AD-A120 354 NAVAL POSTGRADUATE SCHOOL MONTEREY CA F/G 15/5
AN ANALYSIS OF LOCAL DELIVERY COSTS AND TIMES AT NAVAL SUPPLY C--ETC(U)
JUN 82 D G ALLION, J E TUFTS

UNCLASSIFIED NL

1 of 2

NAVAL POSTGRADUATE SCHOOL

Monterey, California

THESIS

AN ANALYSIS OF LOCAL DELIVERY COSTS
AND TIMES AT NAVAL SUPPLY CENTER
OAKLAND, CALIFORNIA

by

Dennis Gilbert Allion

John Emory Tufts

June 1982

Thesis Advisor: A. W. McMasters

Approved for public release; distribution unlimited.

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER

2. GOVT ACCESSION NO. AD-A120357

3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle)
An Analysis of Local Delivery Costs and Times at Naval Supply Center Oakland, California

5. TYPE OF REPORT & PERIOD COVERED
Master's Thesis; June 1982

6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)
Dennis Gilbert Allion
John Emory Tufts

8. CONTRACT OR GRANT NUMBER(s)

9. PERFORMING ORGANIZATION NAME AND ADDRESS
Naval Postgraduate School
Monterey, California 93940

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS

11. CONTROLLING OFFICE NAME AND ADDRESS
Naval Postgraduate School
Monterey, California 93940

12. REPORT DATE
June 1982

13. NUMBER OF PAGES
104

14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)

15. SECURITY CLASS. (of this report)
Unclassified

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)
Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)
Naval Logistics; Supply Support; Military Transportation; Land Transportation; Supply Depots; Naval Budgets

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
This study is an analysis of the local delivery system at the Naval Supply Center Oakland, California. Specifically, the study provides information regarding the average costs of deliveries to various customer locations and how driver time is distributed between travel and non-travel functions. As a result of the study, the authors concluded that Naval Supply Center Oakland and Public Works Center San Francisco are more concerned with the effectiveness of the local delivery

DD FORM 1473, 1 JAN 73 EDITION OF 1 NOV 65 IS OBSOLETE
S/N 0102-014-6601

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

#20 - ABSTRACT - (CONTINUED)

operation than with its efficiency. Accordingly, recommendations regarding modifications to the current local delivery operation are provided in an effort to more evenly balance the emphasis between the system's effectiveness and efficiency.

DTIC COPY INSPECTED 2

A-1

DD Form 1473, 1 Jan 73
S/N 0102-014-6601

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

Approved for public release: distribution unlimited

An Analysis of Local Delivery Costs and Times at Naval Supply Center Oakland, California

by

Dennis G. Allion
Lieutenant Commander, Supply Corps, United States Navy
B.S., Michigan State University, 1971
and
John E. Tufts
Lieutenant Commander, Supply Corps, United States Navy
B.S., Oregon State University, 1971

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT
from the
NAVAL POSTGRADUATE SCHOOL
June 1982

Authors: Dennis Gilbert Allion

John Emory Tufts

Approved by: Alan W. McMasters
Thesis Advisor

Second Reader

Chairman, Department of Administrative Sciences

W. M. Woods
Dean of Information and Policy Sciences

ABSTRACT

This study is an analysis of the local delivery system at the Naval Supply Center Oakland, California. Specifically, the study provides information regarding the average costs of deliveries to various customer locations and how driver time is distributed between travel and non-travel functions. As a result of the study, the authors concluded that Naval Supply Center Oakland and Public Works Center San Francisco are more concerned with the effectiveness of the local delivery operation than with its efficiency. Accordingly, recommendations regarding modifications to the current local delivery operation are provided in an effort to more evenly balance the emphasis between the system's effectiveness and efficiency.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

I. INTRODUCTION

A. PURPOSE

Naval Supply Center (NSC) Oakland is an organizational element of the Department of Defense Material Distribution System (DODMDS). As such, its primary efforts are devoted to procuring, receiving, storing, issuing, transporting and accounting for material in support of DOD activities, primarily Navy fleet units, CONUS activities and overseas bases. This study will concentrate on the local delivery aspect of NSC Oakland's mission. Local delivery is defined as delivery of material via truck to customers within a 100 mile radius of the Supply Center. Specificially, the purpose of this study was to determine the vehicle operator and equipment rental costs of the local delivery system utilized at NSC Oakland and to determine how driver and equipment utilization times were distributed between various aspects of the delivery function.

B. METHODOLOGY

The research methods used during this study were designed to establish an understanding of how the local delivery system was operated (based on trips actually made during the month of October 1981), to outline the flow of funds for the payment of purchased delivery services, to determine what management devices were in use to control spending on and the utilization of the local delivery system, and to make recommendations on how the system might be made more efficient.

Research conducted included: A literature review of policies, regulations and reports applicable to Navy transportation in general and, more specifically, the local delivery system utilized by NSC Oakland; field trips to selected Navy and civilian organizations involved with local delivery; and, an analysis of the available time and cost data regarding driver and equipment charges in support of NSC Oakland's local delivery system.

Field trips taken included those to NSC Oakland to familiarize the authors with the current local delivery system and the environment within which it functions. Additional field trips were made to the corporate offices of Safeway Stores and a United Parcel Service terminal both located in Oakland, California. These visits were made to learn what methods those firms used to promote efficiency in their delivery operations. Field trips were also taken to NSC San Diego to determine how an activity similar in size and mission to NSC Oakland manages the local delivery function, and to the Navy Material Transportation Office (NAVMTO) in Norfolk, Virginia to obtain that office's perspective on the local delivery situation at NSCs in general.

The data analysis consisted primarily of an analysis of local delivery driver trip tickets and dispatcher logs for the month of October, 1981 as well as an analysis of the driver and equipment costs for the same month.

C. THESIS ORGANIZATION

Chapter I of this thesis has presented the authors' objectives, purpose and methodology. Chapter II describes the current local delivery system and how it is funded, summarizes previous studies dealing with DODMDS and NSC Oakland's local delivery system, discusses issues impacting on efforts to improve the system and summarizes information obtained on various field trips. Chapter III presents an analysis of the costs and time factors of the local delivery system plus additional findings determined during the course of this study. Chapter IV is a discussion of the findings presented in Chapter III. Chapter V presents a summary of the conclusions drawn in Chapter IV and makes recommendations regarding how to improve the balance of the efficiency and effectiveness within the local delivery system.

II. BACKGROUND

A. DESCRIPTION OF NSC OAKLAND'S LOCAL DELIVERY SYSTEM

To understand the environment within which the local delivery system operates, it is necessary to explain how the local delivery system fits into the overall NSC Oakland organization, discuss the magnitude of the local delivery system with respect to the total NSC Oakland operation and describe the process utilized by NSC Oakland for receiving and processing customer requests for material from both a documentation flow and a material movement perspective.

1. Command Organization

NCS Oakland is organized into several operating and support departments in order to perform its multi-faceted mission. (An organization chart is provided as Figure 2.1.) The operating departments include the Inventory Control Department, the Regional Contracting Department, the Physical Distribution Department, the Aviation Department, the Fuel Department, the Regional Financial Services Department and the Nuclear Weapons Supply Department.

The local delivery system is an element of the Physical Distribution Department. As such, the local delivery function is performed by the Freight Handling Section of the Central Shipping Branch which is part of the Bulk Distribution Division within the Physical Distribution Department. (See Figures 2.2 and 2.3 for applicable departmental and divisional organization charts.)

According to NSC Oakland's Organization Manual [Ref. 1], the Physical Distribution Department's responsibilities include: Receiving, storing, issuing and shipping

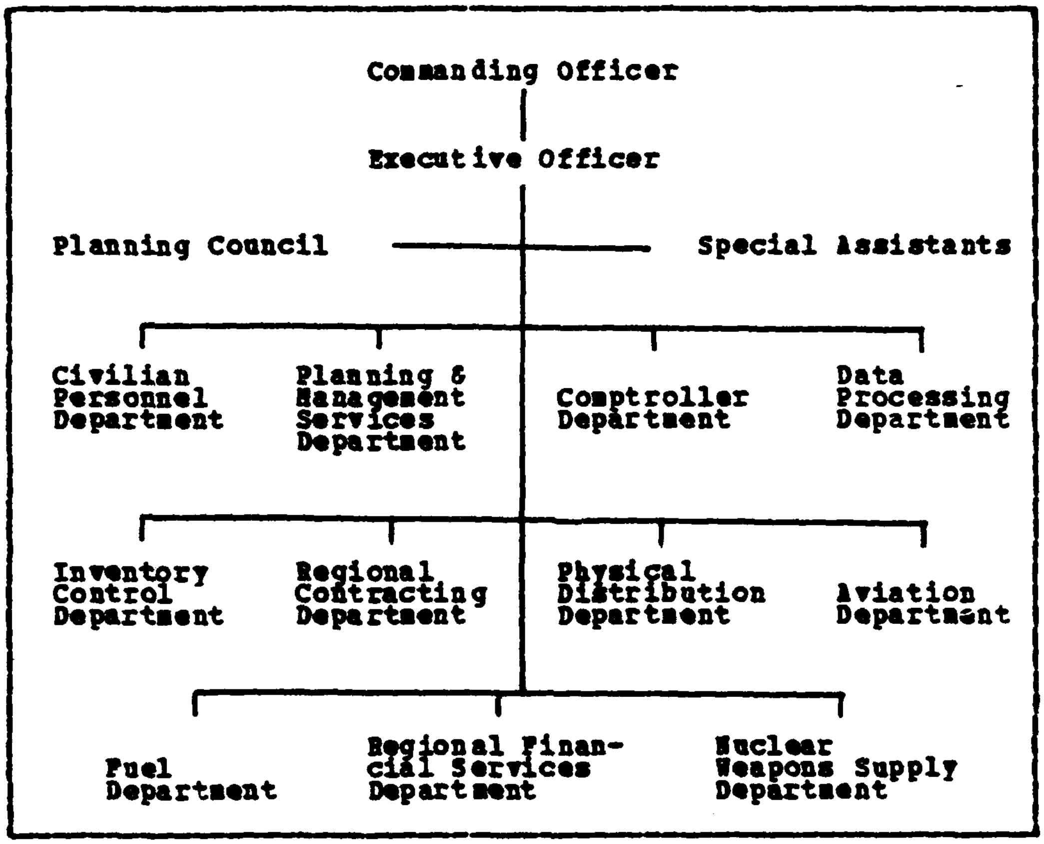


Figure 2.1 NSC Oakland Organization Chart

all material except bulk fuel and inert nuclear ordnance material; directing and controlling associated traffic functions; providing material handling equipment; and, providing household goods and personal effects receiving, shipping, storing and distributing services for areas assigned. The Bulk Distribution Division's responsiblities include: Receiving, storing, issuing, packing, and shipping bulk material of all cognizances stocked at NSC Oakland except subsistence, bulk fuel, and inert nuclear ordnance material; providing materials handling equipment as required;

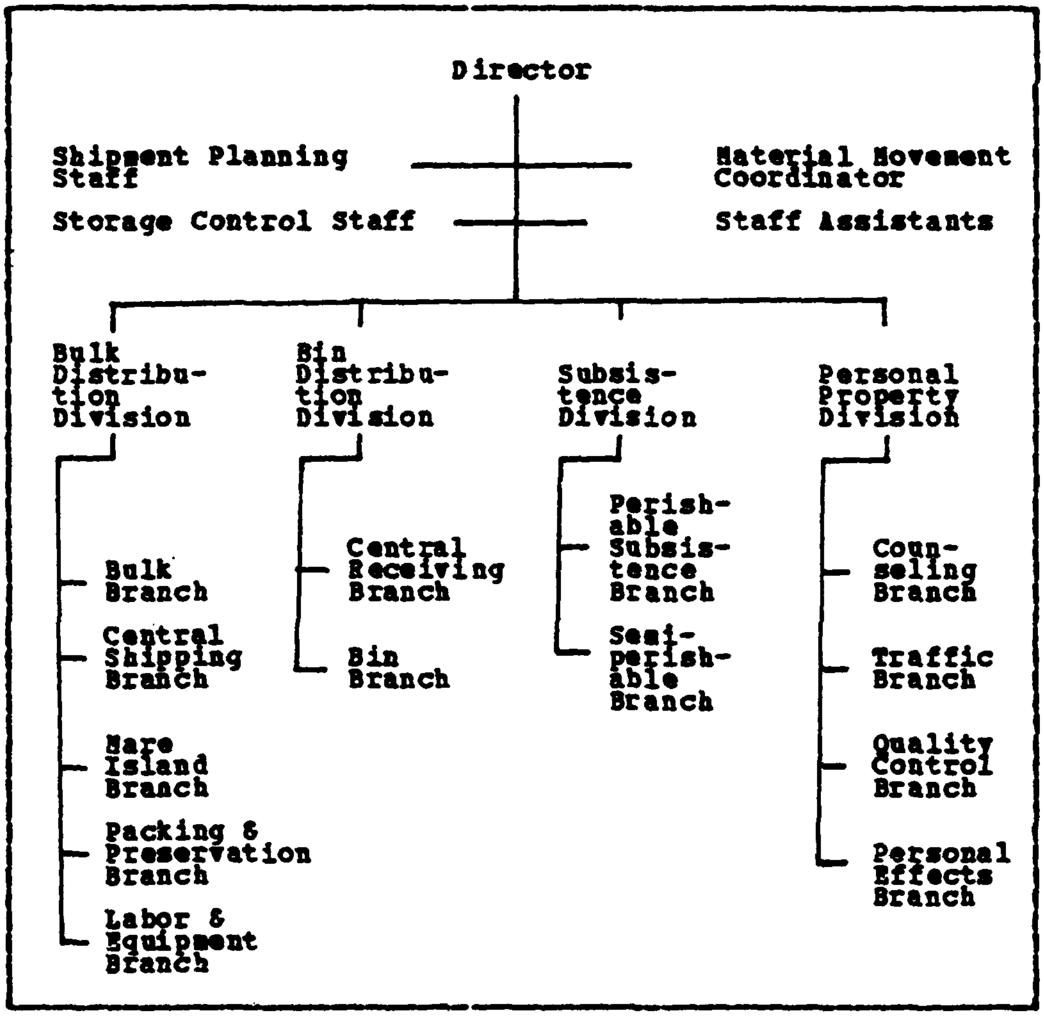


Figure 2.2 Physical Distribution Department

providing liaison between NSC Oakland and Military Transportation Management Command Western Area (MTMCWA), Military Ocean Terminal Bay Area (MOTBA), and export contractors for operations relating to movement of material; coordinating actions to accomplish timely loading of Fleet Support Ships; and, performing necessary liaison/monitoring

