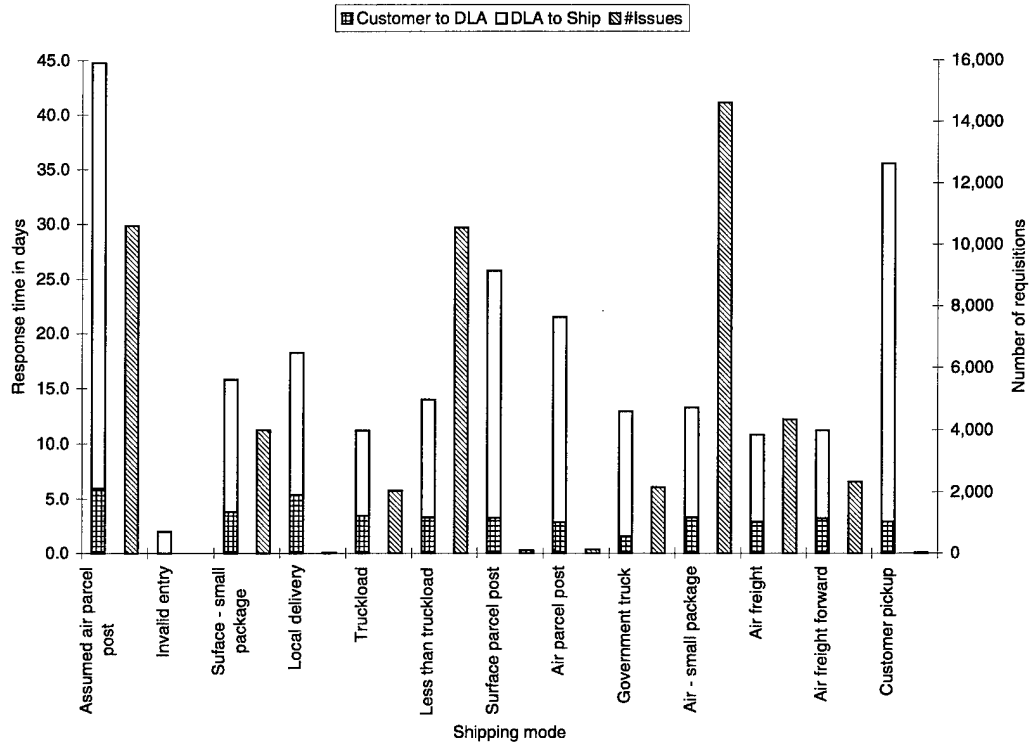


Note: IPG = issue priority group.

LMI asked DLA to break down the logistics response time by the method of shipment. These times are shown in Figure 5-2.

The two most common methods are less-than-full truckload (10,550 issues) and air-small package (14,618 issues). Presumably, the customer needs air shipments more urgently than truck shipments, but the logistics response time (again, less shipping time) is 14 days for truck orders and 13 days for air orders. Assuming that surface shipments take 4 days and air shipments take 2, the total order-to-receipt time (also called "order ship time" by the RICs) would be 18 days for truck shipments and 15 days for air shipments.

Figure 5-2. Logistics Response Time by Method of Shipment



A less expensive approach to expediting deliveries might be to reduce the logistics response time, both from the customer to DLA and DLA’s order processing. Both truck and air shipments take approximately 2 weeks to process to the point of shipment. The 2-day air shipments cost roughly six times as much as the less-than-full truckload shipments (see Table 5-5), yet under the current operating scenario, this premium buys only a 17 percent reduction in time (a 3-day reduction from 18 days to 15 days).

Table 5-5. Representative Freight Rates

Shipping method	Cost per pound (\$)
Full truckload	0.05
Less-than-full truckload	0.15
Ground express	0.40
2-day air	0.95
1-day air	2.00

Sources: Military Traffic Management Command (truckload), United Parcel Service (ground express and air).

## Case Study: Fort Jackson

We obtained information from Fort Jackson's SAILS regarding the time from order to receipt for all requisitions from 1 July 1994 to 14 December 1995. We then extracted records for roughly 2,000 orders corresponding to recruit bag items. We analyzed the logistics response times for Army men's dress uniforms and BDUs and also compared the times associated with traditional material flows through DLA depots with deliveries flowing directly from manufacturers to retail (DVD).

Figure 5-3 shows the average logistics response times for dress uniforms. With the exception of the Women's Short Sleeve Shirt, the average order to receipt time was between 16 and 28 days. The order to receipt time for all dress uniforms averaged 26 days.

*Figure 5-3. Fort Jackson Logistics Response Time for Dress Uniforms*

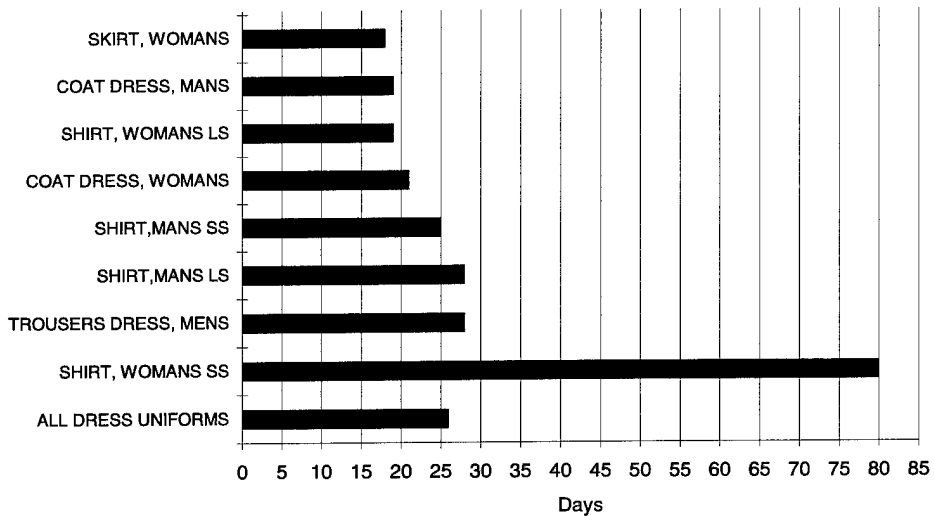
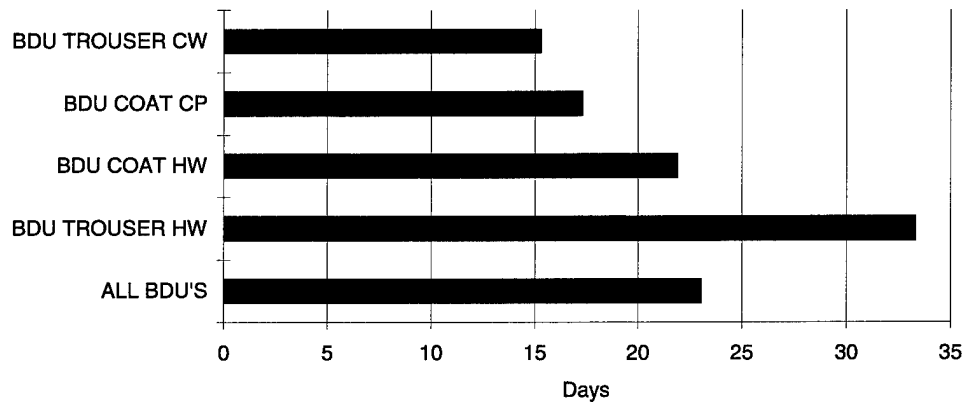


Figure 5-4 shows the results for BDUs. The average order to receipt time for these items was approximately 23 days.



Figure 5-4. Fort Jackson Logistics Response Time for Battle Dress Uniforms



In regard to traditional material flows vs. DVDs, the average logistics response time for all bag item orders at Fort Jackson was 24 days. Of the 2,133 requisitions we tracked, 1,931 flowed traditionally through DLA depots to Fort Jackson. The average time for these orders was 23 days. The times for selected items is shown in Figure 5-5.

Of the 2,133 requisitions we examined, 202 were routed to Fort Jackson via DVD. The average time for these orders was 36 days. Figure 5-6 shows the times for selected DVD items.

Figure 5-5. Logistics Response Times for Fort Jackson for Items Flowing Through DLA Depots

