1976-06

An analysis of the Oakland Naval Supply Center's Bay Area local delivery system

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AN ANALYSIS OF THE OAKLAND NAVAL SUPPLY CENTER'S BAY AREA LOCAL DELIVERY SYSTEM

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THESIS

AN ANALYSIS OF THE OAKLAND NAVAL SUPPLY CENTER'S BAY AREA LOCAL DELIVERY SYSTEM

by

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June 1976

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) An Analysis of the Oakland Naval Supply Center's Bay Area Local Delivery System		5. TYPE OF REPORT & PERIOD COVERED Master's Thesis June 1976 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Edward Simon Hernandez, Jr. Ronald James Gallitz		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 1976 13. NUMBER OF PAGES 103
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office) Naval Postgraduate School Monterey, California 93940		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)		

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

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The current method of operation has been compared to a number of alternative approaches and each, in turn, has been analyzed with a view toward effecting a system that would

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Conclusions and recommendations have been made taking into account the assumptions developed, the research effort made, and the findings uncovered during the analysis.

An Analysis of the Oakland Naval Supply Center's Bay Area Local Delivery System

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MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
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LIST OF ABBREVIATIONS

ACRONYM	DEFINITION
BALD	Bay Area Local Delivery
CASREP	Casualty Report
CWT	Hundred Weight
DOD	Department of Defense
DOT	Department of Transportation
DSA	Defense Supply Agency
GBL	Government Bill of Lading
GSA	General Services Administration
MHE	Material Handling Equipment
MOTBA	Marine Ocean Terminal Bay Area
MSCPAC	Military Sealift Command Pacific
MTIS	Material Turned-In to Store
MTMC	Military Traffic Management Command
NAVFAC	Naval Facilities Engineering Command
NAVSUP	Naval Supply Systems Command
NSC	Naval Supply Center
OPTAR	Operating Target
POA	Pacific Overseas Activities
PUC	Public Utilities Commission
PWC	Public Works Center
PWCSANFRAN	Public Works Center San Francisco
SERVMART	Self Service Fleet Shopping Market for Consumables and Fast Moving Supplies
SOAP	Supply Operations Assistance Program
UMMIPS	Uniform Military Material and Issue Priority System

USN	United States Navy
VSP	Vehicle Scheduling Program

I. INTRODUCTION

During this climate of austere defense funding, every possible avenue must be explored if the Navy is going to save valuable resources. The physical distribution area presented a major avenue of potential savings. Can a total cost approach to physical distribution save the Navy money with no loss in efficiency? Are standards set during times of conflict applicable during a peacetime situation? Is there a way to do the same job for less money with comparable service?

In this thesis, special focus has been placed on the local delivery of items from a Naval Supply Center to its customers, in particular, the Bay Area Local Delivery System of the Naval Supply Center, Oakland, California. It was hoped that any improvements unveiled at Oakland could be expanded to other supply centers throughout the Navy. How important is physical distribution? On page three of Reference 10, Peter Drucker stated:

> Almost 50 cents of each dollar the American consumer spends for goods goes for activities that occur after the goods are made, that is after they have come in finished form off 'the dry end of the machine,' to use the papermaker's graphic term. This is distribution, one of the most sadly neglected, most promising areas of American business.
>
> The activities that are encompassed by the broad term distribution include sorting and cutting, invoicing, billing and other paperwork, labeling, packaging, storing, moving, shipping, plus wholesaling, retailing, financing, and insuring.

The potential for improvement in the civilian sector was every bit as viable in the military organization. Due to the nature of the defense mission, cost considerations were often excluded or overlooked to meet the operational commitments of the active forces. In other words, do not be concerned with secondary transportation costs, get the material out to the customer; the money will take care of itself. This philosophy may be necessary during wartime, but in a peacetime environment every facet of the military operation comes under close scrutiny.

To better understand the Navy distribution system and the local delivery aspect in particular, a closer look at a supply center's mission was necessary.

A Naval Supply Center is a shore (field) activity in an active operating status under a commanding officer and the jurisdiction of the Commander, Naval Supply Systems Command (NAVSUP). It is also subject to the area coordination and authority of the commandant of the appropriate naval district of which it is a part.

In a general sense, the mission of a NSC is to provide supply and support services to the fleet units and shore activities as assigned. It is also to perform such other functions as may be directed by the Commander of NAVSUP.

A. FUNCTIONS

The supply support aspect, as delineated on pages one through eight of Ref. 13, may include the following functional tasks:

1. Provide full supply support for the materials stocked to active and reserve fleet units.

2. Support all Navy shore activities within its appropriate Naval District which could include large repair activities, major rework facilities, naval air stations, shipyards, and regional medical centers. These features vary from center to center, but no matter what the mix, the job is extremely complex.

3. It can be the single stock point for repair parts required for special projects such as the Deep Submergence Reserve Vehicle Program. This again would vary depending on the NSC.

4. The center supplies the appropriate district with printed forms and subsistence in support of Marine Corps activities.

5. Test facilities, missile ranges, and other districts without NSCs also receive support from the centers.

B. SERVICES

Besides the above functional tasks, numerous services are provided by a NSC. Many of those services are included in the list that follows:

1. It operates a chain of NSC SERVMARTS as economical, time-saving, self-service stores for fleet units, shore commands, and other government activities in the immediate vicinity.

2. Centers provide inventory management and supply support for Ready Supply Stores in their appropriate districts. These

facilities have NSC parts located at them for quick access and ease of operation.

3. The NSC participates in the design and development of new systems dealing with supply and finance as directed by NAVSUP.

4. Numerous accounting services are provided to tenant and other selected activities.

5. Household goods services, storage, and movement are handled for eligible Department of Defense (DOD) personnel.

6. Computer services for other activities are provided on a continuing basis as long as personnel resources and machine capabilities permit it.