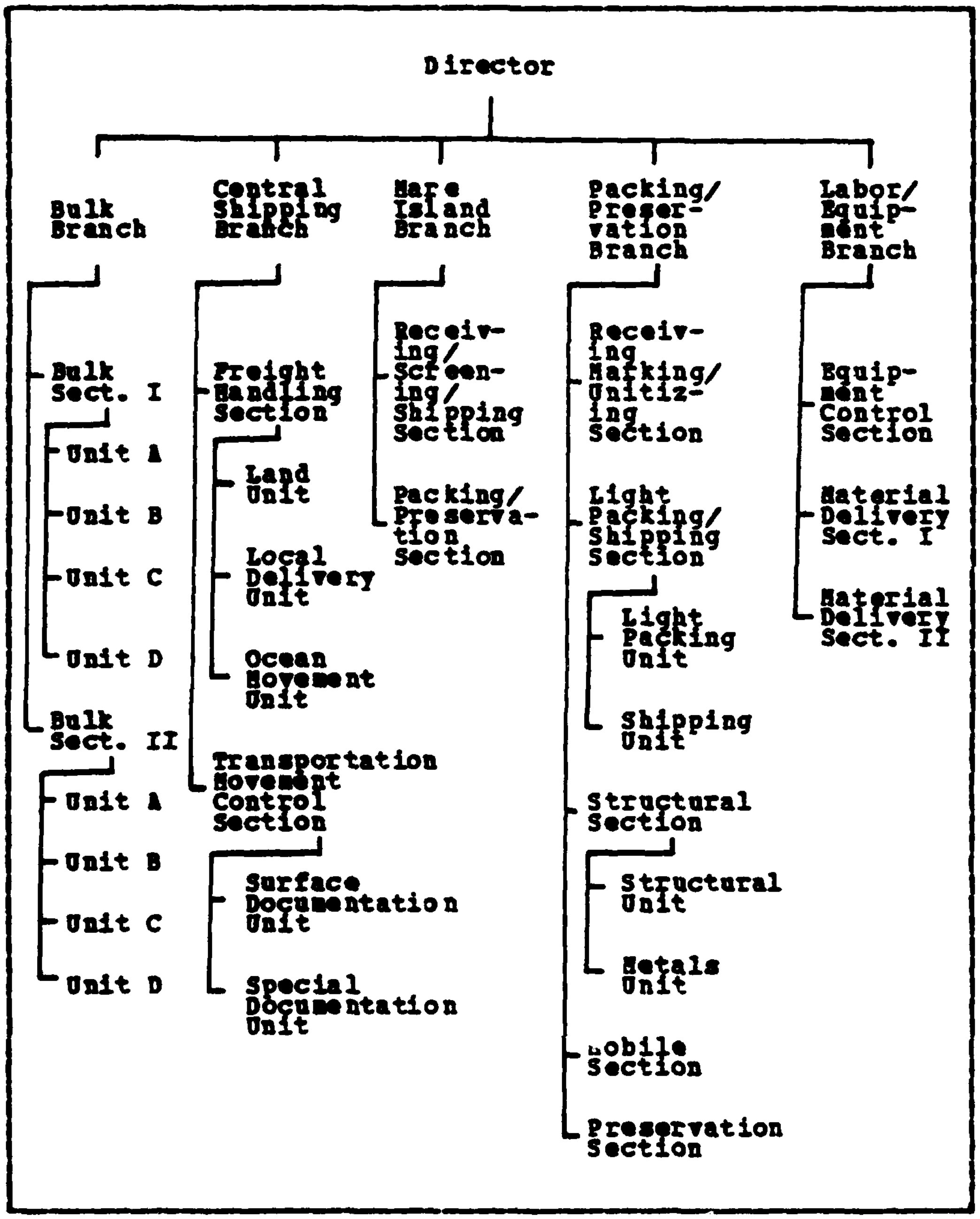


Figure 2.3 Bulk Distribution Division

for special projects. The Central Shipping Branch's responsibilities include: Providing MTMCWA with projected lift requirements for NSC Oakland generated ocean and land shipments and NAVMTO with requirements for QUICKTRANS and Continental United States (CONUS) air cargo; preparing and submiting requests for Export Traffic Release; evaluating transportation performance practices, including documentation and utilization of equipment, and carrier or contractor performance for achieving optimum costs and effectiveness of transportation operations; receiving allocations, ordering, loading, documenting, and effecting drayage of sea containers, air, land and ocean break-bulk cargo; selecting mode and carrier routing for CONUS surface and air shipments as authorized by Military Traffic Management Regulations; reporting transportation holding delays for Military Standard Requisition and Issue Procedure (MILSTRIP) shipment units; and receiving, checking, stowing, staging, loading, and documenting local delivery material. The Freight Handling Section's responsibilities include: receiving, checking, packing, staging and loading Center generated and non-Center generated cargo destined for local, CONUS, and overseas activities; determining manpower and equipment requirements; coordinating with the documentation units for the documentation and movement of freight traffic into commercial and military channels; recommending operational changes to facilitate and expedite the traffic flow in line with the physical capabilities of warehouse space and available personnel; and, recommending policies and establishing or recommending procedures or criteria to increase effectiveness of operations. The Local Delivery Unit's responsibilities include: receiving, checking, consolidating, stowing, staging and loading all cargo consigned to local Fleet units and San Francisco Bay Area DOD activities; maintaining delivery schedules; and, providing delivery support to Military Sealift Command Pacific (MSCPAC) ships.

2. The Magnitude of the Local Delivery Operation

The magnitude of the local delivery operation is reflected by supply operations statistics issued by NSC Oakland. Supply operations statistics for Fiscal Year (FY) 1981 are provided in Appendix A. For example, the Center received, on the average, 195,959 requests for material per month during FY 1981. Of these requisitions, some were for non-standard items (i.e., items without a National Stock Number) and some were for standard items not stocked at NSC Oakland. The requests for standard items stocked at NSC Oakland resulted in an average of 137,791 issues per month or an 87.3% net material availability. Of special interest to this study is the fact that these issues amounted to 42,918 measurement tons per month, of which, an average of 20,083 measurement tons per month, or 46.8%, were processed via the local delivery system.

As a related issue, approximately 17.6% of the FY 81 issues were classified as Issue Group I, 35.4% as Issue Group II and the remaining 47.0% as Issue Group III. Issue Group categorizations are the result of priorities established by requisitioners and relate to issue processing standards with Issue Group I requiring the most expeditious handling. The time standards relating to requisition processing are established by the Uniform Material Movement and Issue Priority System (UMMIPS). The effectiveness of the local delivery system can be measured by its ability to meet or beat the applicable UMMIPS time standards.

3. Documentation Flow

The process that results in an issue of material at NSC Oakland is quite complex and begins with the Supply Center receiving a customer's requisition via message, mail, phone or hand delivery. Requisitions are screened to determine if they are for standard or non-standard items and, if standard, whether or not the item requested is stocked. If the item requested is stocked, the requisition is further screened to determine if the item is in stock or not. Requisitions for non-standard and not stocked or not-in-stock standard items are forwarded to the appropriate item manager at either the Center or an Inventory Control Point for action.

The processing of the remaining requisitions (those for in-stock, standard items) is done by issue group (IG). IG-I requisitions are input almost continuously to the Center's main-frame computer, IG-II and III requisitions are batched and, in most cases, entered every four hours. Issue Group categorization also controls the preparation of issue documents. For IG-I, issue documents free-flow from either the main-frame computer or remote terminals. IG-II and IG-III issues are generally collected and printed once daily.

Once the issue document is printed, the documentation flow continues to play a significant role including providing feedback for maintenance of inventory records. This aspect of the documentation flow is, however, beyond the scope of this study. Of concern now is the material movement triggered by the preparation of the issue document.

4. Material Flow

As indicated earlier, the movement of material issued by NSC Oakland is the responsibility of the Physical

Distribution Department. Receipt and issue of material into and out of NSC Oakland's warehouses is accomplished primarily by means of an Automated Material Handling System (AMHS) operating between the Center's main warehouses. AMHS is a mechanical system that allows a warehouseman to pick material for an issue, place it in a coded tote pan, put the pan on a conveyor belt and have the pan automatically routed to a staging area for packaging/shipping. Material not compatible with the AMHS is moved by other forms of material handling equipment including forklifts, warehouse tractors, straddle trucks, rider/walker transporters, platform trucks, warehouse cranes or warehouse electric tractors. Material to be shipped via the local delivery system is normally staged at the local delivery warehouse (Bldg. 341). (NOTE: NSC Oakland is in the process of installing a state-of-the-art, computer based material handling and control system known as NISTARS which will make much of the current AMHS obsolete. NISTARS will be discussed more fully in a later section of this chapter.)

The local delivery system has the potential to deliver material to approximately 150 customers within a 100 mile radius of NSC Oakland. However, the bulk of the local deliveries are to twelve major concentrations of DOD activities within a 60 mile radius. Additionally, the local delivery system delivers to MOTBA for further movement by water and to Travis Air Force Base, McClellan Air Force Base, San Francisco International Airport and Oakland International Airport for further movement by air. The major points of delivery can be clustered into major geographical areas as shown in Figure 2.4.

Currently, there are four regularly scheduled delivery routes (called "stakes") that service major customers around the bay area. The current schedule for the four regularly scheduled stakes is shown in Table I.

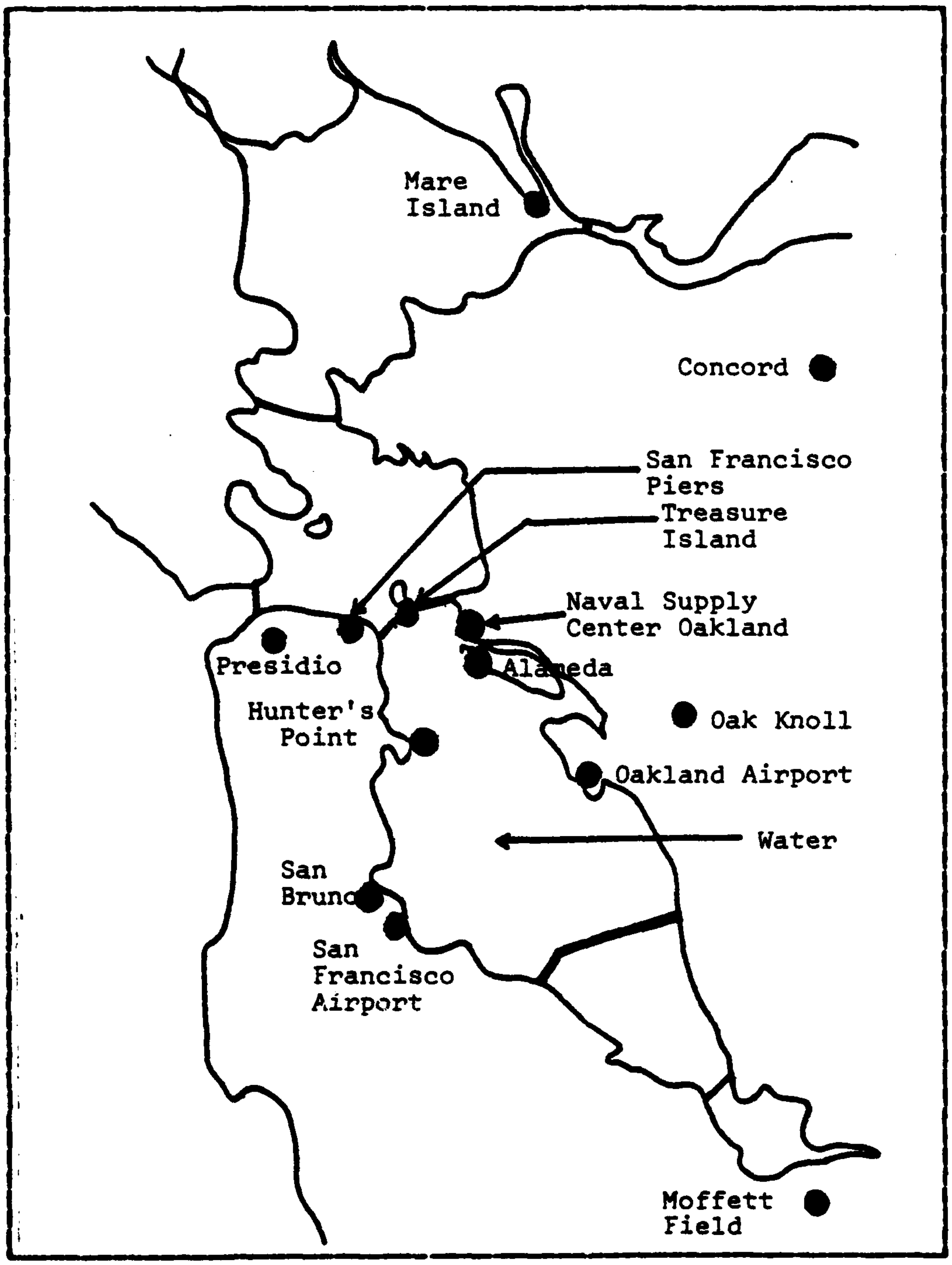


Figure 2.4 Major Local Delivery Areas

TABLE I

Schedule for Local Deliveries

Stake	Major Area Served	Frequency
1	Mare Island	Daily
	Concord	As Required
	Skaggs Island	As Required
2	Treasure Island	Daily
	San Francisco Piers	As Required
	Presidio	Weekly
	Hunter's Point	Daily
	San Bruno	As Required
	Moffet Field	Daily
3	NAS Alameda	Twice Daily
	Oakland Area	As Required
4	NARF Alameda	Twice Daily

Stakes 1 and 2 generally use 40-foot trailers and depart the local delivery warehouse (Bldg. 341 NSC Oakland) at approximately 0900 daily. Stakes 3 and 4 normally use 2 1/2 ton stake trucks and depart Bldg. 341 at 1000 and 1400 daily.

In addition, two trucks per night are sent to Travis AFB, one is to go to the QUICKTRANS terminal and the other to the Military Airlift Command (MAC) terminal. All material that is to be further transported to major fleet centers within the continental United States and is suitable for shipment by commercial airlines goes to the QUICKTRANS terminal. All other air cargo goes to the MAC terminal. A commercial carrier also makes a daily trip from the QUICKTRANS terminal to NSC Oakland and other major Navy activities in the Bay area;however, this run is part of a contract centrally administered by NAVMTO and is not charged to the local delivery system. Material destined for the MAC terminal can be sent to the QUICKTRANS terminal and vice versa because there is a shuttle that moves material between the two terminals. Additionally, a truck is sent as required to the terminal for logistics support of Air Force installations (LOGAIR) at McClellan AFB.

Material to be shipped via the local delivery system is normally received at Bldg. 341 on pallets and must be sorted by customer and staged for delivery. When the daily runs for Stakes 1 and 2 are completed, the trailers are spotted at the Bldg. 341 so they can be loaded for the next day's deliveries. Material received after 1400 for Stakes 3 and 4 is held for loading the following day. The cutoff time for material destined for the QUICKTRANS terminal or the MAC terminal at Travis AFB is 1600.

5. Funding Considerations

The trucks used by the local delivery system are rented from Public Works Center (PWC) San Francisco at an hourly rate plus mileage. Additionally, most vehicles and equipment rented require PWC drivers who are charged for based on an hourly rate plus overtime if incurred.

The drivers on the four regularly scheduled stakes are usually the same each day, thus they are familiar with where and to whom delivery is to be made. The drivers are told by NSC personnel which customers on their stakes are to receive delivery. The drivers then pick their own routes consistent with the order in which the truck has been loaded. Each driver is to maintain a trip ticket to record arrival and departure times along with odometer readings. Additionally, the PWC dispatcher maintains logs to monitor driver assignments and equipment usage.

The cost of personnel, facilities and operating expenses for most aspects of NSC Oakland's local delivery system is paid for by operation and maintenance funds provided to NSC Oakland by the Naval Supply Systems Command

(NAVSUP). One significant exception to this practice is the payment for the costs of vehicles and drivers "purchased" from the PWC which is funded by NAVSUP seperately. The only costs that will be dealt wiht in the remainder of this study will be the costs of these purchased services.

The buyer-seller relationship existing between NSC Oakland and PWC San Francisco is authorized because the PWC is a Navy Industrial Fund (NIF) activity. In general, the mission of NIF activities is to perform work for Navy or other authorized customers on a reimbursable basis. To accomplish this, the NIF, which is a revolving fund composed initially of a corpus of funds appropriated by Congress, is drawn down as funds are expended to do work and then is reimbursed from the appropriated operating funds of the activities for which the work is accomplished. This reimbursement is designed to return the Fund to its original condition.

Transportation services (drivers and equipment) are currently purchased on a Class "C", or individual request, basis under a work request issued by NSC Oakland's Comptroller. Rates are set in advance of the period in which they are used and are promulgated by PWC instruction [Ref. 2]. These "stablilized" rates are designed to allow the using activity to accurately budget for services. PWC Transportation Department personnel collect local delivery system driver and equipment usage data using dispatcher logs and trip tickets. Monthly listings of charges by vehicle type and equipment number and billing summaries by work center and job order number are mechanically prepared from this data.

An accounting document, prepared from the billing summaries, is forwarded monthly from PWC San Francisco to the Regional Financial Services Department of the Supply

Center for payment in order to reimburse the NIF for services purchased for the local delivery operation. The Regional Financial Services Department charges the amount of the billing to the Navy Management Fund (NMF).

The NMF is a revolving fund that initially finances and provides an information base to report transportation costs to Navy management. This initial financing provides for central accounting for certain types of Navy transportation which ultimately results in charges being cleared from the NMF to the applicable financing appropriations. Costs which are currently cleared through the NMF are those which involve Government Bills of Lading (GBLs) for other than household goods shipments, transportation contracts and military transportation agencies.

Under the guidance of NAVSUP, NAVMTO is involved in a program to eliminate the NMF. In the future, transportation charges (such as local delivery transportation) will be directly cited to the funds currently reimbursing the NMF.

Transportation of Navy material is generally categorized by NAVSUP as either First or Second Destination. First Destination Transportation (FDT) is that transportation required to effect the delivery of material from a Navy industrial activity which fabricates new material or a procurement source outside the Defense Supply System to the first point of use or storage for subsequent transfer within the Naval Supply System. Second Destination Transportation (SDT) is any transportation other than FDT. Together, FDT and SDT make up what is called Service Wide Transportation (SWT). FDT is of no additional concern for this study and will not be examined further.

Charges for SDT can include those for port handling, freight cartage, and other costs incurred incident to shipment of property. It is under the term "freight cartage" that NSC Oakland is authorized to charge purchased services for the local delivery system to Transportaion Account Code (TAC) N035 (which identifies it as SDT used exclusively at NSC Oakland). NAVMTO accumulates these charges in the NHF and charges SWT funds administered by NAVSUP in order to reimburse the NHF.

In summary, transportation services for the local delivery system are initially funded by the NIF which is reimbursed by the NHF which is ultimately reimbursed by SWT funds. Therefore, the customer, NSC Oakland, does not pay for the delivery services provided by PWC San Francisco.

6. Effectiveness and Efficiency

Effectiveness in an operation implies that the task being done is the right one and that it is achieving desired results. If a local delivery system delivers all materials to the correct customers within prescribed time frames and within acceptable levels of loss and damage, then it can be described as effective in delivering materials.