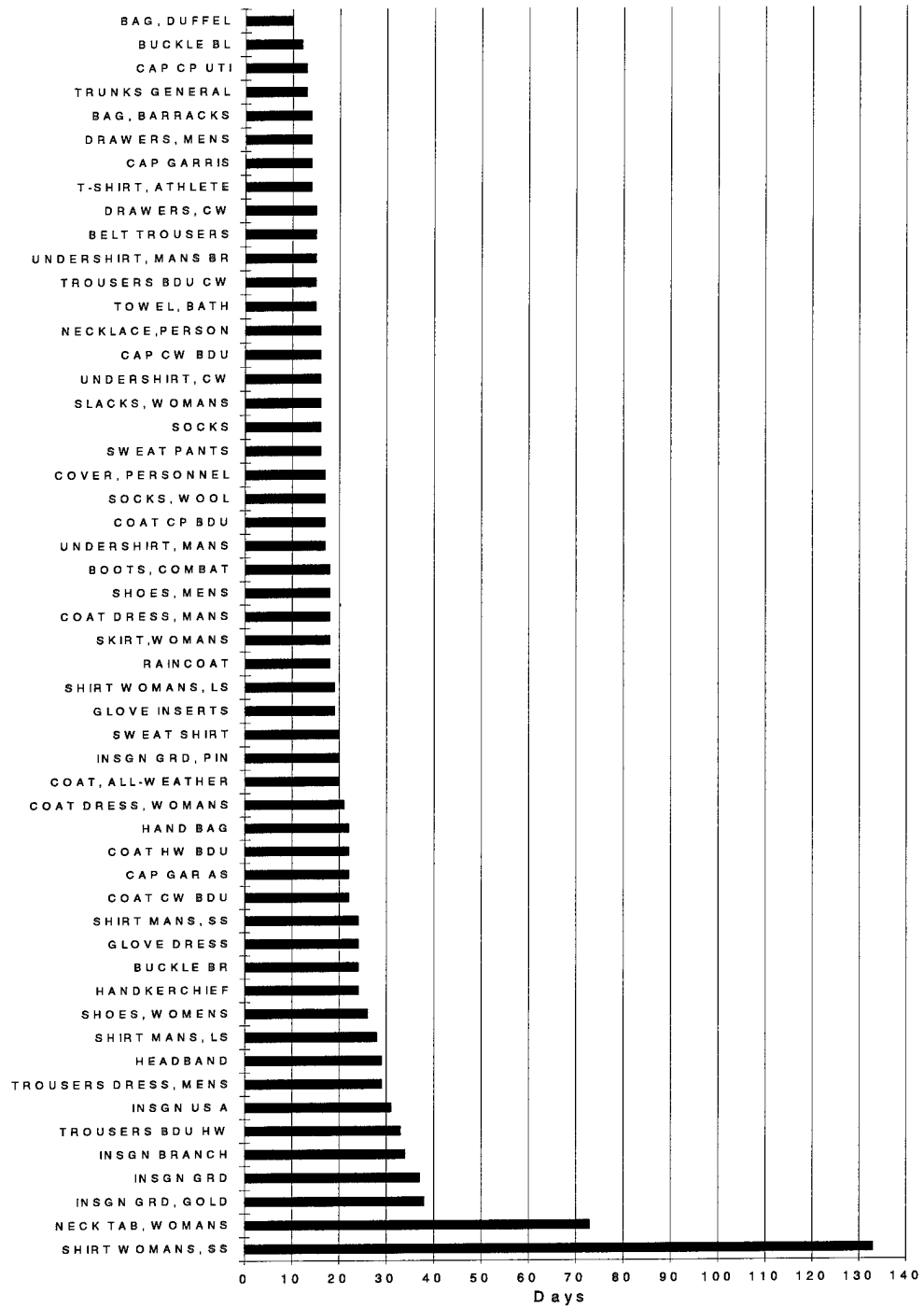


Figure 5-6. Logistics Response Time for Fort Jackson Items Shipped via Direct Vendor Delivery

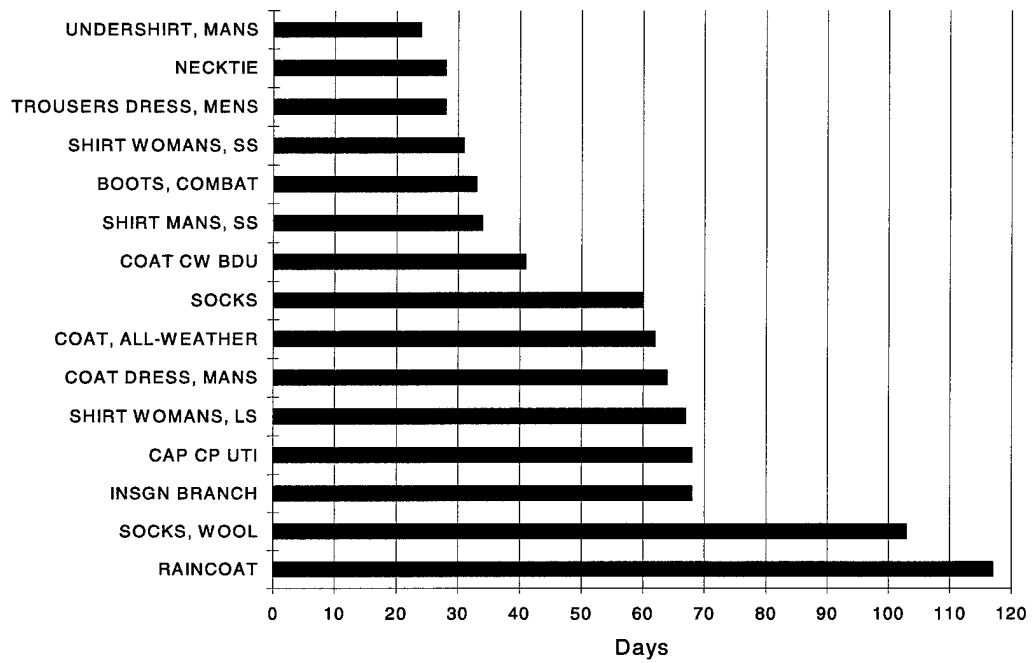


Figure 5-7 shows a breakdown of the activities associated with the 36-day logistics response time for DVD orders.

Figure 5-7. Breakdown of Logistics Response Time for Direct Vendor Deliveries to Fort Jackson

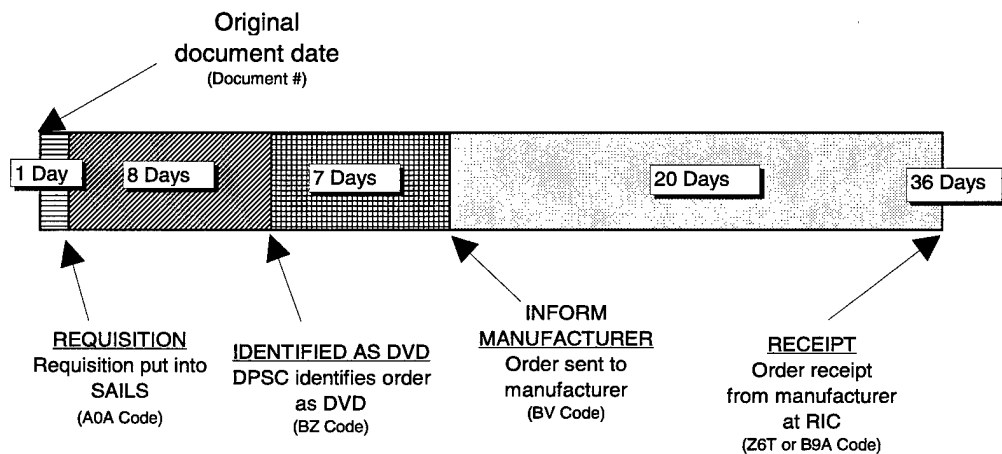
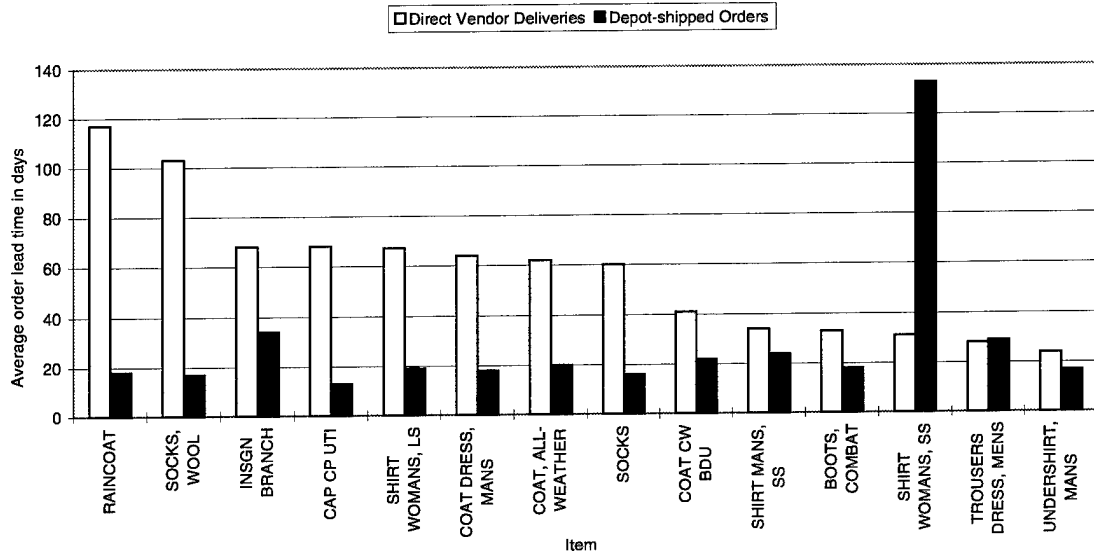


Figure 5-8 shows a direct comparison of items that had orders filled by both DVD and DLA depots. In all but two instances, DVD took longer.

*Figure 5-8. Comparison of Direct Vendor Deliveries to Depot Shipped Orders*



## SPECIAL MEASUREMENTS

Occasionally the military services recruit people who cannot be fitted with a standard-size garment. Those cases result in special measurement orders for garments made-to-order in custom sizes. Most special measurement orders are for dress uniform items, which the recruits first wear at graduation. Because these items are made to order, special measurement orders include not only logistics response time, but manufacturing time as well. Because recruits are fitted for dress uniforms 3 to 4 weeks into their training, and because training lasts 8 weeks (except for the Marines), the required turnaround time for special measurement orders is a maximum of 5 weeks.

We analyzed special measurement order times for the 18-month period between January 1994 and June 1995. During this period, according to the DPSC, the services placed 9,854 special measurement orders. Of these, 2,444 had been completed at the time of our study and 1,250 had valid beginning and ending dates in the file.