7. The NSC often serves as the central area purchasing activity for firm fixed price purchase transactions of ten thousand dollars or less.

8. Civilian personnel services are provided for tenant activities by supply centers.

9. The center is often the area representative for the Military Traffic Management Command (MTMC).

10. On a reimbursable basis, when authorized by NAVSUP, it provides marine terminal services to other government activities and commercial interests.

11. The NSC operates a marine terminal facility for the receipt, shipment, and transshipment of DOD-sponsored ocean cargo.

12. The centers often operate defense fuel support points of the Defense Supply Agency (DSA) for bulk petroleum support of military and federal activities.

13. The NSC may act as the on-scene commander for providing rapid and integrated response to operational pollution spills from Navy facilities in the harbors in which they are located.

14. They serve as the material turned-in to store (MTIS) processing activity for afloat and ashore activities.

15. The NSC serves as the supply operations assistance program (SOAP) processing point for fleet units designated by Commanders in Chief of the various fleets.

16. The centers provide support to foreign governments through Grant Aid and Military Assistance Program projects.

17. As a designated direct overhaul point, the NSC receives, stores, packs and issues material through off-site repair activities.

18. The center serves as a fleet issue control point for materials handling equipment (MHE) and special mobile equipment for forces afloat. It also does that for automotive vehicles for issue at the direction of the Naval Facilities Engineering Command (NAVFAC).

19. The NSC maintains a library of specifications and standards used by the Department of the Navy and furnishes to DOD contractors, forces afloat, and other naval activities, information regarding identification, substitution, commercial description and estimated cost of repairs for all types of material.

20. It provides temporary storage space to fleet units on a space available basis.

21. Supply centers also usually provide training and licensing services for industrial MHE operators for local commands and for personnel of the active fleet on a reimbursable basis as required.

22. The NSC ships or delivers material to customers when requisitioned or when directed by higher authority.

This list is just a sampling of the total mission of a Naval Supply Center, and it can be seen that the local delivery system is a small but important portion of the complete responsibility assigned to the activity.

With the mission of the supply center in focus, it is appropriate now to define the problem being addressed in this study; that is, the potential for cost savings in the BALD system.

The local delivery system, as it now stands, works, but there remains a question as to whether it could be improved upon. The BALD system was providing its customers with excellent service, but what was it costing the Navy to provide that level of service? This thesis will analyze the current system with the intent of determining whether a more efficient way exists to provide equivalent or better service at a lower total cost.

Because transportation just seems to happen (it is too often taken for granted), cost savings are seldom realized due to lack of sufficient management attention. To minimize the total cost of the United States Navy (USN) distribution system, every aspect must be investigated.

This study will approach distribution costs from a micro viewpoint. Although the results may not hold for the entire spectrum of Naval activities, the authors believe that the conclusiveness of this study will be enhanced by limiting the scope of the analysis. Before proceeding to the details of the research findings in the thesis, more elaboration on the background of the subject is appropriate.

C. BACKGROUND

This study was undertaken as a result of a visit to NSC Oakland. One of the division directors suggested that some assistance could be used in analyzing the costs and operation of the local delivery system at the center. It was agreed that the current system would be observed and evaluated with an objective of providing recommendations for improving the operation.

The organization was broken down for clarification at various levels. Organization charts depicting the relationships involved are located in Appendices A through D.

The local delivery section's function as defined in Ref. 19 under the traffic department was as follows:

> Receives, checks, consolidates, stows, stages and loads all cargo consigned to local fleet units and San Francisco Bay Area DOD activities; maintains delivery schedules; receives center generated water freight designated for POA and European customers for forwarding to MOTBA. Provides support to MSCPAC ships by receiving and delivering center generated and vendor receipts stores.

Further amplification indicated that BALD was charged with delivery of requisitioned material to shore and fleet units

within a 60 mile radius of the San Francisco-Oakland Bay Area. Deliveries were also made to Monterey, California, on a weekly or more frequent basis as required. All material for BALD passed through Building 341 on the NSC Oakland complex, after having been received from the material department. A detailed discussion of the inner workings and mission of the BALD system follows in the research findings section of this thesis.

Prior to July 1974, the public works function was a department of the supply center and, as such, under the Commanding Officer's control. The scheduling of vehicles could be accomplished in a manner that the center's efficiency requirements dictated. A total cost approach that could optimize the attainment of command goals through complete control of all the departments was possible under that set-up. At one time, a contract was offered for civilian trucking companies to handle the BALD workload. The contract was in affect for two years, but it was not renewed because of the high costs involved. Another item that caused problems was controlling the trucks once they left the compound. The trucking company was only responsible for the performance of duties as specified in the contract. Coordination and communication conflicts could easily develop and this was particularly true in the crisis oriented support system of the military organization.

In 1974, the public works department was detached from the supply center and a separate command was formed. The vehicle scheduling and dispatching function had been set up in the public works area while it was attached to the center. In negotiations with the newly created organization, it was

decided to have the function remain with public works. That situation led to the current arrangement.

The supply function wanted maximum vehicle usage at minimum cost to cover operational goals. On the other hand, Public Works Center, San Francisco (PWCSANFRAN), wanted to recover all its vehicle costs and to do this, it had to charge high labor and overhead fees. When the goals of the commands conflicted, each organization was likely to follow the course that would fulfill its own objectives. The outcome of that policy might be unsatisfactory results by either command. In fact, it may be detrimental to the overall services' performance.