Efficiency, on the other hand, implies that whatever activity being performed is being done correctly, usually obtaining some prescribed result with minimum effort or cost. Efficiency in a local delivery system can mean that all materials made available for delivery to a number of different customers are delivered at the least cost to the distributor. To maximize efficiency, a delivery operation should minimize the number of trucks and drivers used and ensure that trucks are loaded to the maximum extent possible before dispatching them. Drivers, being relatively more expensive than equipment, should be used predominantly to move material instead of waiting for it to be loaded and offloaded.

A local delivery operation could be efficient but ineffective if it relied totally upon a system wherein deliveries were made to customers only when there was sufficient volume to totally utilize the cargo capacity of its vehicles. Even though some predetermined cost standard per work unit is achieved, this operation would be ineffective because it makes no provision for delivering urgently required materials on an exception basis. On the other hand, a delivery operation might be effective in delivering materials on time but inefficient if the methods used result in gross under-utilization of resources such that acceptable standard costs are exceeded.

The difficult tasks are to find that combination of resources which strikes the proper balance between efficiency maximizing and effectiveness maximizing efforts and to develop a means of measuring both in order to properly manage the delivery operation. Effectiveness in issue and delivery operations in the Navy has been defined and quantified by Uniform Material Movement and Issue Priority System (UMMIPS) time standards. For example, transportation hold times for Issue Groups I, II and III are three, six and thirteen days respectively [Ref. 3]. To a certain extent, efficiency of delivery operations has been quantified by work units (manhours and measurement tons) used in the Navy's Resource Management System (RMS) accounting. However, since the charges for local delivery drivers and equipment at NSC Oakland are not paid for by the Center's operating funds, they are not included in RMS. Therefore, the performance data generated by RMS is of only limited usefulness for measuring the efficiency of Oakland's local delivery system.

B. PREVIOUS STUDIES

1. DODMDS Study

In 1978, a detailed study of the activities of the Department of Defense Material Distribution System (DODMDS) was completed at the direction of the Joint Logistics Commanders (JLC). The study effort was conducted by a Working Group of Military and DoD personnel reporting to a Flag Level Control Panel with representatives from the Logistical Commands, United States Marine Corps (USMC), Defense Logistics Agency (DLA) and the Office of the Secretary of Defense (OSD) for overall management and guidance. The purpose of the study was to examine the CONUS wholesale supply distribution systems of the Army, Navy, Marine Corps, Air Force and DLA and "...recommend improvements which would support operational readiness requirements effectively and economically in peace and under mobilization/wartime." [Ref. 4: pp. 8-9]

One of the recommendations of the study was the merger of the management and administration of Navy wholesale supply distribution facilities at Norfolk, Oakland and San Diego. With this recommendation in mind, the Secretary of the Navy (SECNAV) announced in March 1979 that the wholesale supply support efforts at Naval Air Station (NAS) Alameda, NAS Norfolk and NAS North Island would be consolidated with the parallel wholesale functions performed by NSC Oakland, NSC Norfolk and NSC San Diego respectively. These consolidations were undertaken as part of the Shore Establishment Realignment (SER) effort and commenced 1 October 1979 with NSC Oakland and NAS Alameda and continued with the NSC Norfolk/NAS Norfolk consolidation in May 1980 and the NSC San Diego/NAS North Island consolidation on 1 October 1980 [Ref. 5]. One of the major concerns regarding the proposed consolidations was the avoidance of any degradation of the level of supply support provided to the supply center's new and old customers, especially Naval Air Rework Facilities (NARFs) located at Naval Air Stations.

2. Other Theses

As a related issue, several studies have been conducted with the intent of developing new local material distribution plans which would improve supply support to all customers served by the supply centers in Oakland and San Diego. The findings of some of these studies are summarized below.

Hernandez and Gallitz [Ref. 6] described the local delivery system as it existed at NSC Oakland in 1976. They also examined alternative methods of delivery, including commercial carriers, and developed the costs for each. They concluded that the then existing local delivery operation was providing excellent service and was the least costly alternative examined. They also made several recommendations for further reducing the costs of the local delivery operation.

In 1979, Wieczorek and Eastlund [Ref. 7] examined the material distribution functions associated with providing supply support to NSC Oakland local customers. Among other things, they determined that, for the period of time they studied, 64 percent of the Supply Center's issues was shipped via parcel post, 9 percent was bearer pickup/on base delivery, 4 percent was shipped via commercial land carrier and 4 percent was shipped by sea as breakbulk or in vans. The remaining 19 percent was delivered via the local delivery system. Additionally, they discussed alternative delivery methods and costs attributable to local delivery operations. Their conclusions supported Hernandez and

Gallitz's determination that the local delivery system was effective in satisfying customer needs but they were unable to measure the efficiency of the operation. They recommended that the transportation segment of the local delivery system be studied in greater depth, possibly on a Naval Supply Systems Command (NAVSUP) level because of the need for a coordinated effort at all tidewater areas and the likely prospect of area-wide local delivery transportation contracts being issued as a cost saving measure.

Hrabosky, Owens and Popp [Ref. 8] analyzed pre-consolidation demand history data for supply support provided by NSC Oakland to its local customers and that provided by NAS Alameda to NARF Alameda. The purpose of their analysis was to provide a baseline of data that would facilitate the implementation of the consolidation and the evaluation of post-consolidation supply support provided by NSC Oakland. Additionally, they contended that the database developed could be a source of information for revising the local distribution system and for recommending material to be stocked at either the supply center or a customer's site.

Clausen [Ref. 9] described the local delivery systems that were utilized by NSC Oakland and NSC San Diego in late 1980, discussed the classical vehicle routing problem (VRP) and made recommendations for improving the routing of vehicles at the supply centers in question.

Eller and Moore [Ref. 10] examined and documented the NSC San Diego local delivery system as it existed in 1980 in order to provide a baseline from which to measure future system performance and effectiveness. They concluded that, at the time of their study, that the statistical information they had gathered lacked sufficient detail to yield conclusions on operational efficiency and that the current work measurement unit, pallet count, was not appropriate for management purposes.

Robertson [Ref. 11] discussed the implementation philosophy of the consolidation of wholesale supply activities of the Naval Air Station North Island with NSC San Diego. He documented the preconsolidation supply requirements of the NARF, North Island and other local customers and proposed a list of items to be stocked in a Ready Supply Store at the NARF. He observed that information from his thesis could be used for development of material warehousing and distribution systems at the NSC and, therefore, proposed lists of potential items to be stocked in a Ready Supply Store at the NARF and in the automated warehouse at Supply Center.

C. OTHER CONSIDERATIONS

1. Contracting Out

The efficiency of buyer-seller relationships between governmental activities is coming under closer scrutiny as the Federal sector renews its emphasis on obtaining goods and services from the private sector through contracting out. The Government's general policy of reliance on the private sector for goods and services is set forth in Office of Management and Budget (OMB) Circular A-76 [Ref. 12]. This circular establishes the policies and procedures to be used to determine whether needed commercial or industrial-type work should be done by contract with private sources or in-house using Government facilities and personnel.

A-76 defines a Governmental commercial or industrial activity as one which is operated and managed by a Federal executive agency and which provides a product or service that could be obtained from a private source. Additionally, A-76 defines a private commercial source as a private business, university, or other non-Federal activity, located in the United States, its territories and possessions, the District of Columbia, or the Commonwealth of Puerto Rico, which provides a commercial or industrial product or service required by Governmental agencies. It should be obvious that, within the context of these definitions, the local delivery service provided by PWC San Francisco to NSC Oakland qualifies for serious consideration as a service which is obtainable from private commercial sources.

Government (in-house) operation of a commercial or industrial activity may be authorized under one of the following conditions:

1. No satisfactory commercial source is available.
2. National defense considerations dictate in-house performance.
3. Results of a comparative cost analysis indicate in-house performance is cheaper.

It is the last condition (cost) that has the most significant impact on the local delivery operation at NSC Oakland. A decision for in-house performance based on cost must be supported by a cost comparison prepared in accordance with the Cost Comparison Handbook which was issued as a supplement to A-76. The purpose of the handbook is to provide detailed instructions for developing a comprehensive and valid comparison of the estimated cost to the Government of acquiring a product or service by contract and of providing it with in-house, Government resources.

Prior to conducting a cost comparison, A-76 provides that each agency should assure that Government operations are organized and staffed for the most efficient performance. To the extent practicable and in accordance with agency manpower and personnel regulations, agencies should precede reviews under A-76 with internal management reviews and reorganizations for accomplishing the work more efficeintly. At the direction of the Naval Facilities Engineering Command (NAVFAC), PWC San Francisco is currently conducting a management review of their transportation functions in accordance with A-76. Consequently, some of the recommendations made in this report may be superseded by actions initiated by the PWC or some of the recommendations made may provide ideas for additional improvements. In any event, the outcome of PWC San Francisco's management review and subsequent cost analysis regarding transportation services will have considerable impact on future efforts to improve the efficiency of the local delivery effort at NSC Oakland.

2. NISTARS and NAVADS

Coincidental to the supply support consolidation actions mentioned earlier, NAVSUP undertook an effort to upgrade the controlling of materials handled at NSCs Oakland, San Diego and Norfolk. That effort is known as the Naval Integrated Storage, Tracking and Retrieval System (NISTARS) and was initiated to "...reduce over-all costs of logistics support by dramatically increasing productivity and improve responsiveness to Fleet and industrial customers by increasing our capability." [Ref. 13: p. 55]

In order to achieve these objectives, NISTARS has been designed as a complete system for handling material receipt, storage, consolidation, parcel post shipping and other inventory management procedures. When fully implemented, NISTARS will be capable of tracking material from time of receipt to time of issue. To do this, the system will utilize a dedicated process controller with remote intelligent terminals for data input and operator instruction along with micro-processor controlled material handling equipment and associated storage aids for moving and storing material. Additionally, records will be instantly updated as processing is accomplished in order to provide real-time stock status and requisition/receipt processing information.

Of particular interest to this study is the ability of the local delivery system currently utilized at NSC Oakland to keep up with the NISTARS output. This concern was expressed in the Supply Center's Draft Wholesale Supply Support Consolidation and Warehouse Modernization Plan [Ref. 14: p. 14] prepared for NSC Oakland which stated:

> In order to achieve planned performance rates, NISTARS uses state-of-the-art process controls and the most modern materials. At its upper limit, this system could be capable of making 4,200 issues per hour or 25,000 total issues per shift. Also, it could operate for three shifts per day, bringing the total issues to 75,000 in a 24-hour period. Even though parcel post is used to ship 75% of NSC Oakland issues, the remaining 25% are the most difficult to handle and ship. Even at a reasonably small percentage of NISTARS upper limits, the NISTARS system can completely saturate NSC air, land, and water shipping capacity. Therefore, our transportation management techniques must be improved to provide optimum service from a new NISTARS installation. The Fleet Material Support Office (FMSO) is designing the Navy Automated Transportation Documents System (NAVADS) to fill this need.

According the the requirements statement prepared by FMSO, the primary objectives of NAVADS are to establish and maintain a sufficient database; to provide management control over mode selection, air clearance functions, planning, shipment consolidation and carrier selection; to automate the preparation of shipping documentation; to provide a transhipment monitoring and control system; and, to provide a local delivery scheduling system. In other words, NAVADS is being designed to "...improve documentation speed/accuracy, conserve SDT funds and meet UMMIPS timeframes." [Ref. 15: p. 4]

As currently envisioned at Oakland, NISTARS and NAVADS would result in binnable items being drawn from stock, consolidated by customer and picked up at the NISTARS warehouse by local delivery trucks. Bulk materials would continue to be forwarded to the Bldg. 341 staging and subsequent delivery to local customers.

3. Defense Logistics Agency Material Movement

Under DLA Standard Pricing policy [Ref. 16], a system-wide or standard price is established for most items centrally managed and procured through the Defense Stock Fund. Standard prices include the following elements: Material cost, transportation surcharges, wholesale and retail surcharges, bulk petroleum products service expense surcharge, authorized expenses and price stabilization rates. Only the transportation surcharge is of concern to this thesis.

Surcharge rates for transportation are prescribed by DLA headquarters with input from the Defense Supply Centers (DSCs). These surcharge rates remain in effect until revised rates are recommended by the DSCs and approved by DLA or are prescribed by DLA. A NAVMTO Detachment Oakland study conducted in 1979-80, indicated that 67 percent of NSC Oakland's issues were DLA managed items being shipped at Navy expense, constituting a duplicate payment by the Navy (i.e., payment for transportation as one element of the DLA standard price and as a charge to NAVSUP SWT funds). [Ref. 17]

The study recommended that the Navy should find a method acceptable to DLA for charging it for transportation of DLA items shipped locally by NSC Oakland. Inquiries at both NAVSUP and DLA indicate that this possibility was discussed informally between members of the two organizations but was never officially pursued. The informal discussions indicated that a charge based upon a simple percentage of items shipped would be unacceptable to DLA and that DLA would require itemized listings by GBL or shipment document to substantiate billings for transportation and relate them to requisitions.

D. FIELD TRIP RESULTS

In an attempt to determine how private sector organizations approach the local delivery problem, field trips were taken to the corporate offices of Safeway Stores in Oakland, California, and to a regional terminal for the United Parcel Service (UPS) also located in Oakland. Additionally, field trips were made to NSC San Diego to learn how an activity similar in mission and size to NSC Oakland manages the local delivery function and to NAVMTO located in Norfolk, Virginia to get that activity's view of the local delivery situation. What follows are summaries of the information gathered during these visits.

1. Safeway

Discussions at Safeway were conducted primarily with the Corporate Transportation Methods Engineer and centered around how Safeway is organized to perform its delivery function and what measures are utilized to ensure the delivery system is functioning efficiently.

In general, Safeway has organized its stores into geographical regions with each area serviced by a central warehouse. All equipment used to provide delivery services between the regional warehouses and the stores is owned by Safeway and the drivers are Safeway employees. It was interesting to learn that all the equipment utilized has been specially made to conform with Safeway design and performance specifications.

Delivery schedules are fixed and are based on sales volume, storage space and the nature of the product. Perishable items are generally delivered three times per week while dry and non-food products are delivered twice a week. A computer based vehicle scheduling and routing program is used to assist in routing and load planning. The routing program is designed to ensure that the first stop will be the most remote and the last stop will be the closest to the terminal. Extra effort is made to ensure that the remote sites receive what they ordered. The intent here is that if something is shorted or left out it will impact the closer-in stores and thereby minimize the cost of a special run to correct the discrepancy. Additionally, the utilization of full truck loads for single locations is stressed so that trailers can be dropped and drivers do not need to wait for them to be unloaded. If a trailer is not being dropped, the driver is responsible for unloading the trailer and reloading any retrograde cargo. Driver wait time is also minimized by having all trailers fully loaded when the driver arrives at the beginning of his or her shift. Every effort is also made to utilize the back haul capability of drivers and equipment servicing the stores.

The overall objective of these efforts is to minimize the cost of the delivery operation. The actual costs of transportation are just now being charged to the store receiving the delivery. It is anticipated that this will further increase the efficiency of the delivery system as Store Managers will be held responsible for the bottom line impact of unnecessary or inefficient use of transportation services.

Efficiency in the trucking operation has been encouraged by the establishment of various performance standards designed to optimize driver time utilization.

Performance standards, although modifiable because of the differences between each route, have been generalized and include such things as: Average speeds should be around 25 MPH in the city and 48 MPH on the open road; a healthy level of overtime is 16%; trailer cube utilization should be at least 66% before a trailer is sent out; and, the average time to drop a trailer and get back on the road is 15 minutes. Additionally, standards for tons per driver mile, tons per driver hour, and offload/onload minutes per pallet have been established.

Actual driver performance is monitored by a variety of methods. For example, specific work rules have been established and are communicated to the drivers by use of a formalized Drivers Handbook and a driver training course. Drivers are also required by law to maintain detailed logs of all trips. In addition to driver logs, detailed dispatch sheets are maintained by the terminal dispatchers. An interesting aspect of the dispatch sheets is that the dispatcher is required to enter estimated times of return based on standard times to complete various routes.

The setting of time standards that are firm but fair is accomplished primarily by sending supervisors out on the runs with stop watches to actually measure time requirements. It was repeatedly stressed at Safeway that the key to any performance monitoring program was to ensure that the supervisors were riding the trucks frequently.

Safeway also utilizes on-truck monitoring devices known as Tachographs. These devices measure and record engine performance, speed, shut-own time, RPMs, and total miles driven. The recording styli of the tachograph etch the top layer of a chart, leaving a permanent, precise record of equipment operation. These markings cannot be altered or removed without detection. Tachograph charts are turned in at the end of each run and reviewed by supervisors or other management personnel to ensure performance and operating standards are being complied with. The Tachograph charts utilized by Safeway are made of strong, pressure-sensitive, plastic-coated paper, printed on one side with markings in green. Designed for use under wide temperature variations, the chart material will retain accurate impressions under adverse conditions.

It was interesting to learn that the informat.on provided by the tachograph charts has been successfully utilized by Safeway to council drivers and modify their performance.

The bottom line of the discussions with Safeway was that the success of any delivery operation will be very much dependent upon the degree of supervisory interaction and the utilization of an active dispatcher to monitor and control delivery operations.