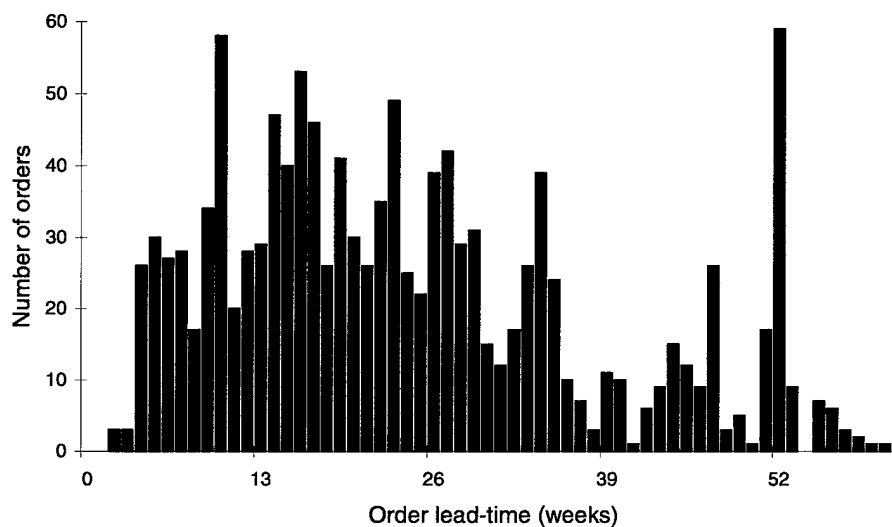
In contrast with the required time of 5 weeks, it took an average of 166 days, or almost 24 weeks, to fulfill these orders. Table 5-6 shows the statistics for our sample.

Table 5-6. Special Measurement Order Statistics

Statistics	Value	Units
Count	1,250	orders
Average (mean)	166	days
Median	150	days
Standard deviation	97	days
Minimum	8	days
Maximum	416	days

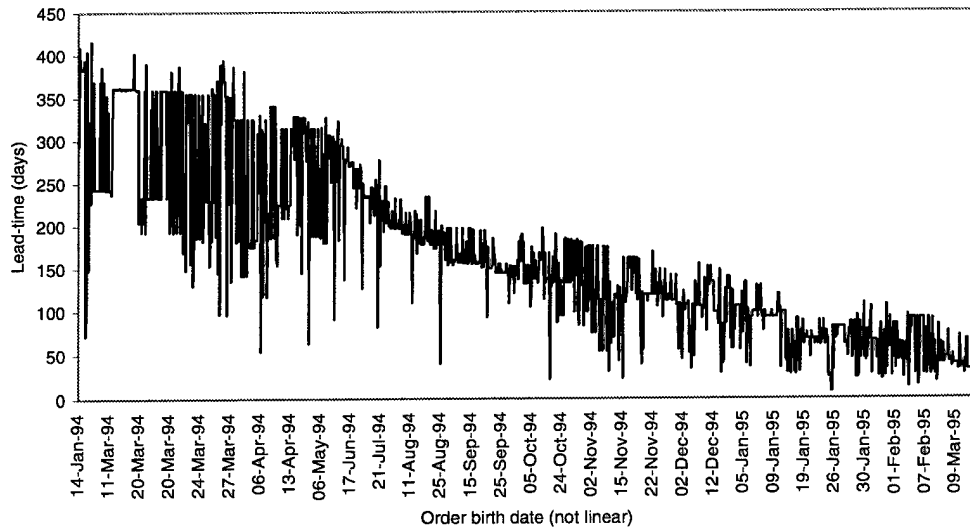
Figure 5-9 shows the distribution of times associated for the 1,250 special measurement orders with complete data.

Figure 5-9. Distribution of Special Measurement Order Times



Contributing to the long special measurement times was the closing of the DPSC clothing factory in 1994. Prior to its closing, that government-run factory performed all special measurement manufacturing. At the time of closing, the DPSC did not have a private-sector manufacturer on contract to take up the lost production, and lead-times grew to about 300 days. As Figure 5-10 shows, lead-times and lead-time variability did come down in 1995, to an average of about 50 days. Note, however, that even with that improvement, recruits requiring special measurement garments will have graduated and moved to their next assignment by the time the garment arrives at the RIC.

Figure 5-10. Improvement in Special Measurement Order Times



The special measurement order dilemma has been partially addressed by the Clemson Apparel Research demonstration factory. Beginning in March 1995, Clemson made dress uniform shirts for the Air Force and Army. Clemson has demonstrated the capability to produce shirts within the customer's lead-time requirements by "jury-rigging" order processing and by studying the special measurement pattern process. For example, rather than wait for special measurement orders to be routed from Fort Jackson, through DPSC (in Philadelphia), to Clemson, which took 1 to 3 weeks, Clemson had Fort Jackson send a copy of the order directly to it so it could start work. Clemson also speeded the process by which special measurement patterns are produced, by demonstrating that very few special measurement orders (about 2 percent) actually require unique patterns. Most special measurement patterns can be rapidly generated by using "extended grade" and "pre-altered" patterns.<sup>10</sup>

<sup>10</sup> "CAR Demo Overview," briefing by Dr. Christine W. Jarvis at the 8th DLA-ARN Workshop, August 1996.

## Chapter 6

# Quality Issues

---

In this chapter we discuss the quality issues related to defense apparel. In the military apparel production/distribution system, the ultimate customer is the soldier. Our assessment of quality is not limited to measures of how many apparel garments fail to meet their product specifications (e.g., defects per garment), but includes the quality of the production/distribution system's service from the customer's perspective. This broadens the scope of traditional quality metrics to include "customer service" aspects, such as availability, customer satisfaction, and responsiveness. While some aspects of quality, such as adherence to specification, can be quantified, others, such as customer satisfaction, are subjective.

## TRADITIONAL QUALITY PROCEDURES

Traditionally, DoD has administered quality control on clothing and textile procurements by levying military product and quality specifications and standards on contracts with military apparel manufacturers. Item specifications instructed the manufacturers on what to make and, essentially, dictated the equipment and the procedures required by the manufacturer to make the item. Contractor quality programs were based on military quality standards, such as MIL-I-45208, *Inspection System Requirements*.<sup>11</sup>

These standards were designed for the large batch manufacturing systems used by apparel manufacturers in the past. However, smaller inventories, quicker response times, smaller production runs, and the emphasis on introducing commercial practices are creating some significant changes in military apparel manufacturing systems. These changes have also necessitated new approaches in the methods that DoD uses for apparel quality control. As a result, DoD is phasing out military specifications, such as MIL-I-45208, in favor of commercial standards.

## QUALITY TRENDS

To monitor manufacturing quality, DLA has relied on government quality audit representatives (QARs). QARs are regionally located throughout the United States and perform in-plant final inspection of apparel items. Traditionally, QARs visited apparel manufacturers every 7 to 10 days and reviewed material and production documentation and inspected finished goods prior to shipment. However, in the era of quick response and DVD, waiting 7–10 days for final inspection is unacceptable. To compensate, QARs now focus on work in process. They examine

---

<sup>11</sup> Effective 1 October 1996, MIL-I-45208 was cancelled.

---

apparel manufacturers' production process records, such as statistical process control documentation, to evaluate the level of control the manufacturer has over total manufacturing process. Also, DoD is now promoting the use of industry standards in lieu of military standards. For example, contractors may now substitute industrial quality standards, such as ISO 9002, *Quality Systems—Model for Quality Assurance in Production, Installation, and Servicing* or ANSI/ASQC Q9002-1994, *Quality Systems—Model for Quality Assurance in Production, Installation, and Servicing* for MIL-I-45208.

Another commercial practice being adopted by DoD is the use of warrantees. These warrantees guarantee a one-for-one replacement of any garment that is defective. To facilitate this process, manufacturers send a supply of preprinted boxes and forms to the customers for their use if they need to return an item. An example of its success is that one manufacturer has delivered over 3 million garments of one type over the last 3 years and has only had one garment returned for replacement. These types of warrantees are very similar to warrantees used by large commercial retailers.

## ADHERENCE TO SPECIFICATION

The product quality—which is defined as adherence to specification—is most readily described by examining two points in time: the point at which apparel manufacturers receive textiles and the point at which RICs issue finished garments to recruits.

Textile quality is crucial to smooth and efficient apparel production. Typically, the number of defects in textiles depends upon the type of fabric. Clemson Apparel Research reports that suppliers average one defect per 100 square yards of dress shirt fabric. Large denim manufacturers average three to 6 defects per 100 square yards. Worsted fabric, used as dress coat material, averages 16–18 defects per 100 square yards. Defects in textiles cause cascading problems. With the trend away from receiving inspection, many defects are not found until fabric cutting, at which point the defect disrupts the marker layout. Defects not found at cutting may be found during assembly, at which point the value added already in the garment is lost, or they may be found by the customer, at which point essentially the entire cost of the garment is lost (in addition to extra transportation and handling).

Most textile defects are found by the apparel manufacturers, and the quality of military garment assembly seems excellent. In general, the RICs report that apparel product quality is good. "Almost all" items arrive in good condition and accurately match orders.

We do not explicitly quantify the product quality of clothing arriving at the RICs. The existing mechanisms to capture quality problems are cumbersome and inconsistently applied. There is no formal receiving inspection performed at the RICs. When the RIC receives a shipment it checks that the correct amount of items were



shipped according to the pack list. Few product defects are found at this point, only errors in shipments.

When defects occur, RIC personnel will likely notice them when issuing garments, or drill instructors will notice them during inspection. The formal procedure to report defects to DLA is to submit a quality deficiency report (QDR). The time required for processing the QDR and notifying DPSC about quality problems inhibits the RICs from using the QDR system. The RICs correct minor defects, processing them as alterations, and make no record of the defect. Only in the case of a chronic quality problem will the RICs follow the QDR process.

## ADEQUACY OF DESIGN AND FIT

Military garments are designed and sized to promote a certain desired appearance, with a minimal amount of tailoring. RIC personnel have suggested some improvements that could be made to the design and sizing of military garments. The implementation of these suggestions would result in improved quality of fit, as well as reduce the amount of garments requiring tailoring, and subsequently the cost associated with tailoring.

*Women's dress shirts.* The women's long sleeve dress shirt, for both the Army and the Air Force, comes in three standard sleeve lengths: short, regular, and long. Approximately 85 percent of these shirts require alterations to accommodate the variety of sleeve lengths seen in women recruits. Adopting a long sleeve sizing practice similar to the men's long sleeve shirt (where more sleeve lengths are available and sized in inches) would alleviate this problem.

*Army men's dress coats.* The Army men's dress coat size patterns result in sleeve lengths that are too short. Most men require sleeve lengths longer than those allowed for in the pattern, increasing the number of alterations.