The intent of this thesis was to look at the alternatives available to the local delivery system, analyze each in turn, and develop a plan for possible improvement for the entire operation. The authors believed there might be a way to do the job more efficiently, with fewer resources expended, and at a lower total cost than the current method. During the research, related areas of cost savings were noted and addressed in the recommendations area of this study. To complete the analysis, assumptions had to be made on certain aspects of the operation.

These assumptions are listed later in the study. The overall objective of this project was to devise a method that would enhance the Oakland BALD system through improved performance and total cost reduction.

II. RESEARCH FINDINGS

To reiterate, the objective of this study was to compare the local delivery procedures being utilized to several alternatives in order to determine if those procedures should be continued, modified, or a new system adopted. Before that determination could be made, a detailed study of the current system was necessary. The analysis was conducted by: interviewing BALD personnel, observing BALD operations, examining the flow of BALD paperwork, analyzing BALD workload statistics, analyzing vehicle usage reports, analyzing available data on vehicle rental costs, and interviewing PWCSANFRAN Transportation Division personnel.

A. THE CURRENT OPERATION

The BALD section utilized PWCSANFRAN tractors, trailers and drivers to deliver requisitioned material to fleet and shore activities within a sixty mile radius of NSC Oakland. In addition, material was delivered to the Naval Postgraduate School in Monterey, one hundred-twelve miles from NSC Oakland, three or four times each month.

The vehicles required by BALD were obtained from PWCSANFRAN under an arrangement known as Class "C" dispatch. Under this arrangement, as described in Ref. 3, pool vehicles could be dispatched on an individual-trip basis, either as "U-Drive" or chauffeured equipment. In accordance with a verbal agreement between the Naval Supply Center Oakland and the PWCSANFRAN, all vehicles provided to BALD were chauffeured.

The BALD operation was manned by a staff of fifteen civilian employees. The organization was divided into two distinct units - office personnel and cargo handlers. The cargo handlers were further divided into receiving and shipping sections, but there was a significant amount of joint effort and overlapping of responsibility in order to handle the fluctuating workloads in those sections.

The BALD supervisor was knowledgeable and highly motivated. The office, receiving, and shipping supervisors were also very effective and dedicated employees.

Cargo for customers in the NSC Oakland local area was brought to the BALD section from various locations on the Supply Center for consolidation and delivery. Upon receipt, the cargo was sorted and segregated by customers. This material was generally received with a minimum amount of packing, and it was pláced loose on pallets for delivery. One copy of the paperwork (DD 1348-1, Issue and Shipping Document; DD 1384, Transportation Control Movement Document, or Contract) was removed from each line item received and forwarded to the office unit for processing. Office personnel divided the documents into three groups: shore stations, USS ships and USNS ships. The documents were then divided by activity within the groups.

Each document listed the weight and cube of the cargo covered. The weight and cube of cargo on hand for each activity was then totaled. Once those totals were obtained, the type of vehicle required to deliver the cargo could be determined and delivery schedules could be prepared. The

delivery schedule listed the volume of cargo (weight and cube) to be delivered to each activity and also the sequence for loading and delivering the cargo.

Once the delivery schedule was prepared and the USN Number of the trailer that would carry the cargo was known, paperwork necessary to establish the Proof-of-Shipment File could be completed. That procedure consisted of: (1) accumulating one copy of the paperwork for each line item loaded in the trailer, (2) preparing a cover sheet for the paperwork (12ND NSC 4480/11), (3) forwarding the cover sheet and other paperwork to the Data Processing Department for additional processing. A blank copy of the cover sheet that was prepared is included as Appendix E.

The Data Processing Department established a file which consisted of one record for each line item delivered. That was accomplished by extracting and key punching the information contained on the cover sheet along with the document numbers listed on the paperwork attached to the cover sheet. The most important information contained in that record was: (1) the document number for each line item shipped, (2) the date shipped, (3) the mode of shipment, (4) the USN Number of the truck or trailer that delivered the cargo. That file was maintained in order to establish proof that cargo was shipped and to assist in locating lost cargo.

The majority of customers serviced by BALD have been divided into three delivery zones. The volume of cargo on hand was normally sufficient to justify scheduling of one twenty-ton van, on normal workdays, to serve each of the

three zones. The following activities were included in the delivery zones. Distant activities outside the zones which received cargo weekly also follow:

ZONE ONE

Location/Activity	Number of Miles from NSC Oakland
Richmond, Naval Fuel Depot, Point Molate	15
Skaggs Island, Naval Radio Station	27
Mare Island	28
1. Marine Barracks	
2. Coastal River Division II	
3. Submarine Development Group I	
4. Naval Inactive Ship Maintenance Facility	
5. Nuclear Power School	
6. Combat System Technical School	
7. Pacific Reserve Fleet	
8. Mare Island Submarine Group	
9. Naval Reserve Training Center	
10. Combat Rations Warehouse	
11. NSC Oakland Building	
12. Supply Overhaul Assistance Program	
13. Naval Support Activity	
14. Commissary	
15. Receiving Warehouse	

ZONE TWO

Location/Activity	Number of Miles from NSC Oakland
Treasure Island	6
1. Marine Corps Receiving	
2. General Supplies and Provisions Warehouse	
3. Naval Support Activity	

Hunters Point	14
1. Naval Reserve Training Center	
2. Marine Barracks	
3. Receiving Warehouse	
San Bruno	22
1. Public Works	
2. 23rd Marine Division	
3. Federal Records Center	
Presidio of San Francisco	9-14
1. Sixth Army Storage Facility	
2. Crissy Field, Sixth Army	
3. MARS Consolidated Warehouse	
4. Provisions Warehouse	
5. Supply Division	
San Francisco	7-14
1. General Services Administration	
2. Regional Office of Civilian Manpower Management	
3. 12th Coast Guard District Office	
4. United States Marine Corps, Pacific Headquarters	
5. United States Department of Labor Bureau of Employee Compensation	
6. General Services Administration Printing and Publications Branch	
7. Coast Guard Air Station, San Francisco International Airport	