2. UPS

The use of standards to control performance was also characteristic of the UPS approach to delivery operations. In the case of UPS, standards are established by extensive application of industrial engineering techniques, especially time and motion studies. UPS has gone much further than Safeway as far as standards are concerned. UPS has established standards for essentially every aspect of their delivery operations including how to load the truck, how to move items to be delivered once in the truck, how long it should take to walk specified distances, how long it should take to obtain a customer's signature, etc. This approach, however effective for UPS, may be too extreme for easy application to the local delivery system at NSC Oakland. A final note on UPS is that they also utilize tachographs to monitor operator and equipment performance and indicated that such on- truck monitoring devices were essential to their efficiency maximizing program.

3. NSC San Diego

Eller and Moore's description of NSC San Diego's local delivery system [Ref. 10] was found to be current. NSC San Diego utilizes a combination of in-house drivers using PWC provided equipment on a class "B", or permanent rental basis, and commercial tenders to accomplish local deliveries. There are currently two firms providing services to the center under tenders. Services are obtained using GBLs which are paid by NAVMTO from the NIF which is in turn reimbursed by NAVSUP SWT funds. PWC trucks and trailers are billed on a monthly basis. These charges are utimately paid for by NAVSUP SWT funds in a manner similiar to the process used in Oakland.

Additionally, NSC San Diego's Transportation Director has developed, for his office's use, a monthly management report based on pallet count as a work measurement unit. Data for report preparation is recorded by truck drivers on a locally developed driver's log. Drivers are required to complete the logs in detail and turn them in daily. Transportation office personnel extract the data from the logs and compile it into report formats. Calculations are performed using a programmable calculator and locally developed programs. This processed data is entered into a word processor in the management report format. The purpose of the management report is to help supervisors and workers focus on productivity. Based on the monthly management reports, NSC San Diego's cost per pallet is currently running less than the comparable cost per pallet moved commercially in that area.

NSC San Diego is also gathering data on turn-around-times at four of its terminals. The objective in doing so is to develop a standard work level performance measure. This measure can then be used to show employees what they have accomplished and how efficient they have been in doing it.

4. NAVMTO

At NAVMTO, it was learned that there was currently in process an effort to contract for approximately one third of NSC Norfolk's local delivery requirements. This portion was already being handled commercially under tenders similiar in concept to the ones used in San Diego. Authority has been recently received from NAVSUP to proceed with the program and solicitations were to be sent to local contractors by mid-1982. NAVMTO personnel were quite confident that by guaranteeing a carrier a large number of one-way trips per week they would receive bids in the range of $65 to $75 per trip [Ref. 18] which would be an improvement over the tenders currently available in the Norfolk area. (A one-way trip is defined by NAVMTO as a trip from a single pickup point to a single delivery location.)

NAVMTO is of the opinion that, in general, local delivery from NSCs can be done less expensively by using commercial carriers rather than Navy assets. It estimates that in Norfolk, in addition to the current deliveries handled by commercial carriers, there is another one third of the local delivery effort could be contracted out. The remaining one third, in NAVMTO's opinion, should be retained for in-house performance due to responsiveness needs. If the current program to increase contracting out at Norfolk is successful, it is anticipated that the effort will be further expanded at Norfolk and other NSCs.

III. ANALYSIS

As mentioned earlier, previous studies of the local delivery function at NSC Oakland indicated the need for a more detailed analysis of the data relating to cost and driver/equipment utilization. With this in mind, the authors of this study set out to determine what data was available and how it could be used.

A. DATA DETERMINATION

Discussions with personnel at NSC Oakland indicated that data regarding shipments of material from the Center was primarily aggregate in nature. For example, one of the measures of effectiveness utilized to monitor performance of the delivery function is whether or not UMMIPS time standards are being met. Data was available by Issue Group for the entire Command but it was not broken down in a manner that would indicate how the local delivery system performed specifically.

The Command does, however, maintain data on the number of measurement tons of material processed into and out of various elements of the Center. The actual number of measurement tons processed through the local delivery system was available from the Monthly Supply Management Reports prepared by the Supply Center. In this case, the level of detail was lacking in that the measurement ton data was not broken down by customer or by run thereby limiting its usefulness for this analysis. The specific details on measurement tons processed through the the local delivery system will be provided in a later section of this chapter.

The source of the most detailed information on driver/ equipment utilization and related costs was PWC San Francisco. From the PWC, the authors obtained copies of the Vehicle/Equipment Request and Record prepared by each driver each day (i.e., trip tickets), dispatcher logs maintained for each day and equipment rental reports and billing summaries for the month of October, 1981.

It was intended initially to analyze several months of data, but the quantity of data and the magnitude of the manual analysis process precluded analyzing more than one month of data. Additionally, difficulty in accessing the data and the quality of the data once accessed caused some problems. First of all, the PWC files all trip tickets applicable to a specific month together regardless of job order number. This required the hand sorting of numerous trip tickets in order to obtain the 274 which were associated with the local delivery job order number (1687011). Once this was completed, an attempt was make to sort the trip tickets chronologically by route. At this point it was observed that a large portion of the runs charged to the local delivery job order number were not scheduled stake runs. That is, of the 274 trip tickets analyzed, 84 were for the regularly scheduled stakes and 65 were for the runs to Travis AFB. The remaining 125 trip tickets were for what appeared to be unscheduled deliveries.

The surprisingly large number of unscheduled trips indicated that the local delivey operation relied considerably less on scheduled deliveries than the authors had believed initially. This also presented problems for data analysis since the authors were attempting to determine average costs and driver time utilization for groups of frequently made deliveries. It was ultimately determined that the remaining trips could be usefully grouped by a combination of origin and general destination. Therefore, the final groupings included, in addition to the four stake runs and the runs to Travis AFB, unscheduled runs originating at NSC Oakland's subsistence warehouse (Alameda Facility) and going to either ships or shore activities, and the remaining runs which were grouped as unscheduled deliveries from NSC Oakland to either ships or shore activities.

Once the trip tickets were sorted chronologically by major grouping, additional problems with the data became apparent including such things as trip tickets not being filled out completely, the purpose for the trip not being clearly indicated, explanations of stops and wait times not being provided, and the same trip ticket being used to record multiple runs.

The same types of comments could be made about dispatcher logs. However, both the quality and consistency of the information provided in the dispatcher logs were considerably higher than many of the trip tickets. Nonetheless, using both the trip tickets and dispatcher logs still did not, in all cases, give a complete picture of driver and equipment utilization. However, the trip tickets and dispatcher logs did provide sufficient information to validate PWC equipment rental reports and billing summaries. Additionally, the authors were able to use the information that was available to determine average costs for major runs and how driver utilization time was distributed between travel and non-travel functions. The results of these aspects of the analysis are provided in the next two sections of this chapter. The third section of this chapter summarizes additional findings made during the course of the study.

B. COST ANALYSIS

Costs related to the delivery services provided by PWC San Francisco in support of the local delivery system (i.e., services charged to Job Order Number 1687011) are composed of three elements: Driver charges, equipment custody charges and mileage charges. Costs for these elements were determined by an analysis of driver trip tickets, dispatcher logs and PWC generated Monthly Transportation Rental Charge reports.

Driver costs were determined by multiplying the total hours used as recorded in Block 7 of the trip ticket by the appropriate PWC stabilized hourly straight time or overtime rate obtained from Reference 2. For all trip tickets analyzed in this study, the straight time hourly rate for PWC drivers was $24.03 and the overtime rate was $29.68. The overtime rate is applied by the PWC whenever a driver works more than eight hours (excluding a one half hour meal break) in one day. It should be noted that PWC drivers start their shifts at either 0600, 0730 or 1200 and work eight and one-half hours. The extra half hour is for a meal break and is not charged to the user activity. Additionally, at the time of this study, it was PWC policy when charging for driver services, to bill in one half hour increments and round up to the next half hour for any period exceeding 30 minutes. In other words, if the driver time was two hours and ten minutes, the user activity would be charged for two and one-half hours.

Referring to the trip ticket dated 5 October 1981 and shown in Appendix B, the hours used as recorded in Block 7 of Part C were four and one-half. This is consistent with the arrival and departure times indicated in Block 6 of Part C and Columns 2 and 3 of Part D which showed the driver started this work assignment at 1630 and completed it at

2100. Knowing that the driver assigned on this trip ticket worked a 1200 to 2030 shift and confirming this by the various assignments he received as indicated on the dispatcher log sheets for the day in question, it was determined that four hours of this trip should be charged at the straight time rate and one half hour at the overtime rate for a total driver cost of $110.96 (i.e., $24.03 times four plus $29.68 times one half). This process was repeated for the remainder of the October 1981 trip tickets to determine the applicable driver charges.

The equipment cost determination began with the identification of the type of equipment utilized. This is recorded in Block 3 of Part C of the trip ticket. The equipment code listed there is necessary to identify the appropriate custody and mileage charges which vary by equipment and are also listed in Reference 2.

The total miles covered by each run is recorded in Block 9 of Part C of the trip ticket. The mileage indicated here should agree with the odometer readings in Block 8 of Part C and Column 4 of Part D. This mileage figure is then multiplied by the appropriate mileage rate to determine the mileage charge for the equipment utilized. For example, referring to Appendix B, the information provided indicates a seven and one-half ton truck tractor (Equipment Code 0614) was used to haul a 20 ton stake semitrailer (Equipment Code 0816) a distance of 102 miles. Since the mileage charge for the tractor was $.280/mile and there are no mileage charges for trailers, the mileage charge for this trip ticket was 102 miles at $.280/mile or $28.56.

Equipment custody charges reflect the time a piece of equipment was assigned in support of a given job order. Determination of custody charges required utilization of the Monthly Transportation Rental Charges report prepared by

PWC. This report identifies the hours for which custody charges are billed by equipment code and by serial number within each type of equipment. These hours were then compared to the Dispatcher Logs to determine how the equipment was utilized. In most cases, the custody hours billed for tractors and trucks matched the hours used for the driver time computations. The one major exception to this was that custody hours were always rounded up to the next whole hour thereby resulting in a one half hour difference in a few instances. In the case of trailers, custody hours generally exceeded driver hours as the result of the practice of spotting the trailers at various locations to facilitate loading and unloading. Custody charges for spotting trailers were confirmed by comprison to the Dispatcher Logs.

Referring again to the example shown in Appendix B, the custody hours for the 0614 tractor were four and one-half rounded up to five at a rate of $4.74 per hour. The custody charge for the 0816 trailer, as recorded on the PWC Monthly Transportation Rental Charges report, was for 13 hours (0800-2300) at a rate of $.67 per hour. Therefore, the equipment custody charge for the run was five hours at $4.74 per hour, or $23.70, for the tractor plus 13 hours at $.67 per hour, or $8.71, for the trailer for a total custody charge of $32.41.

Equipment custody charges were then added to the mileage and driver charges to obtain a total cost per trip ticket. Summarizing this example, the charge for the driver was $110.96, the mileage charge was $28.56 and the custody charge was $32.41 for a total cost of $171.93 for the trip.

The driver, mileage and custody costs for each of the various stake, Travis and unscheduled runs have been totalled and are presented in Tables II through X. In addition to the cost data, the tables indicate the number of trip tickets analyzed, the number of runs reflected on the trip tickets, the number of miles driven and the time used. This data was used along with the cost data to compute average cost per run, average cost per hour and minute and average cost per mile. These averages can be used to monitor trends within a given group of runs, to compare the cost of trips to various customer locations and to compare the costs of current operations with estimates for commercially available delivery services.

It should be noted that for Stakes I, II, III and IV, the number of trip tickets analyzed in each case was 21. This was because there were 21 work days in October 1981 and all of these stakes operated on each of the 21 work days. Stakes I and II made one run per trip ticket, while Stakes III and IV made at least two runs per trip ticket (both Stakes III and IV are scheduled to make two trips per day; the instances where more than two trips occurred appeared to be unplanned for exceptions).

The significance of the summary data presented in Tables II through X will be discussed in Chapter IV of this study.

C. TIME ANALYSIS

1. Driver Time Utilization

Driver and equipment time utilization was found to be composed of various functions including: Loading and off-loading material; driving to, from and between customers; driving between a variety of locations on base at the Supply Center; and, waiting at these stops for a variety of reasons. The exact nature of each portion of time utilization was impossible to determine in many cases because drivers would frequently omit this type of information from the trip tickets. As a result, many of the trip tickets did not provide any useful information for the time analysis or,

TABLE II

Cost Summary: STAKE 1

<u>Primary Areas Served</u>:

Mare Island, Skaggs Island, Concord

(1)	No. of trip tickets........	21		
(2)	No. of runs.................	21		
(3)	Total miles................	1717		
Driver Hours:				
(4)	Straight time..............	132		
(5)	Overtime....................	0		
(6)	Total driver hours (4+5).....		132	
Driver Cost:				
(7)	Straight time....................		$ 3172	
(8)	Overtime.........................		$ 0	
(9)	Total driver cost (7+8).............			$ 3172
Equipment cost:				
(10)	Custody..........................		$ 824	
(11)	Mileage..........................		$ 482	
(12)	Total equip. cost (10+11).............			$ 1306
Summary Statistics				
(13)	Total cost (9+12)........................			$ 4478
(14)	Average cost per run (13/2)...............			$ 213.24
	Average total cost per driver time:			
(15)	Per Hour (13/6)...............			$ 33.92
(16)	Per Minute....................			$ .57
(17)	Average total cost per mile (13/3).......			$ 2.61

TABLE III

Cost Summary: STAKE 2

__Primary Areas Served__:

Treasure Island, San Francisco Piers,

Presidio, Hunter's Point, San Bruno, Moffett Field

(1)	No. of trip tickets........	21		
(2)	No. of runs................	21		
(3)	Total miles................	2316		
Driver Hours:				
(4)	Straight time..............	167		
(5)	Overtime...................	0		
(6)	Total driver hours (4+5).....		167	
Driver Cost:				
(7)	Straight time......................		$ 4013	
(8)	Overtime...........................		$ 0	
(9)	Total driver cost (7+8)..............			$ 4013
Equipment cost:				
(10)	Custody...........................		$ 1153	
(11)	Mileage...........................		$ 690	
(12)	Total equip. cost (10+11).............			$ 1843
Summary Statistics				
(13)	Total cost (9+12)........................			$ 5856
(14)	Average cost per run (13/2)...............			$ 278.86
	Average total cost per driver time:			
(15)	per hour (13/6)...............			$ 34.65
(16)	per minute....................			$ .58
(17)	Average total cost per mile (13/3).......			$ 2.53

TABLE IV

Cost Summary: STAKE 3

Primary Areas Served:			
NAS Alameda, Oakland Area			
(1)	No. of trip tickets........	21	
(2)	No. of runs.................	45	
(3)	Total miles.................	862	
Driver Hours:			
(4)	Straight time...............	168	
(5)	Overtime....................	0	
(6)	Total driver hours (4+5).....	168	
Driver Cost:			
(7)	Straight time.....................	$ 4037	
(8)	Overtime..........................	$ 0	
(9)	Total driver cost (7+8)..............		$ 4037
Equipment cost:			
(10)	Custody...........................	$ 180	
(11)	Mileage...........................	$ 162	
(12)	Total equip. cost (10+11)............		$ 342
Summary Statistics			
(13)	Total cost (9+12)......................		$ 4379
(14)	Average cost per run (13/2)...............		$ 97.31
	Average total cost per driver time:		
(15)	per hour (13/6)...............		$ 26.07
(16)	per minute....................		$ .43
(17)	Average total cost per mile (13/3).......		$ 5.08

TABLE V

Cost Summary: STAKE 4

	Primary Area Served:			
	NARF Alameda			
(1)	No. of trip tickets........	21		
(2)	No. of runs................	42		
(3)	Total miles................	603		
	Driver Hours:			
(4)	Straight time..............	167		
(5)	Overtime...................	0		
(6)	Total driver hours (4+5).....		167	
	Driver Cost:			
(7)	Straight time......................		$ 4013	
(8)	Overtime...........................		$ 0	
(9)	Total driver cost (7+8)..............			$ 4013
	Equipment cost:			
(10)	Custody............................		$ 544	
(11)	Mileage............................		$ 159	
(12)	Total equip. cost (10+11)............			$ 4013
	Summary Statistics			
(13)	Total cost (9+12)....................			$ 4716
(14)	Average cost per run (13/2)..........			$ 112.29
	Average total cost per driver time:			
(15)	per hour (13/6)...............			$ 28.24
(16)	per minute....................			$ .47
(17)	Average total cost per mile (13/3).......			$ 7.82

TABLE VI

Cost Summary: TRAVIS

Primary Areas Served:			
QUICKTRANS Terminal, MAC Terminal			
(1)	No. of trip tickets........	65	
(2)	No. of runs................	65	
(3)	Total miles................	6572	
Driver Hours:			
(4)	Straight time..............	140.5	
(5)	Overtime...................	156.0	
(6)	Total driver hours (4+5).....	296.5	
Driver Cost:			
(7)	Straight time.....................	$ 3376	
(8)	Overtime..........................	$ 4630	
(9)	Total driver cost (7+8)..............		$ 8006
Equipment cost:			
(10)	Custody...........................	$ 2031	
(11)	Mileage...........................	$ 1864	
(12)	Total equip. cost (10+11)............		$ 3895
Summary Statistics			
(13)	Total cost (9+12)........................		$11901
(14)	Average cost per run (13/2)..............		$ 183.09
	Average total cost per driver time:		
(15)	per hour (13/6)................		$ 40.14
(16)	per minute.....................		$ .67
(17)	Average total cost per mile (13/3).......		$ 1.81

TABLE VII

Cost Summary: SUBSISTENCE (SHIP)*

(1)	No. of trip tickets........	30		
(2)	No. of runs................	30		
(3)	Total miles................	1368		
Driver Hours:				
(4)	Straight time..............	152		
(5)	Overtime...................	0		
(6)	Total driver hours (4+5).....		152	
Driver Cost:				
(7)	Straight time....................		$ 3653	
(8)	Overtime.........................		$ 0	
(9)	Total driver cost (7+8)..............			$ 3653
Equipment cost:				
(10)	Custody..........................		$ 917	
(11)	Mileage..........................		$ 390	
(12)	Total equip. cost (10+11).............			$ 1307
Summary Statistics				
(13)	Total cost (9+12)........................			$ 4960
(14)	Average cost per run (13/2)..............			$ 165.33
	Average total cost per driver time:			
(15)	per hour (13/6)................			$ 32.63
(16)	per minute.....................			$ .54
(17)	Average total cost per mile (13/3).......			$ 3.63

*(Includes only deliveries of subistence items from Alameda Facility to ships.)