*Air Force men's dress coat.* The Air Force men's dress coat pattern is too long. By shortening the front pattern by 1 inch, a number of alterations could be avoided.

*Battle dress uniform pants.* Two to three percent of the BDU trousers require leg alterations, usually shortening.

*Battle dress uniform shading.* The camouflage pattern provided in different lots or by different suppliers fades at greatly different rates. This results in mismatches in BDU tops and bottoms. Recruits are not allowed to return BDU garments due to shading mismatches, but drill instructors will not permit recruits to wear mismatched uniforms.

---

## DISTRIBUTION SERVICES

The quality of distribution services includes the accuracy of count and condition of deliveries, the completeness of paperwork, and the nature of packaging.

Our discussions with RICs yielded no issues concerning the accuracy of count or condition of deliveries. Whether shipped from DLA depots or manufacturers, material usually arrives in good condition and in the quantity stated.

The Army has found that DVD shipments sometimes arrive without proper documentation. This leads to extra effort to identify and properly account for the shipment. The method of transport is a factor in this situation. When DVDs are made using commercial express carriers (e.g., United Parcel Service), shipments usually comprise many boxes rather than a pallet load. One order may arrive in tens or hundreds of separate boxes. RIC personnel must locate the documentation in one of the boxes. If the shipment is broken by the carrier, the RIC cannot place the items into stock until the box containing the paperwork arrives and is located. Once the box containing the proper documentation is received, the total shipment can be processed.

Several RIC personnel also observed that DVD shipments come in various packing sizes, which complicate RIC warehouse storage and issuing activities. Some nonstandard packing containers have not held up well in the RIC warehouses, resulting in damaged inventory.

Packaging procedures could also benefit from a correlation between packing requirements and issue quantity. For example, Army socks are packed seven pair to a bundle, bound by two hand-tied strings. Only six pair, however, are issued to each recruit. RIC personnel must untie the bundle and separate the extra pair for later issue. If the packaging specifications were matched to the issue quantity, the time required to unpack and count the correct number for issue would be reduced.

Some items come with extra packaging intended to improve quality that actually hinders RIC handling efficiency. Examples of this include the hangar pack for dress coats, shoe packaging, and the packaging of dress shirts. These types of packaging result in additional time and cost associated with unpacking, along with unnecessary packaging material that must be disposed of.

# Bibliography

---

Apparel Research Network Statement of Work. World Wide Web at <http://mtiac.hq.iitri.com/arn/docs/arnsow.html>. 15 April 1997.

Apparel Research Network World Wide Web site at <http://mtiac.hq.iitri.com/arn/>. 16 April 1997.

*Federal Prime Contracts on CD-ROM*, Fiscal Year 1994. Vienna, VA: Eagle Eye Publishers, Inc., 1994.

Redman, John M., Paolo Chiappina, and Frank Clausen. "A Strategy for Modernizing the Apparel Industry." *Issues in Science and Technology*, Vol. 11, No. 1, Fall 1994, pp. 61–68.

Schwartz, Jerry. "Employing the Lessons of War to Make Better Clothes." *The New York Times*, November 20, 1994, p. F11.

U.S. Department of Commerce. *Census of Manufactures*. 1992.

# Appendix A

## Recruit Clothing Manufacturers

---

The following table lists companies receiving contracts for “bag items” since 31 December 1994.

Company	Location
Addison Shoe Co	Wynne, AR 72396
Albest Metal Stamping Corp	Brooklyn, NY 11211
Altama Delta Corp	Lexington, TN 38351
American Apparel Inc	Selma, AL 36701-2010
Anchortex Corp	Berlin, NJ 08009
Apparel Mfg Corp	Sterling, CT 06377-0216
Aronoff Service Products Inc	Hauppauge, NY 11788
Atlas Headwear Inc	Phoenix, AZ 85021
Bancroft Cap Co	Cabot, AR 72023-1207
Belleville Shoe Mfg Co Inc	Belleville, IL 62222
Bende and Sons Inc	Passaic, NJ 07055-8511
Bernard Cap Co Inc	Hialeah, FL 33016-2425
Bonk Sam Uniform Cap Co	Bronx, NY 10454-4413
Butte Sheltered Workshop	Butte, MT 59701-1645
Califashions Inc	San Francisco, CA 94103-2911
Carribbean Needle Point Inc	Penuelas, PR 00624
Choctaw Mfg Co Inc	Silas, AL 36919
Coastal Enterprises Of Jacksonville	Jacksonville, NC 28546
Craddock-Terry Inc	Lynchburg, VA 24506
Creighton Inc	Reidsville, NC 27323-1797
Crown Purse Inc	Brooklyn, NY 11205
Defense Personnel Support Center	Philadelphia, PA 19101
Denmarks Military Equipment Co	Long Island City, NY 11101-1404
Derossi and Son Co	Vineland, NJ 08360
Dj Mfg Corp	Caguas, PR 00726
E P Industries Inc	Providence, RI 02903-4920
Edcar Industries Inc	San Lorenzo, PR 00754
Elana Mfg Inc	Brooklyn, NY 11201
Elder Hosiery Co	Burlington, NC 27215
Equa Industries Inc	Mayaguez, PR 00680
Glamour Glove Corp	New York, NY 10010-6002
Glove Masters Inc	Worcester, NY 12197
Golden Mfg Co Inc	Golden, MS 38847
Goodwill Industries Of South Florida	Miami, FL 33142-7317
Greca Bros Inc	Hartford, CT 06114
Green Ira Inc	Providence, RI 02905

Company	Location
Hli Lordship Industries Inc	Hauppauge, NY 11788
Industries For The Blind	Talladega, AL 35160-0698
J H Rutter-Rex Mfg Co Inc	New Orleans, LA 70184
K and D Clothing Mfg Co	Philadelphia, PA 19130-3409
Knox County Assn For Retarded	Vincennes, IN 47591-9803
Krew Inc	Attleboro, MA 02703-3046
Ladies Line Inc	Philadelphia, PA 19107-2816
Lajas Industries Inc	Lajas, PR 00667
Lees Apron Mfg Co Inc	Minneapolis, MN 55401-1702
Lion-Vallen Inc	Dayton, OH 45440
Martin Mfg Co Inc	Martin, TN 38237-8701
Maryland Clothing Co	Baltimore, MD 21205-1723
Mauney Hosiery Mill Inc	Kings Mountain, NC 28086-3557
Mcrae Industries Inc	Mount Gilead, NC 27306-9304
Mount Rogers Industrial	Hillsville, VA 24343
Mount Rogers Industrial	Wytheville, VA 24382-9751
National Industries For The Blind	Alexandria, VA 22311-1705
National Industries For The Blind	Alexandria, VA 22311
Nationwide Glove Co Mill	Harrisburg, IL 62946
North Bay Rehabilitation Services	Rohnert Park, CA 94928
Northeastern Associates	Albany, NY 12206-3012
Olympic Mills Corp	Guayanilla, PR 00656
Omega Apparel Inc	Smithville, TN 37166
Orc Industries Inc	La Crosse, WI 54602-0218
Parva Industries Inc	Hamden, CT 06518-2319
Peckham Vocational Industries Inc	Lansing, MI 48906-2927
Propper International	Maunabo, PR 00707
Red Kap Industries	Nashville, TN 37214
Reliable World Trade Co Ltd	San Leandro, CA 94577
Reyes Industries Inc	San Antonio, TX 78221
S And G Industries Inc	Four Oaks, NC 27524
Schreyer Embroidery	Fairview, NJ 07022-1605
Seagoing Uniform Corp	Marshville, NC 28103
Sewell Mfg Co	Bremen, GA 30110-0605
Sidran Inc	Dallas, TX 75229-4702
Singer Hosiery Mills	Thomasville, NC 27360-3648
Southeastern Kentucky	Corbin, KY 40701-1807
Special T Hosiery	Burlington, NC 27216
Spectrum Industries	Waterloo, NY 13165
Sterlingware Of Boston Inc	Boston, MA 02128-2120
Sutler Corp The	Lansdowne, PA 19050
Target Sportswear Inc	Hude, PA 16843
Tennessee Apparel Corp	Tullahoma, TN 37388-3503
Terry Mfg Co Inc	Roanoke, AL 36274-2063
Trans-Regional Mfg Inc	Blackville, SC 29817-1076

*Recruit Clothing Manufacturers*

Company	Location
Travis Association For The Blind	Austin, TX 78764-3297
U S Product Corp	Amsterdam, NY 12010-0667
Uniar Corp	New York, NY 10013
Unicor	Washington, DC 20534
Union Underwear Co Inc	Bowling Green, KY 42102-9015
Urschel Tool Corp	Providence, RI 02907-3113
Vanguard Military Equipment Corp	Long Island City, NY 11104-4201
Vocational Guidance Services	Cleveland, OH 44103-4451
Weintraub Bros Co	Huntingdon Valley, PA 19006-5301
Wellco Enterprises Inc	Waynesville, NC 28786
Wolverine World Wide Inc	Rockford, MI 49351
Young Jack Associates Inc	Hazleton, PA 18201-0522

## Appendix B

# Military Recruit Clothing Issue Lists

Tables B-1 through B-10 list the clothing issued to females and males in the Air Force, Army, Coast Guard, Marines, and Navy.