ZONE THREE

Location/Activity	Number of Miles from NSC Oakland
Naval Air Station Alameda	7
1. Supply Department	
2. Fleet Marine Air Group	
3. Navy Exchange	
4. Commissary Store	
5. Receiving Warehouse	

Alameda	2
1. Naval Reserve Training Center	
2. Coast Guard Training Center, Government Island	
3. Webster Street Storage Facility	
4. Alameda Commissary	
5. Alameda Provisions Storage Facility	
Oak Knoll Hospital, Navy Regional Medical Center	12
Oakland	3-10
1. Naval Recruiting District Office	
2. Medical Supply Corps Facility	
3. Naval Public Works Center	
4. Western Airmotive Incorporated	
5. Dreisbach Cold Storage	
6. Oakland Airport	
Concord, Naval Weapons Station	33

DISTANT ACTIVITIES

Location/Activity	Number of Miles from NSC Oakland
Dixon, Naval Radio Station	78
Stockton	78
1. Communication Station	
2. Commissary	
3. General Services Administration, Rough and Ready Island	
Lathrop, Sharpe Depot	36
Tracy	58
1. Defense Depot	
2. Defense Medical Depot	
Monterey, Naval Postgraduate School	112

In addition to the above activities the BALD section also delivered cargo daily to approximately twenty ships which were located at Mare Island, Alameda, Oakland, Treasure Island, Hunters Point, Concord and Point Molate.

While observing the vans being loaded, it was noted that it was frequently impossible to fully utilize the cube of the vans due to a wide variety of material sizes and shapes. In fact, as stated earlier, the material was protected by a minimum of packing and placed on pallets loose which made the stacking of pallets impractical.

1. Volume of Cargo Delivered by the BALD Section.

The BALD section delivered 28,586,168 pounds of cargo in Fiscal Year 1975. Based upon recorded weights for the period 1 July 1975 through 29 February 1976 and estimated weights for the period 1 March through 30 June 1976, it was anticipated that 26,805,662 pounds of cargo would be delivered by the BALD section in Fiscal Year 1976.

Tables 1 and 2 summarize BALD workload statistics for Fiscal Years 1975 and 1976. The data was extracted from statistical records maintained by the Traffic Division Director's Office and from records maintained in the BALD section office.

2. Vehicle Usage.

Tables 3 and 4 illustrate BALD vehicle usage for normal workdays (Monday - Friday excluding holidays) from 1 October 1975 through 29 February 1976. The data was extracted from the PWCSANFRAN Monthly Transportation Rental Charges Report No. 5H88 for the months of October 1975 through February 1976.

Table 5 is a summary of the PWCSANFRAN Transportation Rental Report covering BALD operations for the month of February 1976. It clearly shows that the type and volume of vehicles utilized by BALD varied significantly from day to day.

TABLE 1

BALD WORKLOAD

July 74 - June 75

Fiscal Year 1975

MONTH	WEIGHT	MEASUREMENT TONS	CUBE
JULY	2,354,877	2,152	86,080
AUGUST	3,088,384	2,836	113,440
SEPTEMBER	2,352,880	2,270	90,800
OCTOBER	2,497,286	2,314	92,560
NOVEMBER	2,617,707	2,684	107,360
DECEMBER	2,086,273	2,121	84,840
JANUARY	2,251,428	2,104	84,160
FEBRUARY	2,309,078	2,152	86,080
MARCH	2,118,319	1,532	61,280
APRIL	2,498,691	2,447	97,880
MAY	2,294,177	2,312	92,560
JUNE	2,117,068	1,864	74,560
TOTALS	28,586,168	26,788	1,071,600
AVERAGES	2,382,181	2,232	89,300

TABLE 2

BALD WORKLOAD

July 75 - June 76

Fiscal Year 1976

MONTH	NUMBER OF DOCUMENTS	WEIGHT	MEASUREMENT TONS	CUBE
JULY	15,923	3,154,700	3,044	121,760
AUGUST	12,336	2,274,241	1,999	79,960
SEPTEMBER	14,431	1,770,569	1,584	63,360
OCTOBER	12,030	2,247,003	1,994	79,754
NOVEMBER	14,718	2,098,281	2,376	95,025
DECEMBER	14,716	2,030,111	2,121	84,859
JANUARY	17,520	2,129,689	2,378	98,282
FEBRUARY	18,597	2,165,848	2,306	92,236
Projected MARCH-JUNE*	62,064	8,935,220	8,900	357,620
TOTALS	182,335	26,805,662	26,702	1,072,856
AVERAGES	15,195	2,233,805	2,225	89,405

*Projected figures for March through June 1976 were calculated by totaling July 1975 through February 1976 figures, dividing by eight and multiplying by four.

TABLE 3

BALD VEHICLE USAGE

Average and Range (Oct 75 - Feb 76)

EQUP CODE	DESCRIPTION	AVERAGE NUMBER OF HOURS USED PER NORMAL WORKDAY*	RANGE OF HOURS UTILIZED ON NORMAL WORKDAY**
0313	Truck, 1/2 ton, pickup	5.9	0-19
0603	Truck, 5 ton, stake	2.7	0-16
0604	Truck, 5 ton, tractor	7.0	0-18
0614	Truck, 7-1/2 ton, tractor	33.0	0-74
0630	Truck, 10 ton, tractor	2.9	0-31
0645	Truck, 15 ton, tractor	1.3	0-9
0812	Trailer, 11-14 ton, stake	3.1	0-14
0813	Trailer, 11-14 ton, stake	11.3	0-24
0816	Trailer, 20 ton, stake	143.3	19-256
0817	Trailer, 20 ton, van	29.7	0-59

*Average number of work hours used per normal workday was calculated by dividing the total number of normal work hours utilized during October 1975 through February 1976 by the number of workdays during that period.