TABLE VIII

Cost Summary: SUBSISTENCE (NON-SHIP)*

(1)	No. of trip tickets........	17		
(2)	No. of runs................	17		
(3)	Total miles................	640		
Driver Hours:				
(4)	Straight time..............	72		
(5)	Overtime...................	0		
(6)	Total driver hours (4+5).....		72	
Driver Cost:				
(7)	Straight time....................		$ 1730	
(8)	Overtime.........................		$ 0	
(9)	Total driver cost (7+8)...............			$ 1730
Equipment cost:				
(10)	Custody..........................		$ 406	
(11)	Mileage..........................		$ 180	
(12)	Total equip. cost (10+11).............			$ 586
Summary Statistics				
(13)	Total cost (9+12).........................			$ 2316
(14)	Average cost per run (13/2)...............			$ 136.24
	Average total cost per driver time:			
(15)	per hour (13/6)................			$ 32.17
(16)	per minute.....................			$ .54
(17)	Average total cost per mile (13/3).......			$ 3.62

*(Includes only delivery of subsistence items from Alameda to shore stations.)

TABLE IX

Cost Summary: NON-SUBSISTENCE (SHIP)*

(1)	No. of trip tickets........	25		
(2)	No. of runs.................	25		
(3)	Total miles.................	1833		
Driver Hours:				
(4)	Straight time..............	121.5		
(5)	Overtime....................	2.0		
(6)	Total driver hours (4+5).....		123.5	
Driver Cost:				
(7)	Straight time...................		$ 2920	
(8)	Overtime.........................		$ 59	
(9)	Total driver cost (7+8)..............			$ 2979
Equipment cost:				
(10)	Custody..........................		$ 834	
(11)	Mileage..........................		$ 276	
(12)	Total equip. cost (10+11)............			$ 1110
Summary Statistics				
(13)	Total cost (9+12)......................			$ 4089
(14)	Average cost per run (13/2)..............			$ 163.56
	Average total cost per driver time:			
(15)	per hour (13/6)...............			$ 33.11
(16)	per minute....................			$ .55
(17)	Average total cost per mile (13/3).......			$ 2.23

*(Includes only non-scheduled deliveries of non-subsistence items to ships.)

TABLE X

Cost Summary: NON-SUBSISTENCE (NON-SHIP)*

(1)	No. of trip tickets........	58	
(2)	No. of runs................	58	
(3)	Total miles................	3183	
Driver Hours:			
(4)	Straight time..............	215.0	
(5)	Overtime...................	25.5	
(6)	Total driver hours (4+5).....	240.5	
Driver Cost:			
(7)	Straight time....................	$ 5166	
(8)	Overtime.........................	$ 757	
(9)	Total driver cost (7+8)..............		$ 5923
Equipment cost:			
(10)	Custody..........................	$ 1087	
(11)	Mileage..........................	$ 795	
(12)	Total equip. cost (10+11).............		$ 1882
Summary Statistics			
(13)	Total cost (9+12)........................		$ 7805
(14)	Average cost per run (13/2)..............		$ 134.57
	Average total cost per driver time:		
(15)	per hour (13/6)................		$ 32.45
(16)	per minute.....................		$ .54
(17)	Average total cost per mile (13/3).......		$ 2.45

*(Includes only non-scheduled deliveries of non-subsistence items to shore activities.)

if the information was provided, it was not sufficiently detailed. This situation led the authors to grouping the driver and equipment utilization times into the two general categories of "travel" and "non-travel" time. Travel time was considered to be that time spent moving equipment from one location to another. Travel time was computed by taking the difference between the departure time from one location and the arrival time at the next stop as indicated in Columns 2 and 3 of Part D of the trip ticket. The non-travel times were computed by taking the difference between the arrival and departure times at each location. The total of all travel and non-travel time was then compared with the total hours used amount recorded in Block 7 of the trip ticket to ensure all time was accounted for.

Initially, an attempt was made to identify the appropriate time distributions for every stop made. This attempt proved impossible because of the very limited information provided on most of the trip tickets reviewed. Therefore, the stops were grouped by major location to facilitate the analysis. For example, several stops made at Mare Island were grouped into one location. Time spent at stops on the Supply Center and time spent traveling between these stops were grouped as "other non-travel" and "other travel" time as appropriate. These "other" categories represent time that could not be clearly identified as time spent delivering material to customers, off-loading material at customer locations or returning to the Supply Center.

Referring to the sample trip ticket contained in Appendix B, the driver left the PWC Transportation Office (Bldg. 410) at 1630 and spent five minutes traveling within the confines of the Supply Center to the Air Freight Warehouse (Bldg. 433), spent fifteen minutes in a non-travel (other) status at Bldg. 433, took 75 minutes to travel to the QUICKTRANS terminal at Travis AFB, was in a non-travel (at customer) status for 25 minutes while at the QUICKTRANS terminal, took ten minutes to travel to the MAC terminal also located at Travis AFB, was in a non-travel (at customer) status for 45 minutes while at the MAC terminal, took 70 minutes to travel back to NSC Oakland (Bldg. 433), spent five minutes in a non-travel (other) status while at Bldg. 433, took five minutes to travel within the confines of the Supply Center to Bldg. 410, and, spent the final five minutes covered by this trip ticket in a non-travel (other) status while at Bldg. 410. In summary, the time recorded on this trip ticket was broken down into 155 minutes of travel time to/from/between customers, 10 minutes other travel, 70 minutes wait at customers and 35 minutes wait at other locations for a total of 270 minutes or four and one half hours.

This time analysis process was repeated for all trip tickets where sufficient information was provided (i.e., trip tickets with sufficient information to split the total time between travel and non-travel facets). The percentages for travel and non-travel times for each grouping of runs are provided in Tables XI-XIX. It should be noted that to facilitate the analysis, the smallest time increment used was five minutes. Since there were no mechanical means of verifying times, such as Tachographs, and the accuracy of driver recorded times was questionable, this simplifying assumption was not considered to invalidate the overall results of the data analysis.

TABLE XI

Driver Time Utilization: STAKE 1

Travel Time (average minutes per day):			
(1)	To/from/between customers.......	165	
(2)	Other...........................	35	
(3)	Total travel time................		200
Non-travel Time (average minutes per day):			
(4)	At Customer.....................	118	
(5)	Other...........................	69	
(6)	Total non-travel time............		187
(7)	Total time (3+6).....................		387
(8)	% Travel time (3/7)..................		51.7
(9)	% Non-travel time (6/7)...............		48.3

TABLE XII

Driver Time Utilization: STAKE 2

Travel Time (average minutes per day):			
(1)	To/from/between customers.......	200	
(2)	Other...........................	20	
(3)	Total travel time................		220
Non-travel Time (average minutes per day):			
(4)	At Customer.....................	106	
(5)	Other...........................	147	
(6)	Total non-travel time............		253
(7)	Total time (3+6).....................		473
(8)	% Travel time (3/7)..................		46.5
(9)	% Non-travel time (6/7)...............		53.5

TABLE XIII

Driver Time Utilization: STAKE 3

Travel Time (average minutes per day):			
(1)	To/from/between customers.......	103	
(2)	Other...........................	4	
(3)	Total travel time..................		107
Non-travel Time (average minutes per day):			
(4)	At Customer.....................	47	
(5)	Other...........................	303	
(6)	Total non-travel time.............		350
(7)	Total time (3+6).........................		457
(8)	% Travel time (3/7).....................		23.4
(9)	% Non-travel time (6/7)................		76.6

TABLE XIV

Driver Time Utilization: STAKE 4

Travel Time (average minutes per day):			
(1)	To/from/between customers.......	84	
(2)	Other...........................	20	
(3)	Total travel time..................		104
Non-travel Time (average minutes per day):			
(4)	At Customer.....................	60	
(5)	Other...........................	313	
(6)	Total non-travel time.............		373
(7)	Total time (3+6).........................		477
(8)	% Travel time (3/7).....................		21.8
(9)	% Non-travel time (6/7)................		78.2

TABLE XV

Driver Time Utilization: TRAVIS

Travel Time (average minutes per day):			
(1)	To/from/between customers.......	170	
(2)	Other..........................	9	
(3)	Total travel time..................		179
Non-travel Time (average minutes per day):			
(4)	At Customer......................	45	
(5)	Other..........................	46	
(6)	Total non-travel time.............		91
(7)	Total time (3+6)......................		270
(8)	% Travel time (3/7).....................		66.3
(9)	% Non-travel time (6/7)................		33.7

TABLE XVI

Driver Time Utilization: SUBSISTENCE (NON-SHIP)

Travel Time (average minutes per day):			
(1)	To/from/between customers.......	46	
(2)	Other..........................	7	
(3)	Total travel time..................		53
Non-travel Time (average minutes per day):			
(4)	At Customer......................	22	
(5)	Other..........................	36	
(6)	Total non-travel time.............		58
(7)	Total time (3+6)......................		110
(8)	% Travel time (3/7).....................		47.7
(9)	% Non-travel time (6/7)................		52.3

TABLE XVII

Driver Time Utilization: SUBSISTENCE (SHIP)

Travel Time (average minutes per day):			
(1)	To/from/between customers.......	260	
(2)	Other...........................	35	
(3)	Total travel time..................		295
Non-travel Time (average minutes per day):			
(4)	At Customer.....................	310	
(5)	Other...........................	92	
(6)	Total non-travel time.............		402
(7)	Total time (3+6).......................		697
(8)	% Travel time (3/7)....................		42.3
(9)	% Non-travel time (6/7)................		57.7

TABLE XVIII

Driver Time Utilization: NON-SUBSISTENCE (SHIP)

Travel Time (average minutes per day):			
(1)	To/from/between customers.......	83	
(2)	Other...........................	19	
(3)	Total travel time..................		102
Non-travel Time (average minutes per day):			
(4)	At Customer.....................	76	
(5)	Other...........................	103	
(6)	Total non-travel time.............		179
(7)	Total time (3+6).......................		281
(8)	% Travel time (3/7)....................		36.3
(9)	% Non-travel time (6/7)................		63.6

TABLE XIX

Driver Time Utilization: NON-SUBSISTENCE (NON-SHIP)

	Travel Time (average minutes per day):		
(1)	To/from/between customers.......	90	
(2)	Other..........................	17	
(3)	Total travel time..................		107
	Non-travel Time (average minutes per day):		
(4)	At Customer.....................	46	
(5)	Other..........................	72	
(6)	Total non-travel time.............		118
(7)	Total time (3+6)......................		225
(8)	% Travel time (3/7)..................		47.6
(9)	% Non-travel time (6/7)...............		52.4

2. Average Travel and Non-travel Times

The purpose of this section of the time analysis was to compute the average travel times for major legs of the local delivery runs and the average non-travel times at various locations. One of the difficulties encountered was the fact that the composition of each run was not the same, even within individual major customer groupings. For example, Stake#1 primarily serves Mare Island and Concord, but only Mare Island is served on a daily basis, deliveries are made frequently to Concord but only on an as required basis and deliveries are occassionally made to the small activity at Skaggs Island. This inherent variability in the composition of the runs resulted in the usable data being further reduced and accounts for the number of observations utilized being less than the number of trip tickets used in the travel/non-travel time analysis discussed earlier. Additionally, because of the wide variation in the content

The results of this portion of the analysis are summarized in Tables XX through XXIX. The average travel times tables were developed on a per trip basis and indicate the points from which and to which the travel time was measured. The average non-travel times tables were developed on a per day basis and indicate where the major amounts of non-travel time were spent. Although the purposes for the various non-travel times are not included since they were not available in most cases, the tables do provide an indication as to how the drivers of the scheduled runs are spending their time.

TABLE XX

Average Travel Times (in minutes): Stake 1

From/To	Total Time	# of Events	Mean	Std Dev	High	Low	Mode
NSC/MI	495	9	55	8	60	45	60
MI/Concord	345	7	49	6	60	45	45
Concord/NSC	390	7	56	9	70	45	60

NSC: Naval Supply Center Oakland MI: Mare Island

TABLE XXI

Average Non-Travel Times (in minutes): Stake 1

Location	Total Time	# of Events	Mean	Std Dev	High	Low	Mode
341 (am)	315	11	28	18	60	10	10
312	165	10	17	9	30	5	10,15
MI	1365	14	98	34	180	55	105
Concord	210	7	30	18	65	5	30
341 (pm)	[illegible]50	10	25	18	70	5	30

341: Bldg. 341 NSC Oakland 312: Bldg. 312 NSC Oakland
MI: Mare Island

TABLE XXII

Average Travel Times (in minutes): Stake 2

From/To	Total Time	# of Events	Mean	Std Dev	High	Low	Mode
NSC/TI	550	18	31	4	60	25	30
TI/HP	270	15	18	6	30	10	15
HP/MF	685	14	49	8	60	35	40
MF/NSC	620	10	62	3	65	60	60

NSC: Naval Supply Center Oakland TI: Treasure Island
HP: Hunters Point MF: Moffett Field

TABLE XXIII

Average Non-Travel Times (in minutes): Stake 2

Location	Total Time	# of Events	Mean	Std Dev	High	Low	Mode
414	205	17	12	4	40	5	10
341	1280	19	67	18	90	25	70
TI	1050	19	55	20	65	15	35
HP	330	16	21	9	40	10	25
MF	585	14	42	23	55	10	30

414: Bldg. 414 NSC Oakland 341: Bldg. 341 NSC Oakland
TI: Treasure Island HP: Hunters Point MF: Moffett Field

TABLE XXIV

Average Travel Times (in minutes): Stake 3

From/To	Total Time	# of Events	Mean	Std Dev	High	Low	Mode
NSC/NAS(am)	340	18	19	8	40	15	15
NAS/NSC(am)	338	16	21	6	30	10	15
NSC/NAS(pm)	165	10	17	5	30	15	15
NAS/NSC(pm)	175	10	18	5	25	10	15,20

NSC: Naval Supply Center Oakland
NAS: Naval Air Station Alameda

TABLE XXV

Average Non-Travel Times (in minutes): Stake 3

Location	Total Time	# of Events	Mean	Std Dev	High	Low	Mode
341 (am)	1890	20	95	37	165	25	70
NAS (am)	335	18	19	18	70	5	10
341 (noon)	2035	22	92	74	180	5	110
NAS (pm)	300	14	21	14	50	5	10
341 (pm)	1642	19	86	47	340	15	120

341: Bldg. 341 NSC Oakland NAS: Naval Air Station Alameda

TABLE XXVI

Average Travel Times (in minutes): Stake 4

From/To	Total Time	# of Events	Mean	Std Dev	High	Low	Mode
312/341	100	20	5	0	5	5	5
NSC/NARF (am)	240	15	16	3	25	15	15
NARF/NSC (am)	320	16	20	0	20	20	20
NSC/NARF (pm)	255	17	15	0	15	15	15
NARF/NSC (pm)	400	20	20	0	20	20	20

312: Bldg. 312 NSC Oakland 341: Bldg. 341 NSC Oakland
NSC: Naval Supply Center Oakland
NARF: Naval Air Rework Facility Alameda

TABLE XXVII

Average Non-Travel Times (in minutes): Stake 4

Location	Total Time	# of Events	Mean	Std Dev	High	Low	Mode
312	605	21	29	6	40	10	30
341 (am)	1830	21	87	14	115	60	85
117/162 (am)	270	21	13	12	50	5	5
5/400/8 (am)	335	21	16	6	30	5	15
341 (noon)	2745	21	131	16	160	100	135
117/162 (pm)	220	21	10	8	30	5	5
5/400/8 (pm)	390	21	19	10	45	5	20
341 (pm)	1135	20	57	17	90	25	45

312: Bldg. 312 NSC Oakland   341: Bldg. 341 NSC Oakland
117/162: Bldgs. 117 and 162 NARF Alameda
5/400/8: Bldgs. 5, 400 and 8 NARF Alameda

TABLE XXVIII

Average Travel Times (in minutes): Travis

From/To	Total Time	# of Events	Mean	Std Dev	High	Low	Mode
NSC/QT	2730	31	88	11	125	70	90
NSC/MAC	1895	21	90	15	135	75	85
QT/MAC	220	20	11	3	15	5	10
QT/NSC	885	12	74	11	90	60	65
MAC/NSC	3125	40	78	9	105	65	70

NSC: Naval Supply Center Oakland
QT: QUICKTRANS Terminal   MAC: MAC Terminal

TABLE XXIX

Average Non-Travel Times (in minutes): Travis

Location	Total Time	# of Events	Mean	Std Dev	High	Low	Mode
433 (Trk #1)	925	44	21	13	50	5	25
433 (Trk #2)	140	22	6	3	15	5	5
QT	1340	32	42	28	120	10	25
NAC	990	40	25	13	65	5	15

433: Bldg. 433 NSC Oakland QT: QUICKTRANS Terminal
NAC: NAC Terminal Trk: Truck

D. ADDITIONAL ANALYSES

The purpose of this section is to present the results of other analyses conducted during the course of this study that, while relating to the local delivery system, did not directly support the cost and time analyses.