*Table B-1. FY96 Issues to Air Force Females*

Lead NSN	Description	Issue quantity	96 price
8410011752252	Coat, All Weather w/Removable Liner,	1	\$91.90
8410013758474	Slacks, Wool/Poly, Serge, 10 oz. AF Shade 1620	1	\$25.80
8415013908554	Trousers, Enhanced HW BDU	2	\$24.55
8415011343175	Cap, Woodland Camouflage Pattern	1	\$5.25
8415013908537	Coat, Cam, Enhanced HW BDU	2	\$24.30
8415013937813	Cap, Woodland Camouflage Pattern Enhanced	1	\$6.60
8410012240485	Slacks, Wool/Poly, Tropical 10 oz.	1	\$25.80
8465011178699	Bag, Duffel, Nylon, OG	1	\$15.25
8415010841705	Trousers, Temperate (BDU)	2	\$22.35
8410012240508	Skirt, Wool/Poly, Tropical, 10 oz.	1	\$23.25
8435010758037	Shoes, Women, Oxford, Black	1	\$30.10
8420011121472	Undershirt, Man's, Qtr. Sleeve, Brn	5	\$2.65
8440005437773	Socks, Cotton/Nylon, Black	4	\$0.85
8410012999536	Jacket, Poly/WI Gabardine, BI AF Shade 1605	1	\$73.95
8455010717475	Standard AF Name Tag, Ind, Blue, Plastic	2	\$0.25
8440010536768	Sock, Men's, Cushion Sole, Stretch Type	4	\$2.10
8415010841639	Coat, Camouflage Temperate (BDU)	2	\$21.75
8315003000327	Buckle, Belt, Trousers, Brass	1	\$0.40
8440011617119	Gloves, Leather, Blk, Unisex	1	\$15.90
8430011981354	Boots, Combat, w/Speed Lacing	1	\$63.40
8445010723725	Handbag, Black, Plastic	1	\$23.40
8440010529738	Belt, Cotton, Web, Blue, w/Black Clip	1	\$1.00
8445012421009	Neck Tab, Blue, AF Shade 1083	1	\$2.30
7210012860983	Towel, Bath, Cotton, White	2	\$3.50
8410013780030	Coat, Service, WI/PI, Trop, 10 oz. Blue, AF Shade 1620	1	\$82.70
8440011814411	Belt, Trousers, Web, Blue, w/Chromium Plate	1	\$1.00
8410013815559	Cap, Garrison, Poly/Wool, Blue, AF Shade 1620	1	\$5.75

*Table B-1. FY96 Issues to Air Force Females (Continued)*

Lead NSN	Description	Issue quantity	96 price
8415014073252	Trunks, General Purpose, Ctn/Poly, Gray	2	\$8.85
8415014073231	T-Shirt, Athlete, Ctn/Poly, Gray	2	\$6.90
8455011127681	Insignia, BOS, US	1	\$1.15
8415014072708	Sweatshirt, Ctn/Poly, Gray	1	\$23.00
8445013758394	Neck Tab, Blue, AF Shade 1622	1	\$2.30
8410013784004	Shirt, Cotton/Poly, Long Sleeve, AF Shade 1550, (Tuck In)	3	\$18.15
8315014137833	Buckle, Belt, Chromium Plated	1	\$1.15
8410013782906	Shirt, Cotton/Poly, Short Sleeve, AF Shade 1550, (Tuck In)	3	\$16.75
8410013758495	Skirt, Wool/Poly, Serge, 10 oz., AF Shade 1620	1	\$23.25
8415014072176	Sweatpants, Ctn/Poly, Gray	1	\$20.00



Table B-2. FY96 Issues to Air Force Males

Lead NSN	Description	Issue quantity	96 price
8415014073231	T-Shirt, Athlete, Ctn/Poly, Gray	2	\$6.90
8420000092347	Drawers, Cotton, Briefs, White	6	\$1.15
8405011745117	Coat, All Weather w/Removable Liner	1	\$80.80
8415014073252	Trunks, General Purpose, Ctn/Poly, Gray	2	\$8.85
8455010717475	Standard AF Name Tag, Ind, Blue, Plastic	2	\$0.25
8440010536768	Sock, Men's, Cushion Sole, Stretch Type	4	\$2.10
8430005594228	Shoes, Men's Dress Black	1	\$29.25
8315003000327	Buckle, Belt, Trousers, Brass	1	\$0.40
8420011940914	Undershirt, Man's, White, V-Neck	5	\$2.65
8405013780011	Trousers, Wl/Poly, Serge, 10 oz, AF Shade 1620	1	\$30.80
8415010841639	Coat, Camouflage Temperate (BDU)	2	\$21.75
8440011617119	Gloves, Leather, Blk, Unisex	1	\$15.90
8315005986278	Buckle, Belt, Nickel Silver	0	\$0.50
8405012624533	Shirt, Cotton/Poly, Short Sleeve,	3	\$10.15
8430011981354	Boots, Combat, w/Speed Lacing	1	\$63.40
8440011560373	Necktie, Blue, AF Shade 1083	1	\$3.45
8415013908537	Coat, Cam, Enhanced HW BDU	2	\$24.30
8440011814411	Belt, Trousers, Web, Blue, w/Chromium Plate	1	\$1.00
8315014137833	Buckle, Belt, Chromium Plated	1	\$1.15
8405013758974	Cap, Garrison (Flight cap), AF SH 1620	1	\$5.75
8415013908554	Trousers, Enhanced HW BDU	2	\$24.55
8405013755649	Coat, Service, Wl/Poly, Serge, 10 oz, AF Shade 1620	1	\$88.00
8405012243368	Trousers, Wl/Poly, Trop, 10 oz.	3	\$30.80
8415011343175	Cap, Woodland Camouflage Pattern	1	\$5.25
7210012860983	Towel, Bath, Cotton, White	2	\$3.50
8455011127681	Insignia, BOS, US	1	\$1.15
8440010529738	Belt, Cotton, Web, Blue, w/Black Clip	1	\$1.00
8405012127428	Shirt, Cotton/Poly, Long Sleeve, W/Epaulets	3	\$11.50
8415013937813	Cap, Woodland Camouflage Pattern Enhanced	1	\$6.60
8415014072176	Sweatpants, Ctn/Poly, Gray	1	\$20.00
8420011121472	Undershirt, Man's, Qtr. Sleeve, Brn	5	\$2.65
8415010841705	Trousers, Temperate (BDU)	2	\$22.35
8415014072708	Sweatshirt, Ctn/Poly, Gray	1	\$23.00
8465011178699	Bag, Duffel, Nylon, OG	1	\$15.25
8440005437773	Socks, Cotton/Nylon, Black	4	\$0.85
8405012986881	Jacket, Poly/wl Gabardine, BI AF Shade 1605	1	\$70.70
8440013815531	Necktie, Men's AF Shade 1622	1	\$3.45

Table B-3. FY96 Issues to Army Females

Lead NSN	Description	Issue quantity	96 price
8440011617119	Gloves, Leather, Blk, Unisex	1	\$15.90
8415010841016	Trousers, Camouflage	2	\$22.35
8415010841683	Cap, Camouflage Pattern	1	\$5.25
8440010536768	Sock, Men's, Cushion Sole, Stretch Type	7	\$2.10
8415010841639	Coat, Camouflage Temperate (BDU)	2	\$21.75
8415006826575	Glove Inserts, Cold	2	\$1.45
8440012882178	Handkerchief, Brown 436	6	\$0.50
8415012344414	Trunks, General Purpose	2	\$7.10
8430011981354	Boots, Combat, w/Speed Lacing	2	\$63.40
8415012344409	Sweatpants	1	\$16.40
8415013107334	Glove, Flexor, Light Duty	1	\$19.00
8415010997825	Coat, Cold Weather	2	\$61.90
8440005731666	Belt, Trousers, Cotton Webbing	1	\$1.00
8410013419904	Coat, Wmn's Poly/Wool AG 489	1	\$86.10
8420011121472	Undershirt, Man's, Qtr. Sleeve, Brn	7	\$2.65
8465011178699	Bag, Duffel, Nylon, OG	1	\$15.25
8315003000327	Buckle, Belt, Trousers, Brass	1	\$0.40
8410013157970	Shirt, Women's, AG-415, LS	1	\$21.50
8435010758037	Shoes, Women, Oxford, Black	1	\$30.10
8415013937813	Cap, Woodland Camouflage Pattern Enhanced	1	\$6.60
8410013239602	Shirt, Women's, AG-415, SS	2	\$11.45
8410013339700	Cap, Garrison, Woman's, Poly/Wool Serge AG 489	2	\$5.75
8410013088649	Coat, All Weather, Double Breasted	1	\$65.80
8410013422387	Slacks, Wmn's A/S Uniform AG489	2	\$28.65
8415013908537	Coat, Cam, Enhanced HW BDU	2	\$24.30
8415012344420	Sweatshirt	1	\$25.20
8410013423214	Skirt, Wmn's All Season AG 489	2	\$20.85
8445013966105	Neck Tab, Woman's Shirt	1	\$4.70
8415013908554	Trousers, Enhanced HW BDU	2	\$24.55
8445013492708	Handbag, Woman's, Syn/Black	1	\$25.60
8415012344425	T-Shirt, Athletic's Man/Woman	2	\$5.50
7210011252594	Towel, Bath, Brown	4	\$3.05

