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Analysis of Pool Distribution Operations at the Los Angeles, California, Regional Freight Consolidation Center

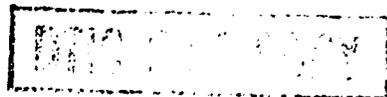
OPERATIONS RESEARCH AND ECONOMIC ANALYSIS OFFICE



DEPARTMENT OF DEFENSE

DEFENSE LOGISTICS AGENCY

March 1991



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Analysis of Pool Distribution Operations at the Los Angeles, California, Regional Freight Consolidation Center

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Mark Kleinhenz

March 1991

DEPARTMENT OF DEFENSE

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ALEXANDRIA, VIRGINIA 22304-6100



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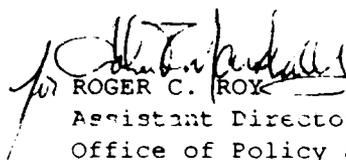
FOREWORD

The Analysis of Pool Distribution Operations at the Los Angeles, CA, Regional Freight Consolidation Center (RFCC), formerly known as an Enhanced DLA Distribution (EDDS) site, is an analysis of the cost effectiveness of pooling operations at the Los Angeles RFCC site in comparison with direct shipment to the customer. One outcome of Defense Management Review Decision 915 was that the EDDS mission was expanded to include a network of RFCCs. The Military Services will be able to route their EDDS-eligible shipments to these centers for consolidation with freight from the Defense Logistics Agency depots for delivery to the ultimate customer. This expanded version of EDDS is now the "Regional Freight Consolidation Program."

The study covers the period January through September 1990. "Pooling" refers to the movement of freight from a depot in truckload quantities to an RFCC site. There the freight is "pooled" with freight from other depots to build larger less-than-truckload shipments for short distance hauls to the customer. This study is the third such analysis of the cost effectiveness of pooling operations at the Los Angeles site.

The two previous analyses estimated that pooling operations over their respective periods of study lost money. One of the conclusions of this study is that over the 9-month period studied, an estimated \$89,068 were saved. Two of the scenarios performed during the sensitivity analysis estimated that additional transportation dollars could have been saved if certain managerial changes in pooling operations had been in effect at the start of the period.

The study recommends that pooling operations be continued at the Los Angeles RFCC and that a fourth study be performed to confirm that pooling operations are continuing to save transportation dollars.

for  Col, USAF
ROGER C. ROY
Assistant Director
Office of Policy and Plans

1. INTRODUCTION. The Defense Logistics Agency's (DLA) Operations Research And Economic Analysis Management Support Office was tasked by the DLA Directorate of Supply Operations, Transportation Division, to provide an analysis of the savings/loss associated with the operation of the Regional Freight Consolidation Program (RFCP), formerly known as the Enhanced DLA Distribution System (EDDS), for the Los Angeles Regional Freight Consolidation Center (RFCC).

A. Background.

In December 1988 the first phase of the implementation of the EDDS was initiated, beginning with the establishment of pooling operations at the Los Angeles commercial site. The Los Angeles EDDS Transportation Cost Analysis for Pool Delivery, DLA-LO Project No. DLA-90-P90108, covering the period December 1988 to June 1989, was the first analysis of the effectiveness of pooling operations. The study concluded that the cost of pool delivery operations had exceeded the cost of direct delivery by an estimated \$200,000.¹ The second study to analyze EDDS pooled delivery operations at the Los Angeles EDDS site, DLA-LO Project No. DLA-91-P00070, covered the period of July 1989 to December 1989. This analysis determined that losses in transportation dollars through pooling operations had been reduced to approximately \$82,000 for the period.²

One outcome of Defense Management Review Decision (DMRD) 915 was that the EDDS mission was expanded to establish a network of Department of Defense regional freight consolidation centers. The Military Services can route their EDDS-eligible shipments to these centers for consolidation with freight from the DLA depots for delivery to the ultimate customer. This expanded version of EDDS is called the "Regional Freight Consolidation Program."

Information on the cost effectiveness of the depot pooling operations at the Los Angeles RFCC is needed to obtain an estimate of the magnitude of savings/loss DLA is experiencing as a result of implementation. Using this information, DLA management can determine what corrective action, if any, is required. The principal purpose of the RFCP is to reduce transportation costs while simultaneously maintaining the required level of customer service. This purpose is in accordance with DMRD 915, a Department of Defense directive concerned with reducing transportation costs.

1. Defense Logistics Agency, Initial Transportation Cost Analysis of the Enhanced Defense Logistics Agency Distribution (EDDS) Los Angeles EDDS Site, March 1990, DLA-90-P90108.