1. Measurement Ton Data

The number of measurement tons of material input to and output from the local delivery system is compiled monthly and included in the supply management reports prepared by NSC Oakland. The measurement ton data was analyzed to get a feel for the significance of the local delivery function within the context of the overall NSC Oakland operation. To do this, information regarding the average monthly measurement tons processed out of the Center during FY 1981 (i.e., October 1, 1980 through September 30, 1981) was obtained from the Supply Operations Statistics for the month of September 1981. As shown in Appendix A, the FY 1981 monthly average for outbound measurement tons was 42,918 or approximately 515,000 measurement tons per year.

Comparing this figure to the data shown in Table XXX, it was apparent that the measurement tons processed through the local delivery system accounted for almost 47 per cent of the Center's total outbound measurement tons. It should be noted that the backlog data generally reflected material on hand at the end of an accounting period and scheduled to be delivered in the near future. Therefore, the appearance of backlogs in the amounts shown in Table XXX seems reasonable and will not be analyzed further in this study.

TABLE XXX

Measurement Tons Processed Through the Local Delivery System During FY 1981

	Beginning Backlog	Inputs	Outputs	Ending Backlog
OCT	831	18,119	17,881	1,069
NOV	1,069	14,705	15,263	511
DEC	511	17,161	17,268	404
JAN	404	16,660	16,245	819
FEB	819	18,960	18,869	910
MAR	910	23,988	24,474	424
APR	424	24,775	24,457	742
MAY	742	19,680	19,643	779
JUN	779	18,824	18,989	614
JUL	614	22,347	22,025	936
AUG	936	22,723	22,653	1,006
SEP	1,006	22,957	23,232	731
Totals		240,899	240,999	

Source: Monthly NSC Oakland Supply Management Reports

2. Issues by Managers

The data presented in Table XXXI represents the number of issues made by NSC Oakland during each month of FY 1981 and is broken down by whether or not the item issued was managed by DLA, the Navy or another activity. The numbers included in the table are approximations based on the issues by manager charts accompanying NSC Oakland's Supply Operations Statistics for September 1981 (Appendix A). This information was analyzed to obtain a perspective on the significance of the amount of DLA managed material issued by NSC Oakland as compared with issues of material managed by other activities. Based on the data presented in Table XXXI, it was apparent that DLA managed items accounted for 67.6% of the issues made by NSC Oakland during FY 1981 while Navy-managed items accounted for 26.1% and items managed by all other activities accounted for the remaining 6.3%. This analysis revealed the significance of the DLA managed items with respect to the overall NSC Oakland operation.

TABLE XXXI

Fiscal Year 1981 Issues by Manager

	DLA	NAVY	OTHER	TOTAL
OCT	97,500	40,000	10,000	147,000
NOV	90,000	30,000	10,000	130,000
DEC	80,000	35,000	5,000	120,000
JAN	95,000	37,500	10,000	142,500
FEB	92,500	40,000	7,500	140,000
MAR	102,500	40,000	10,000	152,500
APR	110,000	37,500	10,000	157,500
MAY	85,000	32,500	10,000	127,500
JUN	87,500	32,500	10,000	130,000
JUL	90,000	35,000	7,500	132,500
AUG	100,000	37,500	7,500	145,000
SEP	90,000	35,000	7,500	132,500
Totals	1,120,000	432,500	105,000	1,657,500
	(67.6%)	(26.1%)	(6.3%)	(100.0%)

Source: NSC Oakland FY 1981 Supply Operation Statistics

3. Frequency of Trips to Customer Locations

The purpose of this portion of the analysis was to determine what customer locations were receiving the highest level of service from the local delivery system based solely on frequency of trips. The 432 trips to customer locations indicated in Table XXXII is greater than the 274 trip tickets analyzed because (as indicated earlier) a single trip ticket can represent stops at more than one customer location. For example, there were 21 trip tickets for Stake #1 analyzed, however, these trip tickets represented 12 trips that stopped at Mare Island only, 9 trips that stopped at Mare Island and also at Naval Weapons Station Concord and 6 trips that stopped at Mare Island and at miscellaneous other stops. Therefore, the 21 Stake #1 trip tickets analyzed resulted in 36 trips to various customer locations. Additionally, trip tickets for Stakes 3 and 4 usually covered two trips per day each.

As can be seen in Table XXXII, the top customer locations in terms of number of trips were NAS Alameda with 102, Travis AFB with 73 and Mare Island Naval Shipyard with 45. In other words, 23.6% of the trips to customer locations made by the local delivery system during October 1981 stopped at customers at NAS Alameda, 16.9% at Travis AFB and 10.4% at Mare Island. This means that a total of 50.9% of the trips to customer locations were made to only three of the customer locations generally served by NSC Oakland's local delivery system.

Additionally, the frequency analysis indicated how major customer locations were being serviced in terms of scheduled and non-scheduled trips. For the purpose of this study, the scheduled trips include the four stake runs plus two trips per day Monday through Friday and one trip per day Saturdays, Sundays and holidays to Travis AFB. All other

TABLE XXXII

Frequency of Trips to Customer Locations During October 1981

Route	NAS	MI	TI	YB	SFP	OK	HP	CON	MF	AF	OAX	SFX	TRAV	OAB	MISC	TOTAL
Stake 1		21						9							6	36
Stake 2			20	12	4		18		21			2			6	83
Stake 3	21		1		2	11				15	1				5	56
Stake 4	42															42
Travis													50			50
Subsistence (Ships)	12	6	1		4			5							2	30
Subsistence (Non-ship)	2	1	1			3			1					2	3	13
Non-subsist (Ships)	15	3			5					3					1	27
Nonsubsist (Non-ship)	10	14	4				2		1	3	7	9	23	3	19	95
Totals	102	45	27	12	15	14	20	14	23	21	8	11	73	5	42	432

NAS: NAS Alameda
MI: Mare Island
TI: Treasure Island
YB: Yerba Buena Island
SFP: San Francisco Piers

OK: Oak Knoll
HP: Hunters Point
CON: Concord
MF: Moffett Field
AF: Alameda Facility

OAX: Oakland Airport
SFX: San Francisco Airport
TRAV: Travis
OAB: Oakland Army Base
MISC: Miscellaneous

trips are considered non-scheduled. Of interest here was the fact that 165 of 432, or 38.2%, of the trips to customer locations were the result of non-scheduled runs.

With regards to the three customer locations that received the largest frequency of trips, non-scheduled runs accounted for 39 of 102, or 38.2%, of the trips to NAS Alameda; 23 of 73, or 31.5%, of the trips to Travis; and, 24 of 45, or 53.3%, of the trips to Mare Island.

4. Trailer Usage

The purpose of this analysis was to determine the number of trailers being rented from the PWC and how they were being utilized in terms of the number of hours the trailers were spotted for loading and the number of hours spent actually moving material to and from customer locations. It should be noted that as a result of the occasionally incomplete data recorded on the trip tickets and the dispatcher logs, some subjectivity was required to allocate some of the trailer custody hours. However, this subjectivity is not considered significant enough to materially affect the overall results of the analysis.

A review of the Monthly Equipment Rental Charges report revealed that various types of trailers were being charged to the local delivery job order number. These included equipment codes 0813, 0816, 0817, 0820, 0822 and 0825. Of these, the 0813, 0816 and 0817 were the most common. Therefore, the trip tickets and dispatcher logs were utilized to divide custody charges for these three types of trailers into two segments, one being that time spent actually moving material to and from customers and the other being that time spent spotted for loading. For example, a review of Equipment Code 816 (20 ton stake semi-trailer) utilization showed that there were 18 of these trailers charged to the local delivery job order on October 1. The total hours for which custody charges for these 18 trailers were levied were 139. Of these, trip tickets and dispatcher logs indicated that ten hours were used to travel to, unload at and return from customer locations. These records also indicated that the ten hours were allocated to four trailers. Therefore, the remaining 129 hours reflected time spent spotted for loading. Also, the data indicates the 14 of the 18 trailers for which custody charges were levied on October 1 were not utilized to move material to customer locations. The results of the trailer utilization analysis are summarized in Table XXXIII.

TABLE XXXIII

Trailer Utilization Summary for October 1981

Equip Code	(Number of Units)	Hours Spotted for Loading	Travel/Off Load Hours	Total Hours
813	(72)	490	102	592
816	(785)	3568	240	3808
817	(204)	1283	458	1741
Totals		5341	800	6141
Per cent of Total Hours		87.0%	13.0%	100.0%

IV. DISCUSSION

In general, this study attempted to describe NSC Oakland's local delivery system in terms of the average costs per trip for delivery services purchased from PWC San Francisco and the distribution of driver time among travel and non-travel functions. In addition to these primary efforts, information was obtained regarding the number of measurement tons of material processed through the local delivery system, the amount of DLA managed material being issued by the Center, the frequency of trips to various customer locations and how various types of trailers were utilized by the local delivery system. This analysis has shown that the local delivery system is a significant element of the NSC Oakland's effort to support its customers, especially when viewed from the perspective of the high percentage of the Center's outbound measurement tons that are processed through the local delivery system.

The impact of the local delivery function on NSC Oakland's ability to perform its mission has come under increasing attention primarily due to four initiatives; the wholesale supply support consolidation, the installation of NISTARS, increased emphasis on contracting out, and funding concerns expressed by NAVMTO. The discussion that follows tries to relate these concerns to the the data that was generated by the analyses conducted and the observations made during the course of this study.

One of the most obvious findings was that the current database and performance records utilized by NSC Oakland and PWC San Francisco do not provide sufficiently detailed information to do as in depth an analysis of the driver and equipment time utilization and related costs as had been originally planned. For example, the failure of drivers to consistently provide complete time and odometer reading data on the trip tickets made these documents frequently unusable or, at best, only marginally useful for providing some indication as to driver time utilization in the very gross terms of travel and non-travel times.

A. COST DATA

The cost analysis indicated that, when compared to the $65-$75 per trip estimate provided by NAVMTO, the average costs per run were, in all cases, higher than what would be expected to be received from a commercial contract carrier. Additionally, the weighted average cost per run for the overall local delivery system was $155.90, more than twice the NAVMTO estimate.

It should be noted, however, that any direct comparison of the average cost per trip data for Oakland and the NAVMTO estimate should be done cautiously since the NAVMTO estimate is based on a one trip/one stop scenario and the Oakland data frequently includes trips with multiple stops. Nonetheless, a general feeling that it is costing NSC Oakland, on the average, more to deliver material to local customers using PWC drivers and equipment then it would if it contracted for these services seems justified. Also, NAVMTO feels additional stops can be added at very reasonable cost thereby indicating that contract delivery services should also be more economical for trips with multiple stops.

This finding conflicts with the conclusion expressed by Hernandez and Gallitz in their thesis on NSC Oakland's local delivery system [Ref. 6] primarily because their approach to contracting out did not include what NAVMTO considers to be potential price economies resulting from guaranteeing a carrier a large number of trips.

The feeling that NSC Oakland is paying more than needed for local delivery services is also supported by the cost per mile data. For example, the weighted average cost per mile was $3.55. This does not compare favorably to Safeway's $1.56 per mile cost for the San Francisco Division. The Safeway figure includes the cost of labor, the fixed and variable cost of operating the equipment and an allocation of overhead. Even when considering differences in cost accounting techniques, the fact that NSC Oakland's average cost per run is more than twice Safeway's for generally the same geographical area suggests NSC Oakland's current costs are excessive.

The analysis also pointed out the high degree of variability between the average costs of the various groups of runs. For example, the average cost per run ranged from a low of $97.31 for Stake 3 to a high of $278.86 for Stake 2. The weighted average cost per run was $155.90 with a standard deviation of $46.80. Since this variability might be attributed to differences in times spent loading, unloading or waiting and/or the number of miles driven, average costs per driver hour and per mile were also computed. Once again the amount of variability seems significant. The average costs per hour ranged from a low of $26.07 for Stake 3 to a high of $40.14 for the Travis runs. The overall weighted average for cost per hour was $32.90 with a standard deviation of $4.50. The average costs per mile ranged from a low of $1.81 for the Travis runs to a high of $7.82 for Stake 4. The overall weighted average cost per mile was $3.55 with a standard deviation of $1.95.

A additional consideration that should be included in any comparison must be the implied cost of the flexibility that Oakland's present system provides. The flexibility issue raises the question as to whether or not the local delivery system really needs the flexibility it currently has designed into it. According to Safeway and UPS, the need for flexibility is real but should be minimized to the greatest extent possible through the use of improved planning and fixed schedules. However, there appears to be little or no incentive for NSC Oakland to reduce flexibility and the associated costs.

One of the reasons NSC Oakland has no incentive to reduce costs is that the driver and equipment costs in support of the local delivery system at NSC Oakland appear to be considered a "free good" since the Supply Center is not required to budget for or account for these costs. The "free good" perspective has resulted in a circumvention of the buyer-seller relationship that should exist between a NIF activity (PWC San Francisco) and its customer (NSC Oakland). As a result, the Supply Center has concentrated its attention on the "what" not the "how" of local delivery. For all intents and purposes, it appears that all the Center must do to continue to get local delivery driver and equipment services paid for with NHF/SDT funds is to annually issue a work request to the PWC and the rest is automatic. There appear to be no external constraints placed on the Center as to the amount of NHF/SDT funds to be obligated against the local delivery job order. This lack of external constraints appears to have led to a situation where charges to the local delivery job order number were always assumed to be correct. In this case, "correct" means both accurate in terms of dollars and factual regarding actual time and usage. Additionally, "correct" implies the trip was needed and it was an appropriate charge to NMF/SDT funds. This study has shown that this assumption is not always valid.

This attitude that the "what" of local delivery is more important than the "how" is also reinforced by the way in which the performance of the local delivery system is monitored. From a performance monitoring perspective, the "what" is ensuring that the UMMIPS time standards are met. To do this, it appears that the objective is to deliver all material processed through the local delivery system by the close of the next working day after it been drawn from stock or sooner, if possible. This policy, while promoting customer satisfaction, does not appear to consider the costs of such an approach and the system-wide judgements regarding how to process material in Issue Groups II and III. In other words, the local delivery system utilized at NSC Oakland appears to be designed to treat all Issue Group I, II, and III material as if it were Issue Group I. This situation is further aggravated by the apparent goal to improve customer support over pre-consolidation levels. This goal appears to have been interpreted by many people involved with the local delivery system to mean treating all deliveries to NARF Alameda and NAS Alameda as emergencies.

B. TIME DATA

Regarding driver times, it is appears that, on the average, drivers are spending more of their time in a non-travel rather than a travel status. For example, the average non-travel times for the various groups of runs ranged from a low of 33.7% for the Travis runs to a high of 78.2% for Stake 4. The overall average percentage for non-travel time was 57.4% with a standard deviation of 13.9%. While some wait time is to be expected, especially in view of the fact that drivers must rely on the customer to unload, the amount of non-travel time currently being incurred appears inefficient.

The comments from Safeway and UPS indicated that a prime concern in the efficient operation of their respective delivery systems is the maximization of the percent of travel time compared to non-travel time. Safeway and UPS were especially concerned that driver wait time at terminals be minimized and, in the case of Safeway, it was expected that turn-around-time at delivery locations should generally not exceed fifteen minutes.

Safeway and UPS also stressed the need for close supervision of drivers. Supervision of drivers performing the local delivery function at NSC Oakland appeared to be extremely lax. This could be attributed to a PWC perception that how the drivers performed on the job would be monitored by NSC Oakland while, at the same time, NSC Oakland perceived that, since the drivers did not work for the Center directly, the Center could not tell them how to do their jobs. Whatever the cause, the drivers were on their own with little or no direct supervision.