**Range of hours utilized on normal workdays was extracted from the PWCSANFRAN monthly Transportation Rental Charges Reports, No. 5H88 for the months of October 1975 through February 1976.

TABLE 4

BALD VEHICLE USAGE

October 75 - February 76

EQUP CODE	Normal Work Hours Utilized In: OCT	NOV	DEC	JAN	FEB	TOTALS
0313	186	163	116	97	31	593
0603	58	100	36	80	0	274
0604	132	135	149	169	118	703
0614	760	612	644	712	593	3,321
0630	80	25	21	82	82	290
0645	8	55	24	23	19	129
0812	40	94	27	16	133	310
0813	265	274	179	160	247	1,125
0816	3,154	3,288	3,058	2,980	1,850	14,330
0817	609	531	630	650	554	2,974

TABLE 5

BALD DAILY VEHICLE UTILIZATION

(in hours) for the month of

February 1976

EQUP CODE	SUN 1	MON 2	TUES 3	WED 4	THUR 5	FRI 6	SAT 7	SUN 8	MON 9	TUES 10	WED 11	THUR 12	FRI 13	SAT 14	SUN 15
0313	0	3	3	3	3	0	0	0	0	3	0	0	0	0	0
0445	0	0	4	0	4	0	0	0	0	6	3	8	8	0	0
0603	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0604	0	5	7	9	15	7	0	0	7	5	5	8	0	0	0
0614	0	24	20	30	28	31	0	0	44	42	37	36	28	1	0
0630	0	2	4	2	8	0	0	0	0	0	5	4	6	0	0
0645	0	6	6	0	0	0	0	0	0	0	0	0	0	0	0
0812	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
0813	8	16	12	8	16	8	8	8	16	15	11	16	8	8	8
0816	88	104	114	103	113	88	64	64	74	108	112	96	94	72	72
0817	16	33	29	38	36	16	32	32	29	23	32	33	27	16	16
0825	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MISC	0	8	0	5	8	8	0	0	8	0	0	0	0	0	0
TOTALS	120	209	207	206	239	166	112	112	186	210	213	209	179	105	104

TABLE 5 (CONTINUED)

EQUP CODE	MON	TUES	WED	THUR	FRI	SAT	SUN	MON	TUES	WED	THUR	FRI	SAT	SUN
	16*	17	18	19	20	21	22	23	24	25	26	27	28	29
0313	0	3	3	0	0	0	0	0	0	0	0	0	0	0
0445	0	8	0	4	4	0	0	3	8	5	0	0	0	0
0603	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0604	0	0	8	6	8	0	0	6	6	4	0	5	7	8
0614	0	39	28	34	30	0	0	38	25	36	8	8	8	12
0630	0	8	13	7	7	0	0	0	14	2	0	0	8	0
0645	0	0	0	0	0	0	0	0	7	0	0	0	0	0
0812	8	8	8	8	8	0	0	0	0	0	0	0	0	0
0813	8	10	11	14	11	8	8	16	16	12	0	0	0	0
0816	72	91	89	84	91	80	80	84	77	68	0	0	0	0
0817	16	33	26	35	31	16	16	21	24	24	0	0	0	0
0825	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MISC	0	2	8	0	0	0	0	0	0	0	0	0	0	0
TOTALS	104	202	194	192	190	104	104	168	177	151	8	13	23	20

The data contained in this table was extracted from the PWCSANFRAN Transportation Rental Charges Report No. 5H88 for the month of February 1976.

*Holiday

Table 6 shows vehicle utilization on weekends and holidays. After reviewing Table 6, it was apparent that truck utilization on weekends and holidays was insignificant while trailer usage appeared high. The utilization of five to six trailers on weekends could be explained by the need to load the trailers on Friday afternoon for the three delivery zones and generally two or three additional trailers for the other sites. Loading on Friday afternoon was necessary to insure the trailers were ready to depart early Monday morning.

However, the need for as many as fourteen trailers, as shown in Table 7, on non-workdays was difficult to understand. There was also a significant difference between the number of trailers indicated as being utilized by BALD and those billed by PWCSANFRAN. Table 7 illustrates those differences. The data contained in Table 7 was extracted from the Equipment Request and Call-Out Records and Property Pass Log Books maintained in the BALD office and from the PWCSANFRAN monthly Transportation Rental Charges Report No. 5H88 for February 1976.

The reports (PWCSANFRAN monthly Transportation Rental Charges Report No. 5H88 and the PWCSANFRAN Fund Status Report No. 3A86) covering vehicle utilization and cost were held by NSC Oakland Budget Office personnel. Those reports had not been routed to BALD personnel for review. Moreover, BALD personnel did not hold a copy of Ref. 16, which listed the cost of PWCSANFRAN transportation services, and they were not familiar with the contents of the instruction. They were,

TABLE 6

BALD VEHICLE UTILIZATION

On Non-Workdays

1 October 75 through 22 February 76

EQUP CODE	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	TOTAL	AVG. HRS/ NON-WORKDAY*	AVG. NO. OF VEHICLES USED PER NON-WORKDAY**
0313	Truck, 1/2-ton pickup	4	8	0	4	0	16	0.33	0.04
0603	Truck, 5 ton stake	0	0	0	0	0	0	0.00	0.00
0604	Truck, 5 ton tractor	0	8	0	23	0	31	0.65	0.08
0614	Truck, 7-1/2 ton, tractor	16	0	0	58	1	75	1.56	0.19
0630	Truck, 10 ton tractor	0	0	0	0	0	0	0.00	0.00
0645	Truck, 15 ton tractor	6	0	0	0	0	6	0.13	0.16
0812	Trailer, 11-14 ton, stake	0	30	0	13	40	83	1.73	0.22
0813	Trailer, 11-14 ton, stake	16	48	16	95	56	231	4.81	0.60
0816	Trailer, 20 ton stake	1200	1568	864	1324	504	5460	113.75	14.22
0817	Trailer, 20 ton van	108	25	64	234	144	575	11.98	1.50
NON-WORKING DAYS		9	11	10	11	7	48		

* Calculated by dividing total hours utilized by total number of non-workdays.
** Calculated by dividing hours per non-workday by 8 hours.