2. Defense Logistics Agency, Los Angeles EDDS Site Transportation Cost Analysis for the Pooling Phase July - December 1989, October 1990, DLA-91-P00070.

B. Problem Statement. Determine the magnitude of savings/loss in transportation dollars that DLA is realizing as a result of the implementation of corrective actions to the pooling operations for the Los Angeles RFCC.

C. Objectives.

1. Calculate the cost of shipments without the implementation of the RFCP in the Los Angeles region.
2. Calculate the cost of shipments under the RFCP distribution method.
3. Compare the cost results without RFCP implementation with the RFCP cost results.

D. Scope.

1. The study will collect depot shipment data for the Los Angeles RFCC for January through September 1990.
2. The RFCC data will consist of all "pooled" shipment data on the Los Angeles RFCC tapes that are available for January through September 1990.

E. Assumptions.

1. Shipments assumed to go direct were built from the RFCC files by aggregating by inbound Government Bill of Lading (GBL) and Destination Cross Reference (DCR) code.
2. All direct shipments were assumed to be moved by the prime carrier.

II. METHODOLOGY.

A. Calculation of Cost of Shipments without RFCP Implementation.

1. The rates to estimate the cost of shipments without RFCP implementation were obtained through an October 1990 data call. The data call was made to obtain the most applicable tenders in use under the Guaranteed Traffic Program (GTP) for the current study period.

2. All data on the RFCC tapes were aggregated by inbound GBL and freight consignee, as defined by the DCR code, to build shipments. Using the "missed consolidation percentage" (MCP) for each DLA depot, the number of shipments was increased according to the MCP to simulate the fact that consolidation of shipments to customers is not perfect. For example, the MCP for Defense Depot, Mechanicsburg, is estimated to be 15.3 percent. Under the direct shipment scenario, 15.3 percent of the total number of GBLs built from the data for Mechanicsburg were split into two shipments of equal weight. This method of building shipments was repeated for the remaining five depots using the following MCPs: 8.0 percent for Defense Depot, Tracy, CA, 2.5 percent for Defense Depot, Columbus, OH, 15.3 percent for Defense Depot,

Memphis, TN, 8.0 percent for Defense Depot, Richmond, VA, and 1.0 percent for Defense Depot, Ogden, UT. All shipments were rated using the applicable GTP tenders to obtain an estimate of the cost of traffic without RFCP implementation.

B. Calculation of Cost of RFCP Shipments.

1. To calculate the cost of shipments from the depots to the RFCC, the data were aggregated by inbound GBL to the RFCC. This aggregate weight was rated using the applicable GTP tenders to obtain the cost of this first transportation leg.

2. To calculate the cost of the second transportation leg (RFCC to the customer) shipments were aggregated by outbound GBL. Shipments were rated by weight and mileage using the rates negotiated for the Los Angeles RFCC pooled shipments. The rate schedule applied was the same schedule as used in the previous study.

3. The total cost of an RFCP shipment is the sum of the costs calculated as described in paragraphs II B.1 and II B.2.

III. ANALYSIS.

A. Results.

Table 1 shows the results of the transportation cost comparison between direct shipment and shipment through RFCC. The columns are arranged according to depot. "DDMP" is Defense Depot, Mechanicsburg, PA, "DDTC" is Defense Depot, Tracy, CA, "DDCO" is Defense Depot, Columbus, OH, "DDMT" is Defense Depot, Memphis, TN, "DDRV" is Defense Depot, Richmond, VA, and "DDOU" is Defense Depot, Ogden, UT. The "Direct Delivery Cost Estimate" is the estimated cost of shipping from the depots direct to the customer. The next sections divide the RFCP cost into an inbound cost (transportation cost from depots to RFCC) and outbound cost (transportation cost from RFCC to customers). The "Total RFCP Cost" is the sum of the RFCC inbound cost and the RFCC outbound cost. This format is consistent with the format presenting results in previous RFCP pooling studies and it is the format used throughout this report to analyze the effect of various scenarios.

Table 1 presents the results of the cost comparison study for the period January through September 1990. The cost of direct delivery is estimated to have been \$1,621,013. This cost total is based on an estimated number of direct shipments of 22,317. The inbound transportation cost to the RFCC is calculated to be \$561,539, based on 1371 actual shipments from the depots to the Los Angeles RFCC. The outbound cost from the RFCC to the customers is calculated to be \$970,406. Adding the inbound and outbound cost of RFCC and subtracting from the estimated direct delivery cost yields an estimated savings of \$89,068 for the 9 months. Significantly the cost per hundredweight (¢/Cwt) out of the Los Angeles RFCC has been reduced considerably since the last study period. For July through December 1989, the rate was 7.35 \$/Cwt. For the period covering the past 9 months the rate had been reduced to 6.45 \$/Cwt.