An analysis of how non-travel time was spent was difficult because of the sketchy information provided on the majority of the trip tickets. However, a review of the trip tickets and observations made indicated some practices that may not promote efficiency, including: Drivers assisting with sorting and loading material prior to leaving Bldg. 341; trucks making multiple stops to pick up material prior to leaving the Center; drivers being on standby at Bldg. 341 when not actually delivering material; and, a tendancy for the time required to complete a delivery to expand to fill the time available.

The analysis of travel and non-travel times once again pointed to a high degree of variability. In this case, the variability was basically unexplained since the travel times were for the same portion of the trips and the non-travel times were computed on a location by location basis.

It should be noted that the standard deviations for the average travel times were generally less severe than those for the average non-travel times. This indicates that it might be easier to establish reasonable standards for travel times than for non-travel times. It may be possible that lack of standards is contributing to the high variances since, without standards, the drivers might have difficulty knowing exactly what is expected of them and supervisors have little indication when performance is slipping. The establishment of standards for average travel and non-travel times is beyond the scope of this study, but the Safeway standards for turn-around-time and average speeds could be used as interim objectives recognizing the need to modify the performance standards based on the characteristics of each group of runs.

An additional observation worth noting is that, in spite of the variances found in most of the computations, no variances were determined for the majority of the average travel times for Stake 4. This could be explained by the proximity of NSC Oakland to NARF Alameda (the only customer location for Stake 4) and the practice of recording time in five minute increments. On the other hand, this situation could also indicate that, because of no direct supervision, the driver appears to be filling the trip tickets out based on past experience rather than actual travel times.

Another indication of the impact of a lack of supervision/control is the fact that the driver of Stake 4 spent, on the average, 275 minutes, or more than four and one-half hours, a day in a non-travel status at Bldg. 341, NSC Oakland's local delivery warehouse. Unfortunately, this was not an isolated occurrence since the driver of Stake 3 spent an almost identical 273 minutes per day at Bldg. 341. This practice of allowing drivers to spend so much time in a non-travel status is indicative of the inefficiencies existing in the current local delivery system. In this particular instance, it seems reasonable to suggest that one driver could cover both Stakes 3 and 4 if the delivery schedules were staggered. Taking this suggestion one step further, it appears that since NARF Alameda is located at NAS Alameda, the two stakes could conveniently be combined into one and thereby achieve additional efficiencies by reducing the amount of travel time required (i.e., make one trip to the NAS/NARF Alameda complex in the morning and one in the afternoon).

C. TRAILER UTILIZATION

The analysis of trailer utilization revealed that custody charges assigned to the local delivery job order were, in many cases, for more than eight hours per day. This is in direct conflict with the PWC instruction covering transportation equipment rental rates which indicates that, except for a few instances, rental charges are generally computed for an eight hour day [Ref. 2: p.15]. The exceptions discussed in the instruction do not apply to the equipment charged to the local delivery job order. PWC Transportation Office supervisory personnel questioned about this issue stated that it was their understanding that the policy was that trailers would be charged for no more than eight hours per day and that this instance of charging for more than eight hours could be a clerical error.

This analysis also revealed that, even if trailers were charged only for eight hour days, the charge applied seven days a week. Several of the trailers charged to the local delivery job order appeared to have been in the custody of some element of the local delivery system for the entire month of October. That means the local delivery job order was charged for 31 days of custody for some of the trailers. At eight hours a day, this equates to a custody charge based on 248 hours. Had the local delivery system rented the trailers on a Class "B" or monthly basis, the custody charge would have been based on 20 days at eight hours per day or 160 hours. It is apparent then that improved efficiency can be achieved easily and with no impact on effectiveness by changing to a Class "B", or monthly rental, status for that equipment which must be retained permanently by the Center.

D. EFFICIENCY

The bottom line impact of all these considerations is an apparent emphasis on the part of NSC Oakland to promote the effectiveness of the local delivery system and ignore its efficiency.

This attention to effectiveness and not to efficiency was also evident in PWC San Francisco's approach to providing equipment and drivers. The PWC's performance has been generally measured by the level of service provided to its customers (primarily responsiveness). In this instance, responsiveness meant getting the requested equipment and drivers to the desired locations at the right time. It appears that the PWC consistently provided timely and flexible support even though an opinion commonly expressed at the Supply Center was that the PWC needed to provide more vehicles more quickly. Since the PWC was getting paid for whatever services they provided, even when the NSC was billed for equipment custody charges based on more than eight hours in a day or hourly rates when monthly rates would have been cheaper, there was little if any incentive for the PWC to question the "how" of providing the service except to be as responsive as possible consistent with existing personnel and equipment constraints. Based on the observation that the system generally appeared to operate satisfactorily to all concerned, it is understandable that there was no expressed need for the NSC and the PWC to work more closely together regarding requirements, scheduling and efficient utilization of personnel and equipment.

An additional comment that can be made as a result of this apparent emphasis on effectiveness vice efficiency is that there may be some "fraud, waste and abuse" implications, or at least the potential for criticism, from the perspective that the local delivery system is not as efficient as it could be. The recommendations that follow in Chapter V should contribute to the improved efficiency of the local delivery system while not adversely impacting the system's effectiveness.

In the meantime, the renewed emphasis on contracting out appears to have changed PWC's focus on efficiency. This is supported by the steps the PWC is currently taking to try to improve the efficiency of the transportation services they provide in order to ensure their competitiveness for a planned cost comparison study pursuant to OMB Circular A-76. If the NSC and the PWC want to retain their current buyer/seller relationship, they must consider working more closely together to improve efficiency or the delivery service will most likely be contracted out.

An increased emphasis on the efficiency of the local delivery system also seems appropriate in view of the commitment expressed by the Supply System to improve the material handling processes at NSC's through the installation of NISTARS. As discussed earlier, NISTARS output, even at only a low level of capacity, will saturate the current capability of the local delivery system. The benefits to be derived from NISTARS will, therefore, be constrained by the ability of the local delivery system to process outbound material. Thus, the need to efficiently utilize existing transportation resources will be even greater.

To properly plan and manipulate the local delivery system as projected under NAVADS, much clearer descriptions of the nature of the trips, their destinations, the frequency of deliveries, the measurement tons carried, the time requirements, the equipment requirements and the priorities of the shipments are needed. This study indicates that the necessary data is not readily available and that additional analysis will be required to develop it.

Additionally, during the trailer utilization analysis it was observed that a seemingly disproportionate amount of trailer time is spent spotted for loading. For example, 5341 of 6141, or 87.0%, of the custody hours charged for Equipment Codes 0813, 0816 and 0817 during the month of October 1981 were for time spent apparently spotted for loading. An examination of the Monthly Equipment Rental Charges report and the applicable dispatcher logs revealed that, in several cases, trailers were spotted at the Supply Center or the Alameda Facility for days and even weeks at a time without apparent movement. While this type of trailer utilization does not appear to enhance the effectiveness of the local delivery operation, it clearly reduces the system's efficiency.

V. RECOMMENDATIONS

NSC Oakland is organized to perform a local delivery function in support of customers located within a 100 mile radius of the Supply Center and to utilize the local delivery system to transport material to other major transshipment points within the same radius. It has been shown that the local delivery system is a significant element of the Supply Center's effort to support its customers especially when viewed from the perspective of the high percentage of the Center's outbound measurement tons that are processed through the local delivery system.

It was clear from the beginning of this study that NSC Oakland's primary concern regarding local delivery was getting material to customers and transshipment points as quickly as possible. This concern is reinforced by the way the local delivery system is funded, how the system's performance is measured and an apparent desire on the part of NSC Oakland to improve levels of customer support as a result of the wholesale supply support cosolidation.

The recommendations that follow are not intended to change the way NSC Oakland's local delivery system is operated just for change's sake, but rather to propose modifications to the current operation in the hope of striking a balance between a renewed emphasis on the system's efficiency and the desire to maintain appropriate levels of customer service.

1. NSC Oakland establish a new or expand an existing position description to include overall coordination of the local delivery system (i.e., all jobs appropriately charged to the local delivery job order

number). Included would be functions such as: Interfacing with PWC regarding equipment requirements; ensuring that jobs charged to the local delivery job order number are both legitimate and accurate; coordinating trips to customer locations to ensure the number of trips is minimized by maximizing equipment weight, cube and backhaul utilization; ensuring optimal usage of the existing contract delivery service from Travis AFB; optimizing driver and equipment time utilization by monitoring the location of all drivers and equipment being charged to the local delivery job order, including trailers spotted for loading, and the purpose of and time spent at all stops; ensuring drivers fill out the trip tickets completely and accurately; and, developing internal management reports to measure performance in terms of such things as measurement tons per customer, number of pallets per customer, number of trips per customer and time utilization by function so that informed judgements can be made regarding the scheduling and routing of deliveries.

2. In support of Recommendation One, NSC Oakland consider utilizing production reports similar to those currently being used at NSC San Diego. In particular, the authors of this study feel that pallet count would be a good place to start developing meaningful performance indicators for NSC Oakland's local delivery system.

3. PWC San Francisco increase the level of driver supervision by such mechanisms as installation of on-vehicle monitoring devices similar to Tachographs and increasing the frequency of supervisors actually riding the trucks in order to observe performance.

Care needs to be taken regarding this recommendation so that increased supervision is viewed as a necessary element of a professionally managed delivery system and not solely as a way to gain information to be used against the drivers. Explanation of similar techniques utilized in the very successful delivery operations of Safeway and UPS might be a useful way to get this point across.

4. PWC San Francisco and NSC Oakland jointly develop performance standards for travel, loading and unloading times. Both Safeway and UPS indicated that standards have been useful as a way to monitor performance, especially by indicating when corrective action may be necessary, and as a way to encourage desired types of behavior by clearly communicating what level of performance is expected. A much more detailed study than this would be necessary to establish appropriate standards, but this study does indicate that the current lack of standards may be contributing to the tremendous variations observed in travel and non-travel times.

5. NSC Oakland consider such efficiency related actions as reducing the number of runs to customer locations and increasing backhaul utilization. Actions in support of this recommendation could include such things as: Increased utilization of fixed schedules and consolidated shipments as ways to enhance planning and scheduling as well as weight and cube utilization; installation of radios in all vehicles so that positive contact can be maintained at all times, this would be especially helpful in coordinating backhaul requirements; adjusting delivery schedules to ensure UMMIPS standards are not unnecessarily exceeded (i.e.,

do not treat all Issue Group II and III material as if it was Issue Group I); and, critically review the need for runs that will result in the use of overtime.

6. NAVMTO/NAVSUP direct cite a DLA Transportation Account Code (TAC) for local delivery of subsistence items originating at the Alameda Facility. Although implementation of this recommendation would not result in the Navy being reimbursed for all DLA material being shipped via the local delivery system, deliveries of subsistence items originating at the Alameda Facility account for a large number of the trips charged to the local delivery job order and they represent a relatively easily identified and accounted for portion of the local delivery charges. The implemention of this recommendation, therefore, should be relatively simple and could result in a major reduction in the local delivery costs charged to NHP/SDT funds.

7. PWC San Francisco conduct a cost comparison study in accordance with the provisions of OMB Circular A-76. Since the comparison of the cost of internal operations with commercially available services is an Executive Branch mandate motivated by the desire to achieve economy in operations, PWC San Francisco and NSC Oakland have no choice and should strive to ensure the cost comparison study is done properly. Although cost comparison studies have the potential for generating significant negative feelings and opposition among the work forces involved, the preliminary efforts currently underway at PWC San Francisco appear to have had a positive impact especially in generating a willingness to look at current operations and consider ways to improve their

efficiency. This positive environment needs to be nurtured throughout the study and NSC Oakland needs to take an active part in determining and articulating their requirements so that PWC San Francisco can adequately address them in the statement of work that will be developed and used as a basis for the cost comparison.

8. Additional study be undertaken to closely monitor measurement tons per customer, pallets per customer, cube utilization, and time and mileage requirements in order to develop an accurate database in support of efforts to design a vehicle scheduling algorithm for potential use as part of NAVADS. One approach for doing this is to define, in advance, the data required and have NSC and/or PWC personnel collect it in detail for a period of 30 days or more. This controlled approach to data gathering is necessary since relying on historical data has proven to provide insufficient detail.

9. NAVSUP consider establishing the effectiveness of the utilization of SWT funds in support of local delivery systems as a special interest item for command inspections conducted by NAVSUP's Inspector General. The purpose of this recommendation is to emphasize NAVSUP's concern for efficiency in the utilization of funds and to help re-orient those commands which might continue to view the performance of their local delivery systems only in terms of effectiveness.

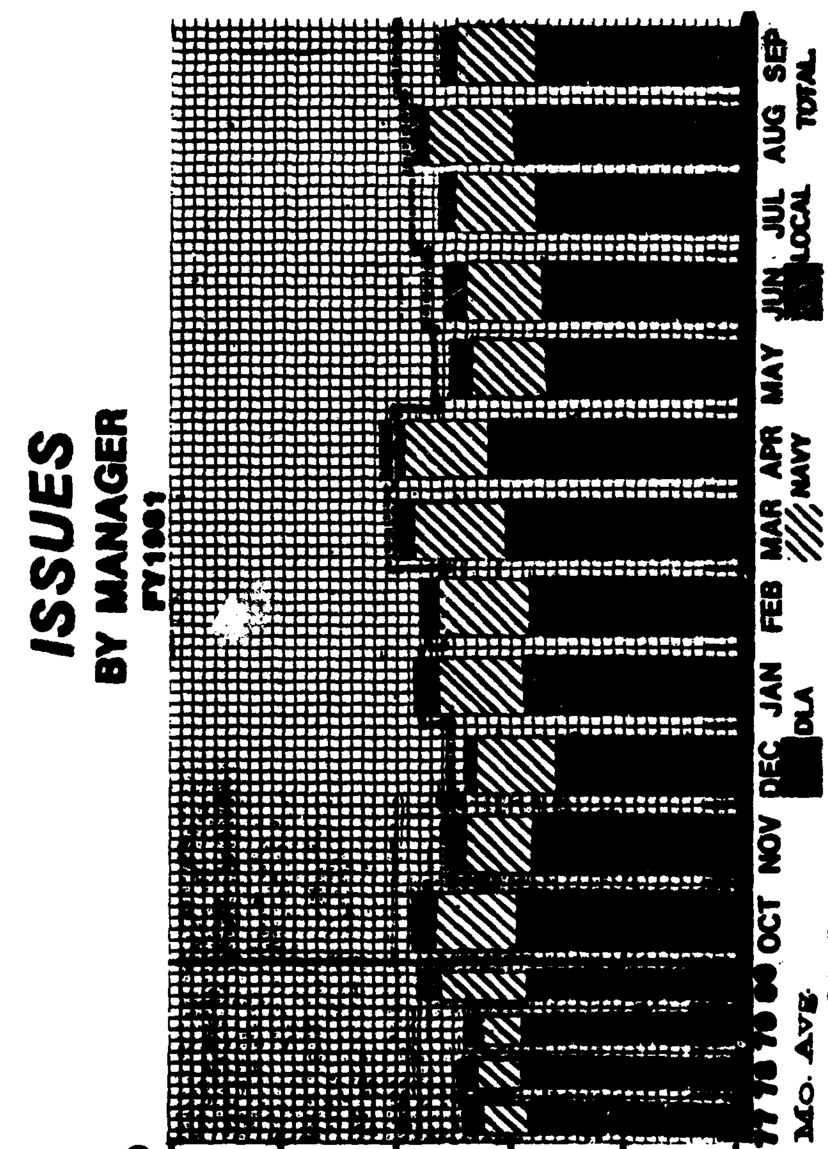
It is recognized that implementation of most of these recommendations will cost NSC Oakland additional resources (money, people, time, etc.) and that any cost savings generated will accrue to NAVSUP managed SWT funds and not NSC Oakland operating funds. The lack of a direct economic incentive for NSC Oakland may make the acceptance and implementation of these recommendations more difficult then normally expected. Additionally, since the performance of the local delivery system is based primarily on achievement of UMMIPS time standards, it may be difficult to implement any changes that do not directly contribute to reduced transportation hold times. These are but two of the many behavioral considerations involved with implementing changes to how NSC Oakland, or any organization, is currently doing business and they point to the difficulty in implementing changes in general.