TABLE 7

BALD RECORDS OF VEHICLE UTILIZATION
COMPARED TO PWCSANFRAN MONTHLY
TRANSPORTATION REPORT NUMBER 5H88
FOR THE MONTH OF FEBRUARY 1976

FEB	DAY	PER BALD RECORDS TRAILERS UTILIZED	PER PWCSANFRAN RECORDS TRAILERS UTILIZED	PER PWCSANFRAN RECORDS TRACTORS UTILIZED
1	SUN	0	15	0
2	MON	5	21	7
3	TUE	3	24	6
4	WED	8	26	8
5	THU	7	26	8
6	FRI	5	15	6
7	SAT	Weekend	14	0
8	SUN	No Record	14	0
9	MON	4	17	8
10	TUE	6	22	7
11	WED	13	21	9
12	THU	12	19	8
13	FRI	4	19	6
14	SAT	Weekend	13	1
15	SUN	No Record	13	0
16	MON	Holiday No Record	13	0
17	TUE	4	20	6
18	WED	4	18	8
19	THU	8	18	7
20	FRI	7	20	7
21	SAT	Weekend	13	0
22	SUN	No Record	13	0
23	MON	5	16	5
24	TUE	6	17	9
25	WED	4	13	7
26	THU	4		
27	FRI	5		
28	SAT	Weekend		
29	SUN	No Record		

Cut-off date for February report was 25 February. Charges after that date were to be included on March report which was not available at time of analysis.

therefore, scheduling transportation without knowing the cost of the equipment being utilized.

An examination of PWCSANFRAN Monthly Transportation Rental Charges Report Number 5H88 for the month of January 1976 indicated that trailers were being paid for on some days when they were not being utilized. When BALD personnel were shown a copy of the report, they were surprised to see that they were paying for some trailers on twenty-eight consecutive days when their records denoted that they should have been charged for two days rental. BALD personnel researched two of the trailers (USN Number 97-22509 which was billed for the period 2 through 29 January and USN Number 97-24000 which was billed for 6 through 28 January 1976) and found that both of the vehicles had been stranded in Alameda.

Conversations with Public Works Center (PWC) Transportation Office personnel revealed that it was the Naval Supply Center's responsibility to advice PWC when a trailer was empty and ready to be returned. BALD personnel were of the opinion that it was PWCSANFRAN's responsibility to determine when trailers were offloaded and ready to be returned. Reference 16 does not discuss responsibility for return of trailers dropped off at outlying activities. A large portion of the differences between trailer usage recorded by BALD and PWCSANFRAN records as shown in Table 7 may be explained by stranded trailers at off-station activities.

The number of tractors utilized daily in February in comparison to the number of trailers utilized also tended to support the theory of stranded trailers. Since BALD did not

record the USN Numbers for tractors utilized, it was not possible to compare BALD records for tractor utilization with PWC-SANFRAN records.

3. Cost of NSC Oakland Local Transportation.

NSC Oakland rented tractors, trailers and drivers from the San Francisco Navy Public Works Center at predetermined rates. In accordance with page three of Ref. 16, hourly charges for truck drivers had been calculated by PWCSANFRAN as follows:

Motor Vehicle Operator (WG-8, 3rd step at $6.45 per hour) working one straight-time hour on a customer job:

Basic hourly rate	$6.45
Accelerated by 35.8%	2.31
Sub-total	$8.76
Applied Overhead	4.91
Total Labor Rate	$13.67

Table 8 provides a listing of the vehicles most frequently utilized and their rental rates. The information contained in Table 8 was extracted from pages four through six of enclosure one of Ref. 16.

NSC Oakland's Fiscal Year budget was $34,361,000 and $776,863 or 2.26 percent was spent for local transportation. It was impossible to determine how much of this cost was the result of BALD operations because costs were not allocated to the various sections within NSC Oakland.

It was estimated that NSC Oakland would spent $905,127 for local transportation in Fiscal Year 1976 from their

TABLE 8

VEHICLES MOST FREQUENTLY UTILIZED BY NSC OAKLAND
AND THEIR RENTAL RATES

EQUP CODE	DESCRIPTION	MONTHLY CUSTODY RATE	HOURLY RATE	MILEAGE RATE
0313	Truck, 1/2 ton, pickup	$ 55.00	.45	.055
0603	Truck, 5 ton, stake	250.00	2.10	.150
0604	Truck, 5 ton, tractor	250.00	2.10	.150
0614	Truck 7-1/2 ton, tractor	320.00	2.65	.150
0630	Truck, 10 ton, tractor	320.00	2.65	.275
0645	Truck, 15 ton, tractor	320.00	2.65	.275
0812	Trailer, 11-14 ton, stake	40.00	.35	N.A.
0813	Trailer, 11-14 ton, stake	40.00	.35	N.A.
0816	Trailer, 20 ton, stake	65.00	.55	N.A.
0817	Trailer, 20 ton, van	65.00	.55	N.A.