Table 1

DIRECT COST VS RFCP COST
JANUARY - SEPTEMBER 1990

Direct Delivery Estimate

	DDMP	DDTC	DDCO	DDMT	DDRV	DDOU	Total
Wgt	863,331	6,386,935	561,860	1,585,915	868,547	4,780,689	15,047,277
GBLs	2,949	7,394	1,616	2,914	2,447	4,997	22,317
Cst	\$180,209	\$564,698	\$106,864	\$236,410	\$165,667	\$367,165	\$1,621,013

RFCP First Leg - Inbound Transportation Cost

Wgt	863,331	6,386,935	561,860	1,585,915	868,547	4,780,689	15,047,277
GBLs	300	274	243	101	294	159	1371
Cst	\$87,370	\$128,155	\$58,741	\$112,280	\$86,538	\$88,455	\$561,539

RFCP Second Leg - Outbound Transportation Cost

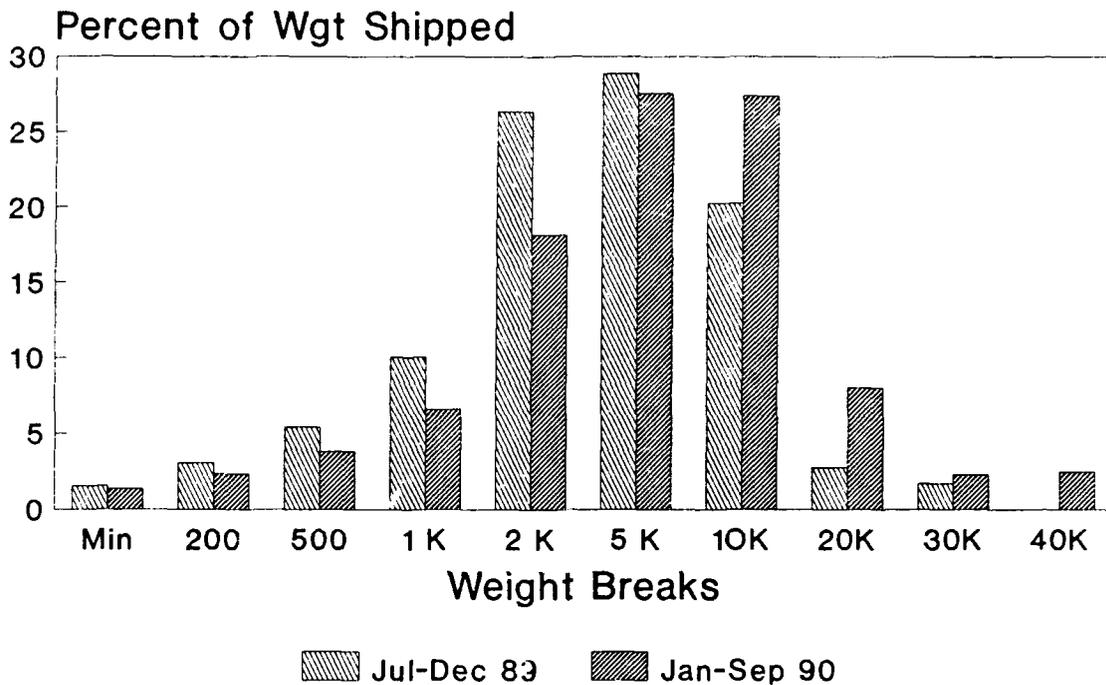
	Weight	15,047,277
	GBLs	7,679
	Cost	\$970,406
Total RFCP Cost		\$1,531,945

Cost Difference (Direct - RFCP) \$89,068

() - Loss

Since the same pooling rate schedule was used in this study as in the previous study, the reduction in the average pooling rate is attributed to improved consolidation performance at the RFCC. Figure 1 presents a comparison of the distribution of shipment sizes out of the RFCC during the July - December 1989 study and for the current study.

Figure 1
**Distribution of Pooled
 Shipment Weight**



The "y" axis is the percentage of all weight shipped and the "x" axis shows the weight categories. As an example, for the 10K weight category (10,000 to 19,999 pounds) for July - December 1989 approximately 20 percent of all weight shipped was in the range of 10,000 to 19,999 pounds; for the period January - September 1990 the percentage was more than 27 percent. By inspection one can see that the distribution of the weight for January - September 1990 is shifted more to the higher weight categories than the distribution for the previous period, indicating better consolidation of freight. In Appendix A, tables A-1 and A-2 present the data that were used to generate Figure 1.