Table B-4. FY96 Issues To Army Males

Lead NSN	Description	Issue quantity	96 price
8315002754513	Buckle, Belt Web, Brass	1	\$0.75
8465011178699	Bag, Duffel, Nylon, OG	1	\$15.25
8440005731666	Belt, Trousers, Cotton Webbing	2	\$1.00
8420011121472	Undershirt, Man's, Qtr. Sleeve, Brn	7	\$2.65
8440005437773	Socks, Cotton/Nylon, Black	3	\$0.85
8415013937813	Cap, Woodland Camouflage Pattern Enhanced	1	\$6.60
7210011252594	Towel, Bath, Brown	4	\$3.05
8415012344409	Sweatpants	1	\$16.40
8415012344414	Trunks, General Purpose	2	\$7.10
8420011121957	Drawers, Men's, Brown Brief	7	\$1.60
8415013908554	Trousers, Enhanced HW BDU	2	\$24.55
8415013908537	Coat, Cam, Enhanced HW BDU	2	\$24.30
8415010997825	Coat, Cold Weather	2	\$61.90
8415010841639	Coat, Camouflage Temperate (BDU)	2	\$21.75
8405013419967	Trousers, Men's Poly/Wool AG 489	2	\$28.05
8405013341493	Cap, Garrison Male AG 489	2	\$5.75
8415012344425	T-Shirt, Athletic's Man/Woman	2	\$5.50
8415013107334	Glove, Flexor, Light Duty	1	\$19.00
8440012882178	Handkerchief, Brown 436	6	\$0.50
8415006826575	Glove Inserts, Cold	2	\$1.45
8405013307381	Coat, Men's Poly/Wool AG 489	1	\$104.55
8440011717571	Necktie, Man's, Blk, 56-57.5 in. long	1	\$3.00
8415012344420	Sweatshirt	1	\$25.20
8405013088673	Coat, All Weather, Mens Double Breasted	1	\$66.35
8440011617119	Gloves, Leather, Blk, Unisex	1	\$15.90
8420005436643	Undershirt, Cotton, White, Crew Neck	2	\$2.65
8405013748887	Shirt, Man's, Cotton/Poly, Green, SS, w/Stand-Up Collar	2	\$10.15
8315003000327	Buckle, Belt, Trousers, Brass	1	\$0.40
8430011981354	Boots, Combat, w/Speed Lacing	2	\$63.40
8405013119691	Shirt, Man's, Cotton/Poly, Green, LS	1	\$11.95
8440010536768	Sock, Men's, Cushion Sole, Stretch Type	7	\$2.10
8415010841683	Cap, Camouflage Pattern	1	\$5.25
8430005594136	Shoes, Men's, Dress blk	1	\$29.25
8415010841016	Trousers, Camouflage	2	\$22.35

Table B-5. FY96 Issues to Cost Guard Females

Lead NSN	Description	Issue quantity	96 price
8430011052332	Shoes, Safety (Boot)	1	\$56.00
8435010758016	Shoe, Women's, Dress Oxford, Black	1	\$30.10
8410011134640	Shirt, Utility, Blue, LS	2	\$14.20
8410012175523	Skirt, Women's, Service Dress	1	\$18.35
8410012175417	Coat, Woman's, Service Dress	1	\$112.15
8465011178699	Bag, Duffel, Nylon, OG	1	\$15.25
8410011752252	Coat, All Weather w/Removable Liner,	1	\$91.90
7210012860983	Towel, Bath, Cotton, White	4	\$3.50
8455011101383	Insignia, Group Rate	2	\$0.30
8455011097113	Shield	2	\$1.40
8410012999536	Jacket, Poly/WI Gabardine, BI AF Shade 1605	1	\$73.95
8315002754513	Buckle, Belt Web, Brass	1	\$0.75
8455010420866	Insignia, Garrison Cap	1	\$1.15
8455010412362	Insignia, Service Hat	1	\$1.50
8410010194226	Shirt, Woman's, Cotton/Poly, LS	3	\$19.95
8410011178701	Shirt, Utility, SS, Blue	2	\$14.40
8440002700535	Belt, Trousers, Black	1	\$1.00
8410010731117	Slacks, Women's, Cotton/Poly, Undress	4	\$16.85
8410010194274	Shirt, Woman' s, Cotton/Poly, SS	4	\$17.65
8445013492708	Handbag, Woman's, Syn/Black	1	\$25.60
8405010061074	Cap, Knit, Blue Wool	1	\$2.40
8445013171620	Neck Tab, Woman's, Shirt Poly/Wool	1	\$5.45
8405010738123	Jacket, Man's Utility, Blue	1	\$32.65
8445010213067	Necktie, Ascot Blue	2	\$4.95
8445003101151	Gloves, Women's Nylon/Knitted White	1	\$5.00
8440011617119	Gloves, Leather, Blk, Unisex	1	\$15.90
8410012175479	Slacks, Women's	2	\$29.15
8440005437777	Sock, Men's, Cushion Sole, Stretch Type, Olive	6	\$2.10
8410011462799	Shirt, Dress SS, White	1	\$12.45

Table B-6. FY96 Issues to Coast Guard Males

Lead NSN	Description	Issue quantity	96 price
8415009045130	Trunks, General Purpose, Tan	1	\$6.05
8405012986881	Jacket, Poly/wl Gabardine, BI AF Shade 1605	1	\$70.70
8455010420866	Insignia, Garrison Cap	1	\$1.15
8405010738123	Jacket, Man's Utility, Blue	1	\$32.65
8455011097113	Shield	2	\$1.40
8405001400793	Trousers, Men's Cotton/Poly, Undress	4	\$15.95
8405011745117	Coat, All Weather w/Removable Liner	1	\$80.80
8315002754513	Buckle, Belt Web, Brass	1	\$0.75
8440011560373	Necktie, Blue, AF Shade 1083	1	\$3.45
8405012127428	Shirt, Cotton/Poly, Long Sleeve, W/Epaulets	3	\$11.50
8405011133453	Trousers, Serge, Blue	2	\$24.00
8440005437777	Sock, Men's, Cushion Sole, Stretch Type, Olive	6	\$2.10
8440011617119	Gloves, Leather, Blk, Unisex	1	\$15.90
8405011132555	Coat, Serge, Dress Blue	1	\$110.25
8405011130941	Cap, Garrison, Man's, Poly/Wool	1	\$7.35
8455010412362	Insignia, Service Hat	1	\$1.50
8405010239807	Shirt, Utility SS	2	\$14.40
8405010061074	Cap, Knit, Blue Wool	1	\$2.40
8405001523952	Strap, Chin	1	\$0.60
8405011134635	Shirt, Utility L/S	2	\$16.10
8455011101383	Insignia, Group Rate	2	\$0.30
8465011178699	Bag, Duffel, Nylon, OG	1	\$15.25
8430005594136	Shoes, Men's, Dress blk	2	\$29.25
8430011052332	Shoes, Safety (Boot)	1	\$56.00
8405012624533	Shirt, Cotton/Poly, Short Sleeve,	3	\$10.15
8440002700535	Belt, Trousers, Black	1	\$1.00
8440001600770	Gloves, Cloth, White, Pair	1	\$10.70
7210012860983	Towel, Bath, Cotton, White	4	\$3.50

Table B-7. FY96 Issues to Marine Corps Females

Lead NSN	Description	Issue quantity	96 price
8415013908554	Trousers, Enhanced HW BDU	5	\$24.55
8415013908537	Coat, Cam, Enhanced HW BDU	5	\$24.30
8410012794473	Cap, Service, Poly/wl Gabardine, Green	1	\$39.15
8455009651556	Insignia, Garrison Cap	1	\$0.40
8315005433724	Buckle, Web Belt, Brass	1	\$0.80
8455009651664	Insignia, BOS, Cap, Blk	1	\$0.75
8455009857414	Insignia, BOS Collar	1	\$0.85
8410012797730	Skirt, Women's, Poly/Wool Gabardine, Blue	1	\$18.50
8410012789760	Skirt, Women's, Poly/Wool Gabardine, Green	2	\$17.15
8410012794466	Cap, Garrison, Poly/wl Gabardine, Green	1	\$7.80
8410011737064	Shirt, Women's, Poly/Wool, LS	3	\$18.75
8410012792454	Coat, Wms Poly/Wool Gabardine, Green	1	\$90.85
8410011508390	Coat, All Weather, Dress	1	\$76.90
8410011684446	Shirt, Women's, Poly/Wool, SS, Qtr. Sleeve	3	\$15.60
8410012789731	Slacks, Women's, Poly/Wool Gabardine, Green	1	\$22.80
8465011178699	Bag, Duffel, Nylon, OG	1	\$15.25
8440011617119	Gloves, Leather, Blk, Unisex	1	\$15.90
8410011013570	Cap, Service Wms, Vinyl, White	1	\$46.15
8420011121472	Undershirt, Man's, Qtr. Sleeve, Brn	6	\$2.65
8445012802215	Necktab Wms, Green	1	\$3.20
8405012466658	Cap, Utility, Camouflage, Hot Weather	2	\$3.85
8445011539673	Necktab Wms, Black	1	\$3.15
8435010758037	Shoes, Women, Oxford, Black	1	\$30.10
8415013110380	Trunks, General Purpose	1	\$4.45
8405011929164	Sweater, Pull-Over Olive Green	1	\$18.15
8430011981354	Boots, Combat, w/Speed Lacing	1	\$63.40
8430013127818	Boots, Combat, Tropical, Pair	1	\$53.75
8440010536768	Sock, Men's, Cushion Sole, Stretch Type	6	\$2.10
8440007536364	Belt, Trousers, Khaki	2	\$1.00
8455002929332	Insignia, Bofs, Cap, Gold, Screwpost	1	\$0.75