$35,902,000 budget. That cost represented 2.52 percent of the Fiscal Year 1976 budget. The cost of local transportation for Fiscal Year 1976 would be 16.5 percent higher

$$\left(\frac{\$905,127 - 776,863}{776,863} = 16.5 \text{ percent}\right)$$

than the cost in Fiscal Year 1975.

Table 9 illustrates the procedure used to calculate the estimated cost of transportation for Fiscal Year 1976. The costs for July 1975 through February 1976 were extracted from the PWCSANFRAN Fund Status Report No. 3A86 for NSC Oakland. It should also be noted that the costs cited include the cost of PWCSANFRAN tractors, trailers, and drivers but does not include NSC Oakland personnel required for staging and loading cargo.

4. Transportation Cost for BALD Operations.

In October 1975 provisions were made to charge NSC Oakland transportation costs to the end user. In order to properly distribute the cost, twelve job-order numbers were established as follows:

Activity	PWCSANFRAN Job Order
Inventory Control	1067051
Fuel	1067052
Nuclear Weapons Supply	1067053
Material Storage	1067054
Material L and E	1067055
Material ALAFAC	1067056
Material Baymart	1067057
Traffic Department	1067058
Expedited Movements	1067059
Land Section	1067060
Bay Area Local Delivery	1067061
Container Section	1067062

TABLE 9

NSC OAKLAND

ESTIMATED TRANSPORTATION COSTS FOR FISCAL YEAR 1976

	ACTUAL COST								PROJECTED COSTS*	
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR-JUN	TOTALS
LABOR COST	60,746	60,183	61,686	65,397	51,287	51,942	58,284	48,985	229,255	687,765
VEHICLE RENTAL COST	16,118	20,076	20,206	17,585	17,016	19,496	17,148	17,263	72,454	217,362
TOTAL COSTS	76,864	80,259	81,892	82,982	68,303	71,438	75,432	66,248	301,709	905,127

*Figures for March through June were calculated by adding July 75 through February 76 figures. The result was divided by eight and then multiplied by four.

Since the establishment of the PWCSANFRAN job-order numbers listed above, the cost of transportation used by the BALD operation was available. Table 10 shows the calculated cost for BALD transportation for the period 1 July 1975 through 30 September 1975, the actual cost for the period 1 October 1975 through 29 February 1976 and the projected cost for the period 1 March 1976 through 30 June 1976.

B. DELIVERY OPERATIONS AT NSC SAN DIEGO

NSC San Diego was visited to determine how another NSC obtained delivery vehicles and also how they scheduled and routed their vehicles. It was found that vehicles were assigned to NSC San Diego on a Class "B" assignment from the Navy Public Works Center, San Diego. Under this arrangement vehicles were assigned on a full-time basis, and they were dispatched and driven by NSC San Diego instead of Public Works personnel. Page 22 of Ref. 12 required the assignment to be reviewed annually by the local Public Works Center or the Naval Facility's Field Engineering Office to ensure that the vehicles were needed to efficiently support the conduct of official business and that utilization requirements were met.

The NSC San Diego dispatcher utilized a radio to provide or request information from NSC drivers. Problems such as non-availability of personnel to offload cargo or high priority cargo movements were frequently resolved through use of the radio. Better vehicle utilization resulted from having radio contact with drivers.

NSC San Diego utilized a computerized IBM program to determine the quantity and type of vehicles required on any given

TABLE 10

BALD TRANSPORTATION COST FOR FISCAL YEAR 1976

	*CALCULATED COST			**ACTUAL COST					***PROJECTED	
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR-JUN	TOTALS
LABOR COST	21,747	21,546	22,084	21,552	18,066	18,361	21,790	17,059	81,103	243,308
VEHICLE RENTAL COST	5,770	7,187	7,234	7,286	7,177	6,532	7,242	5,536	26,982	80,946
TOTAL COST	27,517	28,733	29,318	28,838	25,243	24,893	29,032	22,595	108,085	324,254

*Calculated by dividing total Oct 75 - Feb 76 BALD COSTS by total Oct 75 - Feb 76 NSC Oakland transportation cost to obtain a percentage. This percentage was then applied to the July, August and September transportation costs to determine the calculated costs for BALD.

**Obtained from the PWCSANFRAN Report 3A86 (Fund Status Report).

***Figures for Jul 75 - Feb 76 were totaled, divided by eight and then multiplied by four to obtain the projected cost for Mar - Jun 76.

day. That program also established the sequence of delivery stops in order to minimize the distance traveled and to maximize vehicle utilization.

What did San Diego gain by going to an automated Vehicle Scheduling Program? How did the center go about implementing the automated system? It was decided to test the program in a limited, tightly controlled environment. The fresh provisions deliveries were examined during a ten day period, and detailed statistics and records were kept on the manual scheduling methods. A complete parallel computer originated vehicle loadout and schedule was then produced. By implementing the automated system side by side with the manual system the chance of lost service because of no backup system was eliminated. The results of the test were then displayed on page 27 of Ref. 7 and are repeated here:

> The results were startling: a 15 percent reduction in the number of vehicles required to make deliveries, and a 40 percent reduction in vehicle time.
>
> Although these results were affected by the low volume, and it was unlikely such exceptional results could be achieved elsewhere, the potential was too promising to ignore, and management's decision was an easy one--continue to automate. After additional refinement of the computer programs, each of the other delivery areas was automated over an eight-month period.

The chart below depicts the results of the ten day parallel scheduling test.