B. Sensitivity.

To gain insight into the program changes required to make the RFCP pooling phase more cost effective, several scenarios were examined. The scenarios, in the order presented, are: (1) distribution of savings, (2) implementation of a fixed charge for small pooled shipments (under 70 pounds) and (3) cost results of implementing the round-robin and fixed charge for small pooled shipments.

1. Distribution of Savings.

One question of particular interest is whether the savings of \$89,068 is evenly distributed throughout the period or whether the savings accrued towards the end of the study period. To answer this question, the analysis was repeated, concentrating on the period of July through September 1990. Table 2 presents the results of this analysis. The total weight for this period is 5,479,046 pounds. The cost comparison shows that there was an estimated savings of \$41,658. This figure represents 46.8 percent of the total estimated savings for the 9-month study period (\$89,068) indicating the larger portion of the net savings did occur in the final 3 months. Therefore the remaining scenarios will focus on the July through September period.

Table 2

DIRECT COST VS RFCP COST
JULY - SEPTEMBER 1990

Direct Delivery Estimate

	DDMP	DDTC	DDCO	DDMT	DDRV	DDOU	Total
Wgt	337,825	2,287,771	242,878	711,914	359,733	1,538,925	5,479,046
GBLs	917	2,418	546	1,121	658	1,658	7,318
Cst	\$62,684	\$194,498	\$40,928	\$100,212	\$56,458	\$120,312	\$575,092

RFCP First Leg - Inbound Transportation Cost

Wgt	337,825	2,287,771	242,878	711,914	359,733	1,538,925	5,479,046
GBLs	70	84	77	32	76	46	385
Cst	\$30,636	\$44,489	\$24,349	\$47,318	\$33,873	\$28,502	\$209,167

RFCP Second Leg - Outbound Transportation Cost

Weight	5,479,046
GBLs	2,230
Cost	\$324,267

Total RFCP Cost \$533,434

Cost Difference (Direct - RFCP) \$41,658

() - Loss

2. Fixed Charge For Pooled Freight Less Than 70 Pounds.

Under this scenario, the RFCC operator receives a fixed charge of \$24 for small pooled freight shipments (less than 70 pounds). Table 3 presents the results of this analysis. A total of 569 shipments were affected by this new policy. The results show that the total second leg cost was reduced by \$6,535 to \$317,732. The savings was generated by trading the higher minimum charge of the effective rate schedule in exchange for the lower fixed charge of \$24.

Table 3

DIRECT COST VS RFCP COST
WITH IMPLEMENTATION OF \$24 FIXED CHARGE
FOR ALL POOLED SHIPMENTS LESS THAN 70 POUNDS
JULY - SEPTEMBER 1990

Direct Delivery Estimate

	DDMP	DDTC	DDCO	DDMT	DDRV	DDOU	Total
Wgt	337,825	2,287,771	242,878	711,914	359,733	1,538,925	5,479,046
GBLs	917	2,418	546	1,121	658	1,658	7,318
Cst	\$62,684	\$194,498	\$40,928	\$100,212	\$56,458	\$120,312	\$575,092

RFCC First Leg - Inbound Transportation Cost

Wgt	337,825	2,287,771	242,878	711,914	359,733	1,538,925	5,479,046
GBLs	70	84	77	32	76	46	385
Cst	\$30,636	\$44,489	\$24,349	\$47,318	\$33,873	\$28,502	\$209,167

RFCC Second Leg - Outbound Transportation Cost

	Weight	5,479,046
	GBLs	2,230
	Cost	\$317,732
Total RFCC Cost		\$526,899
Cost Difference (Direct - RFCC)		\$48,193

() - Loss

3. Cost Results for Last Quarter of 1990 with Implementation of Round-Robin and a Fixed Charge for Pooled Freight Less Than 70 Pounds.

This scenario builds on the earlier scenario in which cost results were analyzed for the last quarter of 1990 to determine if the principal portion of the savings accrued at this time. The purpose of the round-robin is to reduce the first leg cost of the PFCP. Shipments to the RFCC are consolidated at the depot for one week or until a truckload is reached. The carrier transports this load of consolidated freight to the RFCC once per week for a fixed charge and returns to the depot with a load of vendor freight. The vendor freight is composed of shipments collected at the RFCC destined for customers located in that depot's region. At present three depots are participating in the round-robin: DDMT, DDRV and DDMP. The fixed charge for the weekly shipment to the RFCC is: \$1,619 for DDMT, \$2,329 for DDMP, and \$2,349 for DDRV. To reduce the second leg cost of RFCP the policy of giving the RFCC operator a fixed amount of \$24 for pooled freight less than 70 pounds was applied. The results of this analysis are shown in Table 4.