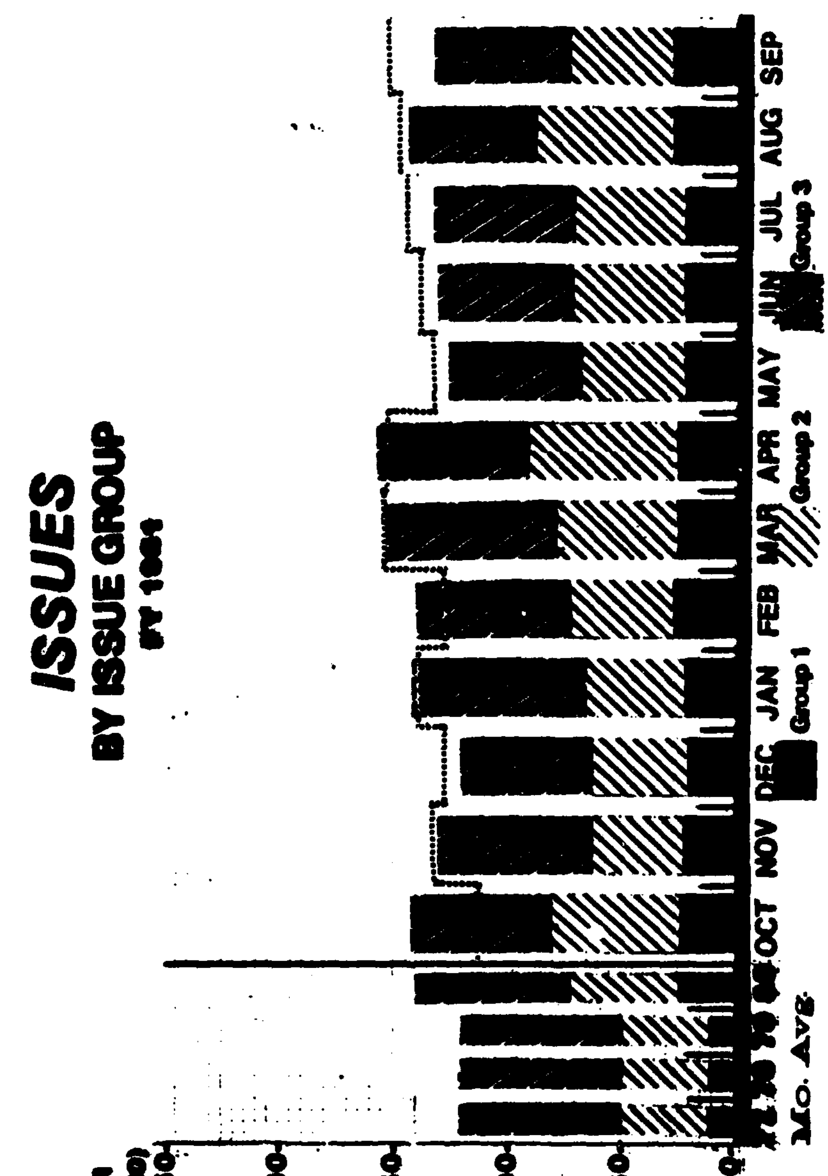
Nonetheless, it appears that the time has come to give a closer look at not only the effectiveness of local delivery operations, but also at their efficiency. Although these two perspectives are different, it seems appropriate to strive for a balance between the two. There appear to be several actions that can be initiated to improve the efficiency of NSC Oakland's local delivery system and, if thoughtfully implemented, these actions should not adversely impact the system's overall effectiveness.

It is hoped that, in addition to describing some of the cost and time utilization characteristics of NSC Oakland's local delivery system, this study will generate a renewed emphasis regarding the efficient utilization of SWT funds in support of the local delivery function.

APPENDIX A

SUPPLY OPERATIONS STATISTICS FOR FY 1981




ISSUES
BY ISSUE GROUP
FY 1984
LI
(000)
250
200
150
100
50
0
Mo. Avg
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
Group 1
Group 2
Group 3

AD-A120 397 NAVAL POSTGRADUATE SCHOOL MONTEREY CA F/G 15/5

AN ANALYSIS OF LOCAL DELIVERY COSTS AND TIMES AT NAVAL SUPPLY C--ETC(U)

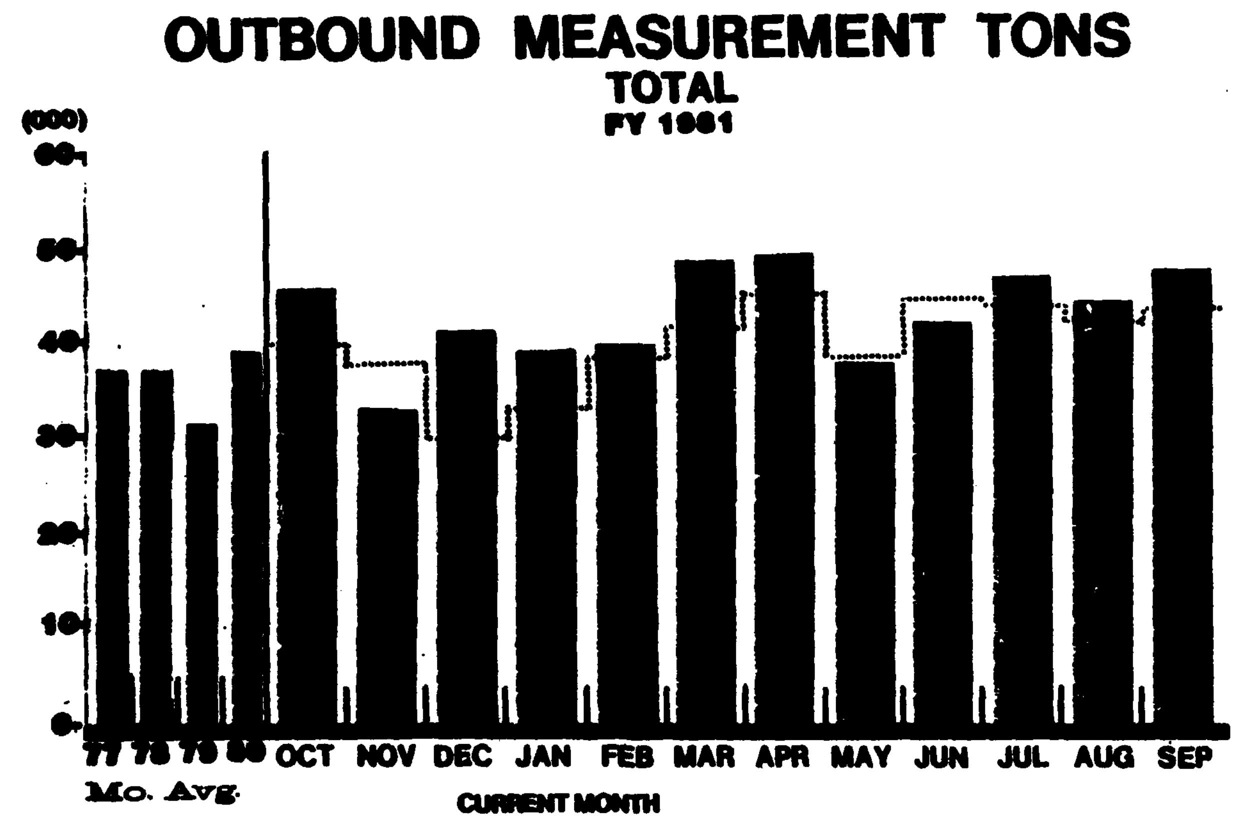
JUN 82 D G ALLION, J E TUFTS

UNCLASSIFIED NL

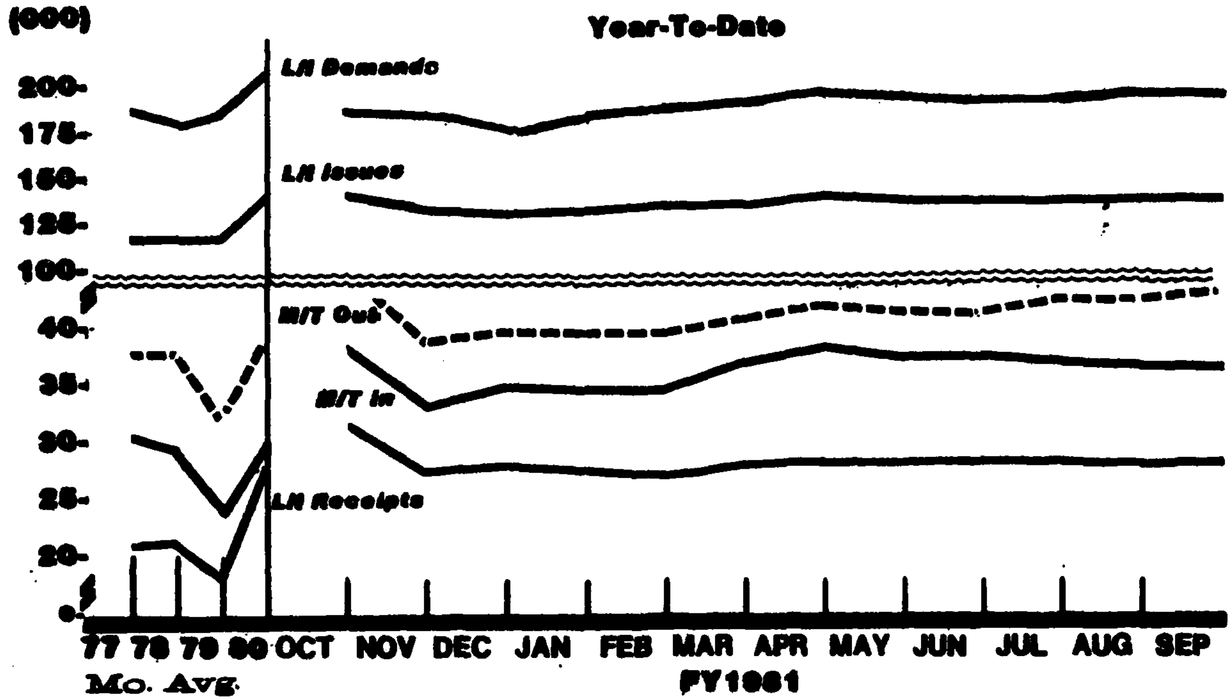
2 of 2

END

11-82


OUTBOUND MEASUREMENT TONS
TOTAL
FY 1981
(000)
60
50
40
30
20
10
0
77 78 79 80
Mo. Avg.
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
CURRENT MONTH

Average Monthly Workload



COMPARISON OF SELECTED DATA

		FY 1981 NO. AVG.	COMPARISON FY 1981 NO. AVG. / FY 1980 NO. AVG.
DEMANDS		195,959	- 5%
ISSUES	ISSUE GROUP I	24,237	- 2%
	ISSUE GROUP II	48,809	+ 2%
	ISSUE GROUP III	64,745	- 2%
	TOTAL ISSUES	137,791	- 1%
RECEIPTS		28,611	+ 3%
TOTAL MEASUREMENT TONS	-INBOUND	36,549	+ 22%
	-OUTBOUND	42,918	+ 9%
NET MATERIAL AVAILABILITY	DLA	88.4%	UP 3.4%
	NAVY	84.7%	DOWN 0.5%
	LOCAL	85.2%	DOWN 7.4%
NET MATERIAL AVAILABILITY TOTAL		87.3%	UP 0.4%

APPENDIX B

SAMPLE TRIP TICKET

VMCC (10)

VEHICLE/EQUIPMENT REQUEST AND RECORD

GOVERNMENT PROPERTY

PART A. To be filled in by Requesting Activity.

1. Requesting Activity	2. Type Equip. Requested	3. With Operator
FHK-#433-TC-NSC.	[illegible]	☒ Yes ☐ No

4. Report to (Name, Bldg., Room)	5. Phone
Ol. @ #433-TC-NSC.	6641

6. Requested Time: Date	Time	7. Destination
5 - OCT 1981		Quick Trans. & MACTO TRAVIS-A.F.B.

8. Accounting Data Chargeable
1687011

9. Signature of Requestor	10. Date
[illegible]	OCT [illegible]

PART B. Transportation Dept. fill in on receipt of request.

1. Request Received: Date	Time	2. Received by (Signature)
5 - OCT 1981		[illegible]

PART C. DISPATCH AND USE INFORMATION

1. [illegible] No.	2. Equip. Type	3. [illegible] Code
96-37586	97-26416	6614-0816

4. Date Dispatched	6. Time		7. Total Hours Used
5 - OCT 1981	In	2100	4 1/2 HRS
	Out	1630	

5. Date Returned	8. Meter Readings		9. Total Miles
	In	20772	102
	Out	20670	

10. Dispatcher's Signature		11. [illegible]
[illegible]	1 & 2	721

12.	No. Gallons	Cost
Fuel, Passenger [illegible]		$

13. Remarks [illegible]

5 OCT 1981

97-26416 spotted at 433NSC

PART B. TRIP INFORMATION

DESTINATION	TIME		ODOMETER READING	REPORT TO
	ARRIVE	DEPART		
1	2	3	4	5
410	1630	1635	20670	
433	1640	1705	20671	
TAFB QT	1820	1845	20719	
TAFB MAC	1855	1940	20721	
433	2050	2035	20772	
410	2100		20772	

I certify equipment was used for OFFICIAL purposes.

[illegible] (Signature) | [illegible] (Signature)

LIST OF REFERENCES

1. Naval Supply Center Oakland, Organization Manual, NSCOINST 5450.3R, 21 September 1981.

2. Public Works Center San Francisco, PWCSFRAN INSTRUCTION 2030.1F, 14 July 1981.

3. Naval Supply Center Oakland, NSCO INSTRUCTION 4614.3D, 4 April 1979.

4. Department of Defense, Joint Logistics Command, DOD Material Distribution Study (DODMDS) Volume I, July 1978.

5. Gallo, Chris and Carpenter, Robert, "Aviation Wholesale Supply Support Consolidation," The Navy Supply Corps Newsletter, pp. 29-31, July 1980.

6. Hernandez, E. S. Jr. and Gallitz, R.J., An Analysis of the Oakland Naval Supply Center's Bay Area Local Delivery System, Master's Thesis, Naval Postgraduate School, Monterey, California, June 1976.

7. Wieczorek, R. J. and Eastlund, L.E., An Analysis of Material Distribution form Naval Supply Center, Oakland to Local Customers, Master's Thesis, Naval Postgraduate School, Monterey, California, December 1979.

8. Hrabosky, B. Jr., Owen, W.A., and Popp, R.G., Pre-Consolidation Supply Support for NARF Alameda and NSC Oakland Local Customers, Master's Thesis, Naval Postgraduate School, Monterey, California, September 1980.

9. Clausen, C. O., Vehicle Routing Algorithms for Local Delivery at Naval Supply Centers, Master's Thesis, Naval Postgraduate School, Monterey, California, March 1981.

10. Eller, J. M., and Moore, R.T. III, An Analysis of Material Distribution from NSC San Diego to Local Customers, Master's Thesis, Naval Postgraduate School, Monterey, California, September 1981.

11. Robertson, J. M., Pre-Consolidation Supply Demand Patterns of NARF North Island and Local Customers of the Naval Supply Center San Diego, Master's Thesis, Naval Postgraduate School, Monterey, California, September 1981.

12. Office of Management and Budget, Circular No. A-76: Acquiring Commercial or Industrial Type Products and Services Needed by the Government, 29 March 1979.

13. "Focus on the Future," The Navy Supply Corps Newsletter, p. 53-57, July 1980.

14. Industrial Naval Air Station Alameda and Naval Supply Center Oakland, Draft Wholesale Supply Support Consolidation and Warehouse Modernization Plan, 23 March 1979.

15. Navy Fleet Material Support Office, Navy Automated Transportation Documentation System (NAVADS) Requirements Statement, FMSO Document No. NAVADS RS-01, 28 February 1978.

16. Defense Logistics Agency, Defense Logistics Agency Manual 7000-1, undated.

17. Connel, G., Barks, J. and Perez, E., Bay Area Distribution Study, Draft report prepared for Navy Material Transportation Detachment Oakland, undated.

18. Navy Material Transportation Office UNCLASSIFIED Letter 00X:JC to Naval Supply Systems Command, Subject: Norfolk Area Local Delivery System Study, 5 March 1982.

INITIAL DISTRIBUTION LIST

		No. Copies
1.	Defense Technical Information Center Cameron Station Alexandria, Virginia 22314	2
2.	Defense Logistics Studies Information Exchange U.S. Army Logistics Management Center Fort Lee, Virginia 23801	1
3.	Library, Code 0142 Naval Postgraduate School Monterey, California 93940	2
4.	Department Chairman, Code 54 Department of Administrative Sciences Naval Postgraduate School Monterey, California 93940	1
5.	Professor A. W. McMasters, Code 54Mg Department of Administrative Sciences Naval Postgraduate School Monterey, California 93940	5
6.	Commander P. W. Blondin, Code 54Zf Department of Administrative Sciences Naval Postgraduate School Monterey, California 93940	5
7.	LCDR D. G. Allion NAVMAT Detachment, Riyadh APO New York, New York 09038	1
8.	LCDR J. E. Tufts U.S.S. Sacramento (AOE-1) FPO Seattle, Washington 98799	1
9.	Naval Supply Systems Command Code 054 Washington, D.C. 20376	1
10.	Mr. H.J. Lieberman Code Sup 0431B Naval Supply Systems Command Washington, D.C. 20376	1
11.	Naval Supply Center Code 401 Oakland, California 94623	1
12.	Director, Operations Analysis Office Code 08.3 Naval Supply Center Oakland, California 94623	5
13.	Commanding Officer Navy Fleet Material Support Office Code 93 Mechanicsburg, Pennsylvania 17055	1

14. Commanding Officer 1
Navy Material Transportation Office
Norfolk, Virginia 23511

15. Officer-in-Charge 1
NAVMTO Detachment
Oakland, California 94623

16. Public Works Center San Francisco 1
PO Box 24003
Oakland, California 94623

17. LCDR B.J. Maguire 1
Code 49
Naval Supply Center
San Diego, California 92132