Table B-8. FY96 Issues to Marine Corps Males

Lead NSN	Description	Issue quantity	96 price
8405012683698	Crown, Service Cap, White, Poly/Rayon	1	\$5.20
8405012797652	Cap, Garrison, Poly/Wool Gabardine, Green	1	\$5.75
8405013046455	Crown, Service Cap, PWG, Green	1	\$5.75
8405012797671	Trousers, Man's Poly/Wool Gabardine, Green	2	\$25.90
8405012795579	Coat, Man's Poly/Wool Gabardine, Green	1	\$110.55
8405011064731	Frame, Service Cap	1	\$13.30
8405011961764	Shirt, Man's, Poly/Wool Qtr Sleeve	3	\$12.25
8405011734446	Shirt, Man's, Poly/Wool LS	3	\$17.20
8405011070225	Coat, All Weather, Dress	1	\$76.70
8405012800105	Trousers, Man's Poly/Wool Gabardine, Blue	1	\$28.00
8315005433724	Buckle, Web Belt, Brass	2	\$0.80
8405011929164	Sweater, Pull-Over Olive Green	1	\$18.15
8315006649126	Buckle, Belt Brass	1	\$0.50
8405012466658	Cap, Utility, Camouflage, Hot Weather	2	\$3.85
8455009651556	Insignia, Garrison Cap	1	\$0.40
8420000092347	Drawers, Cotton, Briefs, White	6	\$1.15
8420005436643	Undershirt, Cotton, White, Crew Neck	3	\$2.65
8415013110380	Trunks, General Purpose	1	\$4.45
8420011121472	Undershirt, Man's, Qtr. Sleeve, Brn	6	\$2.65
8430005594136	Shoes, Men's, Dress blk	1	\$29.25
8440011617119	Gloves, Leather, Blk, Unisex	1	\$15.90
8440010536768	Sock, Men's, Cushion Sole, Stretch Type	6	\$2.10
8455002860307	Insignia, Blk, Metal	2	\$0.05
8455002929332	Insignia, Bofs, Cap, Gold, Screwpost	1	\$0.75
8440011900066	Nectie. Knaki	2	\$1.95
8455005529645	Clasp, Necktie	1	\$0.85
8455009651664	Insignia, BOS, Cap, Blk	1	\$0.75
8455009857414	Insignia, BOS Collar	1	\$0.85
8430013127818	Boots, Combat, Tropical, Pair	1	\$53.75
8455011239298	Insignia, Button Screwpost, Gold	2	\$0.40
8440007536364	Belt, Trousers, Khaki	2	\$1.00
8465011178699	Bag, Duffel, Nylon, OG	1	\$15.25
8415013908537	Coat, Cam, Enhanced HW BDU	5	\$24.30
8440005437773	Socks, Cotton/Nylon, Black	4	\$0.85
8415013908554	Trousers, Enhanced HW BDU	5	\$24.55
8430011981354	Boots, Combat, w/Speed Lacing	1	\$63.40

Table B-9. FY96 Issues to Navy Females

Lead NSN	Description	Issue quantity	96 price
8445013492708	Handbag, Woman's, Syn/Black	1	\$25.60
8420005436643	Undershirt, Cotton, White, Crew Neck	8	\$2.65
8440011617119	Gloves, Leather, Blk, Unisex	1	\$15.90
8440010536768	Sock, Men's, Cushion Sole, Stretch Type	5	\$2.10
8410012202511	Coat, All Weather	1	\$58.60
8440011985175	Neckerchief, Black	1	\$5.80
8445010688339	Belt, Web, Cotton, Black w/Silver Clip	2	\$1.00
8440005437773	Socks, Cotton/Nylon, Black	5	\$0.85
8445013171620	Neck Tab, Woman's, Shirt Poly/Wool	1	\$5.45
8405010061074	Cap, Knit, Blue Wool	1	\$2.40
8455003705868	Insignia, Service Hat and Cap	1	\$0.65
8315010694982	Buckle, Web, Belt, Silver	2	\$0.70
8455010048946	Group Rate Mark Emb BI Tw Poly (3/4 size)	3	\$0.40
8455010126581	Group Rate Mark Emb Wh Pop P/C (3/4 size)	3	\$0.20
8455010898289	Group Rate Mark Emb Wh Poly (3/4 size)	2	\$0.20
8465011178699	Bag, Duffel, Nylon, OG	1	\$15.25
7210012860983	Towel, Bath, Cotton, White	4	\$3.50
8445010688340	Belt, Web, Cotton, White w/Silver Clip	3	\$1.00
8410013121415	Jumper, Service Dress, White, Cotton	2	\$9.90
8410013734404	Slack, Svc Dr P/W Blue	1	\$18.05
8410013721705	Skirt, P/W Blue (Wash)	1	\$25.25
8410013721656	Skirt, Poly Twill White	1	\$13.35
8410010696611	Shirt, Poplin, Cotton/Poly, SS, White	3	\$13.95
8410010730283	Jacket, Utility. Pop/Cotton Poly Blue	1	\$35.30
8410013585733	Slack, Summer White P/C	2	\$17.35
8410010746193	Slacks, Utility, Cotton, Poly, Denim	1	\$12.10
8410010747010	Shirt, Utility, Cotton/Poly Chambray, LS	1	\$7.20
8410013758405	Coat, Svc Dr P/W Blue	1	\$91.60
8410013181605	Skirt, Summer, White, P/C	2	\$14.90
8410013734412	Skirt, Svc Dr P/W Blue	1	\$25.00
8410013119640	Slacks, Svc, Dress, White, Cotton	2	\$12.55
8410013056969	Hat, Service w/2 Crowns	1	\$31.00
8410012405844	Cap, Garrison, Tropical, Poly/Wool, Blue	2	\$4.65
8410012338815	Overcoat, Melton, Wool, Blue (Peacoat)	1	\$98.75
8410012303122	Sweater, Acrylic, Blue	1	\$10.65
8410012299436	Shirt, Trop, Poly/Wool, Blue LS (Wash)	2	\$19.35
8410011823893	Slacks, Utility, Cotton, Flame Retardant	4	\$20.50
8410011918977	Shirt, Utility, Cotton, Flame Retardant, LS	4	\$13.70



*Table B-9. FY96 Issues to Navy Females (Continued)*

Lead NSN	Description	Issue quantity	96 Price
8410013585684	Slack, P/W Blue (Wash)	2	\$21.00
8430011958091	Shoe, Safety, Chukka	1	\$35.60
8435010758037	Shoes, Women, Oxford, Black	1	\$30.10

Table B-10. FY96 Issues to Navy Males

Lead NSN	Description	Issue quantity	96 price
8405011919004	Shirt, Utility, LS, Flame, Retardant	4	\$14.00
8405010738123	Jacket, Man's Utility, Blue	1	\$32.65
8440011617119	Gloves, Leather, Blk, Unisex	1	\$15.90
8455010048946	Group Rate Mark Emb BI Tw Poly (3/4 size)	3	\$0.40
8455010126581	Group Rate Mark Emb Wh Pop P/C (3/4 size)	2	\$0.20
8440004122309	Belt, Web, Cotton, Blk, w/Silver Clip	2	\$1.00
8405011541738	Overcoat, Melt, W1 B1 (Peacoat)	1	\$104.30
8405011900028	Hat, White (100% Cotton)	3	\$4.95
8405011511865	Trousers, Tropical Poly/Wool, Blue (Wash)	2	\$24.25
8465011178699	Bag, Duffel, Nylon, OG	1	\$15.25
8440010536768	Sock, Men's, Cushion Sole, Stretch Type	5	\$2.10
8405012306144	Shirt, Tropical, Poly/Wool, Blue (Wash)	2	\$17.95
8440004122326	Belt, Web, Cotton, White, W/Silver Clip	3	\$1.00
8405012202532	Coat, All Weather	1	\$58.35
7210012860983	Towel, Bath, Cotton, White	4	\$3.50
8440005437773	Socks, Cotton/Nylon, Black	6	\$0.85
8455010898289	Group Rate Mark Emb Wh Poly (3/4 size)	2	\$0.20
8440011985175	Neckerchief, Black	1	\$5.80
8405010761901	Jumper, Blue Dress	1	\$53.65
8405010760711	Trousers, Poly Twill, White	2	\$14.15
8405010744905	Shirt, Utility, LS, Chambray	1	\$9.70
8405010744885	Trousers, Utility, P/C Denim	1	\$10.15
8415009045130	Trunks, General Purpose, Tan	1	\$6.05
8405010765992	Trousers, Blue, Serge, Broadfall	1	\$39.60
8405012144000	Sweater, Wool/Modacrylic, Blue	1	\$15.00
8315005986278	Buckle, Belt, Nickel Silver	2	\$0.50
8405011823863	Trousers, Utility, Cotton, Flame Retardant	4	\$18.80
8405010761943	Jumper, White Dress	2	\$10.10
8420005436643	Undershirt, Cotton, White, Crew Neck	8	\$2.65
8405010061074	Cap, Knit, Blue Wool	1	\$2.40
8405006298368	Shirt, SS, Poplin, Cotton/Poly, White	2	\$7.50
8405001962138	Trousers, Tw, Cotton/Poly, White	2	\$15.10
8440011717571	Necktie, Man's, Blk, 56-57.5 in. long	1	\$3.00
8430005594228	Shoes, Men's Dress Black	1	\$29.25
8430011958091	Shoe, Safety, Chukka	1	\$35.60
8420000092347	Drawers, Cotton, Briefs, White	8	\$1.15

## Appendix C

# Apparel Industry/Occupation Profile

---

The following computer printout displays the occupations used by the apparel industry and the degree to which they are used.

**Industry/Sector Summary**

**Apparel**

---

<b>Number of Defense Workers (1)</b>	5,466
<b>Defense Labor Cost (2)</b>	\$86,696,704

---

(1) Number of "people-equivalents." For example, two workers each devoting half their time to defense-related work equals one person-equivalent.

(2) Reflects median earnings, exclusive of benefits. 1991 Dollars.