The total direct cost remains the same (\$575,092). The first leg cost of RFCP was reduced from \$209,167 to \$195,576. The round-robin program reduced the first leg cost at all three depots during this 3-month period. The second leg cost was reduced from \$324,267 to \$317,732. The net effect of these managerial actions was to increase savings from \$41,658 to \$61,784.

Assuming the volume of freight during this last quarter to be typical of the freight volume in all quarters, if the round-robin is implemented and if the fixed charge for small pooled shipments is in effect, then the projected potential annual savings of the pooling program at the Los Angeles RFCC is estimated to be \$247,136.

IV. CONCLUSIONS AND RECOMMENDATIONS.

A. Conclusions.

- o The pooling program at the Los Angeles RFCC saved an estimated \$89,068 for the period January through September 1990.

- o Of the total estimated savings, \$41,658 occurred in the last three months of the study period.

- o The fixed charge initiative for pooled freight less than 70 pounds would have increased the estimated savings for the last 3 months from \$41,658 to \$48,193.

- o Implementing both the round-robin and the fixed charge for the final 3 months of Fiscal Year 1990 would have increased the estimated savings from \$41,658 to \$61,784.

B. Recommendations.

- o Continue RFCP pooling operations at the Los Angeles RFCC.
- o Implement the \$24 fixed charge for small pooled freight.
- o Implement the round-robin program.

o Conduct a follow-up study for the next 6-month period to verify that RFCP pooling operations are continuing to save transportation dollars and specifically to verify that the round-robin program is saving transportation dollars at all participating depots.

Table 4

DIRECT COST VS RFCP COST
WITH IMPLEMENTATION OF BOTH ROUND-ROBIN AND FIXED
CHARGE FOR ALL POOLED SHIPMENTS LESS THAN 70 POUNDS
JULY - SEPTEMBER 1990

Direct Delivery Estimate

	DDMP	DDTC	DDCO	DDMT	DDRV	DDOU	Total
Wgt	337,825	2,287,771	242,878	711,914	359,733	1,538,925	5,479,046
GBLs	917	2,418	546	1,121	656	1,658	7,318
Cst	\$62,684	\$194,498	\$40,928	\$100,212	\$56,458	\$120,312	\$575,092

RFCP First Leg - Inbound Transportation Cost

Wgt	337,825	2,287,771	242,878	711,914	359,733	1,538,925	5,479,046
GBLs	13	84	77	23	13	46	256
Cst	\$29,942	\$44,489	\$24,349	\$40,251	\$28,043	\$28,502	\$195,576

RFCP Second Leg - Outbound Transportation Cost

Weight	5,479,046
GBLs	2,230
Cost	\$317,732

Total RFCP Cost	\$513,308
Cost Difference (Direct - RFCP)	\$61,784

() - Loss

APPENDIX A

Distribution of Pooled Shipment Weight

Table A-1

Distribution of Pooled Weight By Weight Category
 Los Angeles RFCC July - December 1989

Weight Category	GBL Weight	Percent of All Weight	Number GBLs	Percent of All GBLs
Min	129,924	1.54%	1,756	35.37%
200	258,213	3.07%	796	16.04%
500	455,345	5.41%	640	12.89%
1 K	845,225	10.05%	585	11.78%
2 K	2,214,481	26.32%	692	13.94%
5 K	2,428,511	28.86%	352	7.09%
10 K	1,706,962	20.29%	129	2.60%
20 K	232,291	2.76%	10	0.20%
30 K	142,656	1.70%	4	0.08%
Total	8,413,608	100.00%	4,964	100.00%

Table A-2

Distribution of Pooled Weight By Weight Category
 Los Angeles RFCC January - September 1990

Weight Category	GBL Weight	Percent of All Weight	Number GBLS	Percent of All GBLS
Min	205,871	1.37%	3,274	42.64%
200	353,963	2.35%	1,097	14.29%
500	573,237	3.81%	803	10.46%
1 K	990,504	6.58%	699	9.10%
2 K	2,736,038	18.18%	843	10.98%
5 K	4,147,715	27.56%	586	7.63%
10 K	4,120,338	27.38%	309	4.02%
20 K	1,206,770	8.02%	50	0.65%
30 K	344,499	2.29%	10	0.13%
40 K	368,342	2.45%	8	0.10%
Total	15,047,277	100.00%	7,679	100.00%

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