09-May-96

**Preceding Page Blank**

## Contribution of Activities to Defense Manufacturing Labor Costs

### Apparel

Activity	Portion of Total Labor Cos
<b>Engineering and Product Development</b>	
<b>Engineering Managers :</b>	
Engineering, mathematical, and natural science managers	0.304%
<b>SUBTOTAL</b>	<b>0.304%</b>
<b>Engineers and Designers :</b>	
Mechanical engineers	0.096%
Designers, except interior designers	0.910%
Industrial engineers, except safety engineers	0.403%
All other engineers	0.030%
<b>SUBTOTAL</b>	<b>1.439%</b>
<b>Technicians :</b>	
All other engineering technicians and technologists	0.175%
<b>SUBTOTAL</b>	<b>0.175%</b>
<b>Tool Makers :</b>	
Patternmakers and layout workers, fabric and apparel	1.042%
<b>SUBTOTAL</b>	<b>1.042%</b>
<b>SUBTOTAL FOR Engineering and Product Development :</b>	
	<b>2.960%</b>
<b>Management and Administration</b>	
<b>Finance and Accounting :</b>	
Statistical clerks	0.028%
Financial managers	0.471%
Billing, cost, and rate clerks	0.223%
Accountants and auditors	0.258%
Bookkeeping, accounting, and auditing clerks	0.988%
Billing, posting, and calculating machine operators	0.080%
Cost estimators	0.120%
Payroll and timekeeping clerks	0.537%
<b>SUBTOTAL</b>	<b>2.705%</b>
<b>Management Information Systems :</b>	
Systems analysts and computer scientists	0.183%
Computer programmers	0.266%
Data entry keyers, except composing	0.224%
Computer operators, except peripheral equipment	0.168%

**Contribution of Activities to Defense Manufacturing Labor Costs**

**Apparel**

Activity	Portion of Total Labor Cos
Peripheral EDP equipment operators	0.014%
<b>SUBTOTAL</b>	<b>0.856%</b>
<b>Marketing, Sales, Public Relations :</b>	
Adjustment clerks	0.243%
All other sales and related workers	2.289%
Salespersons, retail	0.390%
Marketing, advertising, and public relations managers	0.338%
<b>SUBTOTAL</b>	<b>3.260%</b>
<b>Other Management and Administration :</b>	
General managers and top executives	8.319%
Administrative services managers	0.140%
All other managers and administrators	0.612%
All other clerical and administrative support workers	0.088%
Switchboard operators	0.083%
Duplicating, mail, and other office machine operators	0.084%
General office clerks	0.934%
All other management support workers	0.194%
File clerks	0.050%
Typists and word processors	0.071%
Receptionists and information clerks	0.119%
Secretaries, except legal and medical	0.788%
Clerical supervisors and managers	0.572%
All other professional workers	0.092%
<b>SUBTOTAL</b>	<b>12.126%</b>
<b>Personnel :</b>	
Personnel clerks, except payroll and timekeeping	0.106%
Personnel, training, and labor relations managers	0.280%
Personnel, training, and labor relations specialists	0.119%
<b>SUBTOTAL</b>	<b>0.505%</b>
<b>SUBTOTAL FOR Management and Administration :</b>	
	<b>19.453%</b>
<b>Manufacturing</b>	
<b>Assembly (except electronic) :</b>	
All other assemblers and fabricators	0.799%
<b>SUBTOTAL</b>	<b>0.799%</b>
<b>Finishing :</b>	

## Contribution of Activities to Defense Manufacturing Labor Costs

### Apparel

Activity	Portion of Total Labor Cos
Coating, painting, and spraying machine operators, tenders, setters, and se	0.028%
Painting, coating, and decorating workers, hand	0.022%
<b>SUBTOTAL</b>	<b>0.051%</b>
<b>Forming :</b>	
Extruding and forming machine setters, operators and tenders	0.025%
Plastic molding machine operators and tenders, setters and set-up operato	0.012%
<b>SUBTOTAL</b>	<b>0.037%</b>
<b>Heat and Surface Treatment :</b>	
Furnace, kiln, or kettle operators and tenders	0.014%
<b>SUBTOTAL</b>	<b>0.014%</b>
<b>Joining :</b>	
Cement and gluing machine operators and tenders	0.031%
<b>SUBTOTAL</b>	<b>0.031%</b>
<b>Material Removal :</b>	
Cutting and slicing machine setters, operators and tenders	0.447%
Machinists	0.022%
Portable machine cutters	0.807%
<b>SUBTOTAL</b>	<b>1.276%</b>
<b>Other Production Processes :</b>	
<b>Other Metal, Plastic, and Ceramic</b>	
All other machine operators, tenders, setters, and set-up operators	0.188%
All other hand workers	0.864%
All other precision workers	0.068%
All other metal and plastic machine setters, operators, and related workers	0.026%
All other precision metal workers	0.013%
<b>Printing and Publishing Processes</b>	
Screen printing machine setters and set-up operators	0.391%
All other printing, binding, and related workers	0.091%
Printing press machine setters, operators and tenders	0.055%
<b>Textiles and Apparel Processes</b>	
Sewing machine operators, garment	39.254%
Textile bleaching and dyeing machine operators and tenders	0.123%
Textile draw-out and winding machine operators and tenders	0.750%
Textile machine setters and set-up operators	0.166%
All other precision textile, apparel, and furnishings workers	0.394%
Sewing machine operators, non-garment	0.991%
Pressing machine operators and tenders, textile, garment, and related mat	2.245%
Shoe and leather workers and repairers, prec	0.026%

**Contribution of Activities to Defense Manufacturing Labor Costs  
Apparel**

Activity	Portion of Total Labor Cos
Cutters and trimmers, hand	1.200%
Sewers, hand	0.624%
Pressers, hand	0.823%
Custom tailors and sewers	0.712%
<b>SUBTOTAL</b>	<b>49.003%</b>
<b>Test, Inspection, and Repair :</b>	
<b>Product Repair</b>	
Heat, air conditioning, and refrigeration mechanics and installers	0.023%
<b>Quality Assurance</b>	
Weighers, measurers, checkers, and samplers, recordkeeping	0.087%
Inspectors, testers, and graders, precision	3.938%
<b>SUBTOTAL</b>	<b>4.048%</b>
<b>SUBTOTAL FOR Manufacturing :</b>	<b>55.259%</b>
<b>Other Support</b>	
<b>Other Support :</b>	
<b>Other Support</b>	
Laundry and drycleaning machine operators and tenders, except pressing	0.226%
Teachers and instructors, vocational education and training	0.123%
All other health professionals, paraprofessionals, and technicians	0.015%
All other service workers	0.098%
<b>SUBTOTAL</b>	<b>0.462%</b>
<b>SUBTOTAL FOR Other Support :</b>	<b>0.462%</b>
<b>Production Support</b>	
<b>Materials Handling :</b>	
Hand packers and packagers	1.794%
Freight, stock, and material movers, hand	1.672%
Machine feeders and offbearers	0.228%
Industrial truck and tractor operators	0.107%
All other material moving equipment operators	0.078%
Stock clerks, stockroom, warehouse, or yard	0.647%
Truck drivers light and heavy	0.361%
All other helpers, laborers, and material movers, hand	1.429%
Packaging and filling machine operators and tenders	0.104%
All other transportation and related workers	0.016%
<b>SUBTOTAL</b>	<b>6.436%</b>
<b>Physical Plant Operations and Maintenance :</b>	
<b>Electrical and Electronic Maintenance</b>	
Electricians	0.024%



---

## Contribution of Activities to Defense Manufacturing Labor Costs

### Apparel

Activity	Portion of Total Labor Cos
<b>Mechanical and Structural Maintenance</b>	
Industrial machinery mechanics	1.704%
<b>Other Maint., Construction, and Repair</b>	
All other mechanics, installers, and repairers	0.439%
Vehicle washers and equipment cleaners	0.138%
Maintenance repairers, general utility	0.292%
<b>Plant Operations and Security</b>	
Janitors and cleaners, including maids and housekeeping cleaners	0.626%
All other clean and building service workers	0.039%
Boiler operators and tenders, low pressure	0.024%
Guards	0.075%
<b>Woodworking</b>	
Carpenters	0.019%
<b>SUBTOTAL</b>	<b>3.380%</b>
<b>Production Management :</b>	
Production, planning, and expediting clerks	0.434%
All other material recording, scheduling, and distribution workers	0.383%
Industrial production managers	2.541%
Blue collar worker supervisors	5.483%
<b>SUBTOTAL</b>	<b>8.841%</b>
<b>Purchasing :</b>	
Order clerks, materials, merchandise, and service	0.537%
Procurement clerks	0.061%
Purchasing agents, except wholesale, retail, and farm products	0.230%
Traffic, shipping, and receiving clerks	2.165%
Purchasing managers	0.215%
<b>SUBTOTAL</b>	<b>3.209%</b>
<b>SUBTOTAL FOR Production Support :</b>	<b>21.867%</b>
<b>TOTAL FOR ALL ACTIVITIES :</b>	<b>100.000%</b>

09-May-96

---

## Appendix D

# Glossary

---

ARN	Apparel Research Network
BDU	battle dress uniform
DEIMS	Defense Economic Impact Modeling System
DLA	Defense Logistics Agency
DORO	DLA Operations Research Office
DPSC	Defense Personnel Support Center
DVD	direct vendor delivery
LMI	Logistics Management Institute
NSN	national stock number
PGC	Procurement Group Code
QAR	quality audit representative
QDR	quality deficiency report
R&D	research and development
RIC	recruit induction center
SAILS	Standard Automated Intermediate Logistics System
SIC	standard industrial classification

# REPORT DOCUMENTATION PAGE

Form Approved  
OPM No.0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources gathering, and maintaining the data needed, and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503.

1. AGENCY USE ONLY (Leave Blank)		2. REPORT DATE Aug 97	3. REPORT TYPE AND DATES COVERED Final	
4. TITLE AND SUBTITLE Metrics for the Apparel Reserch Network Volume I: The Defense Apparel Business			5. FUNDING NUMBERS C DASW01-95-C-0019 PE 0902198D	
6. AUTHOR(S) Eric L. Gentsch Jack J. Vandenberghe				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Logistics Management Institute 2000 Corporate Ridge McLean, VA 22102-7805			8. PERFORMING ORGANIZATION REPORT NUMBER LMI-DL702T1	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Mr. Donald O'Brien, Chief, Technical Enterprise Team Defense Logistics Agency 8725 John Kingman Road, Room 3135 Fort Belvoir, VA 22060-6221			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION/AVAILABILITY STATEMENT A: Approved for public release; distribution unlimited			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words)  The Apparel Research Network (ARN) is a consortium, sponsored by the Defense Logistics Agency (DLA), whose purpose is to improve costs; lead-times; and quality in the design; production; and distribution of defense clothing. DLA engaged the Logistics Management Institute to quantitatively describe the defense clothing business in order to support the direction and conduct of ARN research. In Volume I, we present a consolidated statement of costs for that business. We also provide lead-time statistics, focusing on logistics response time, and we discuss quality issues. In Volume II, we perform a cost/benefit analysis of the proposed ARN research program.				
14. SUBJECT TERMS Clothing and textiles; apparel research			15. NUMBER OF PAGES 72	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UL	