	MANUAL SCHEDULE		COMPUTER SCHEDULE	
DATE	TIME	TRIPS	TIME	TRIPS
Day 1	7.50	2	5.42	2
Day 2	16.05	5	10.04	4
Day 3	11.35	3	8.18	3
Weekend	---	-	---	-
Day 6	9.20	3	5.52	2
Day 7	8.10	3	5.40	2
Day 8	9.05	2	4.35	2
Holiday	---	-	---	-
Day 10	12.25	2	5.07	2
TOTALS	73.50	20	43.98	17

Now that it has been shown that automating NSC San Diego created a substantial vehicle time and usage savings, what was the cost savings? Personnel costs were cut through elimination of one scheduler, two truck drivers, and the transfer of one programmer. This was a bonus because at that time, personnel reductions were being ordered throughout the Navy. Gross savings of $19,490 were reported in Ref. 2 by San Diego because of VSP in the personnel area.

With the prior discussion for background, it was appropriate to go into the advantages and disadvantages of VSP.

1. VSP Advantages.

a. Reference 9 stated that VSP has been successful in other places, including England as well as the supply center.

b. Use of computer technology allowed completion of the scheduling job in minutes. The time and cost savings were substantial.

c. The vehicle fleet operating costs were reduced through better utilization of existing equipment.

d. Customer service was improved through systematic deliveries. The ability to loadout commensurate with customer needs was a plus factor.

e. Capital expenditures for new equipment was reduced because the automated system had demonstrated the ability to do the same job with less equipment.

f. Minimization of mileage was programmed into the computer run.

g. Overtime expenses could be minimized through programming which specified maximum route time. The driver's performance could be compared to the computer run estimates in order to evaluate their efficiency.

h. Prompt return of input data led to more efficient order picking as well as more profitable use of warehouse and dispatching personnel.

i. The computer allowed later cutoff times for order processing, giving faster turnaround, as schedules were completed minutes after the data became available.

j. All documents were produced in delivery sequence order, eliminating manual sorting.

k. Summaries of time, mileage, and load by route and in total were provided to assist management in controlling the delivery operation.

l. Substantial overall savings were attained. The user's entire fleet and related manpower expenses might be cut by five to twenty-five percent as demonstrated by those organizations already having utilized VSP.

m. A more accurate and efficient distribution system was the result of operating the automated system. The program could be tailored to the specific user's needs, ensuring optimal outcomes.

n. A variety of additional statistical reports in areas of schedule cost evaluation, labor performance history, and vehicle maintenance recommendations could have been easily produced.

o. Additional features are presented in Appendix F.

2. VSP Disadvantages.

a. The system was dependent on the computer. An electrical failure or machine breakdown could seriously diminish, if not totally disrupt, the delivery of goods to customers.

b. The implementation of VSP would require restraining of the current work force in other areas of the organization. Some marginal production would be experienced during the transition and learning curve period.

c. Management attention and dedication were required to ensure that the program was achieving desired results. Page 179 of Ref. 1 stated:

> Ambition plays a large part in determining a successful distribution system, because success depends upon personal yardsticks. Success is relative. The measures for it must be based upon the objectives of the plans and the degree to which they are achieved . . .
>
> Success depends upon the ability of managers to manage well, supervisors to supervise well, and operators to operate well. Each person in the distribution system must be integrated with the others, because its success will be proportional to the joint effort put into it.

d. The running of VSP required the minimum of an IBM System 360, Model 30, with 32 thousand storage, two 2311 disk storage units, card reader, printer, and console printer. This advantage was a result of the VSP having been written in IBM Basic Assembler Language; therefore, it was not adaptable to all computer systems.

III. ASSUMPTIONS

Certain factors have to be assumed when undertaking a study of this nature. The following assumptions were considered basic to the successful analysis of the BALD operation:

1. If the Naval Supply Center, Oakland, were to obtain its own drivers, the Public Works Center drivers would not have to be displaced because of lack of work. If the drivers were displaced, the supply center would be under no obligation to hire them.

2. The dispatching system shows no favoritism for one command over another. The current method of dispatching satisfactorily fulfills the requirements of all involved parties.

3. The price sheets and forms utilized in this study were correct and any projections, inferences, or recommendations made from them were therefore valid. In particular, data contained in PWCSANFRAN 3A86 (Fund Status Report) and PWCSANFRAN 5H88 (Monthly Transportation Rental Charges) was accurate.

4. The tractors currently used by BALD are being utilized to the fullest, and cost savings could not be effected by reducing the number of tractors or by rescheduling the deliveries. It was assumed that planning in that area had already been done and the best system available was being used.

5. Navy-owned vehicles were identical to those of leasing organizations and could perform the same mission with the same effectiveness. There was no significant difference in the maintenance down by public works and that of the commercial firms, either in cost or in quality of work.

6. A contractual lease arrangement could be written so as to insure uninterrupted use of leased vehicles by NSC Oakland in event of war or other national emergency.

7. If a lease agreement were chosen, there would be no trouble with implementation due to problems with disposition of Navy-owned vehicles currently on hand. Those vehicles would be assigned to augment existing pre-positioned war reserve stocks (which were somewhat depleted during the course of the Vietnam War).

8. Costs quoted by a major commercial organization were comparable to costs that would be quoted by any leasing company. Since the commercial firm researched has been a leader in the truck leasing business, it was regarded a precedence setter. Therefore, the rates quoted could be utilized in this study and compared with public works charges to get an accurate idea of the costs involved in a lease versus buy situation.

9. The company that received the drayage contract was as qualified as all other bidders to do the specified job.

10. NSC Oakland personnel costs for staging and loading cargo would not increase or decrease as a result of changing the source for obtaining tractors, trailers, and drivers.

11. An IBM System 360, Model 30 with 32 thousand storage, two 2311 disk storage units, card reader, printer, and console printer would be available for use, if required, in the San Francisco Bay area.

12. The IBM scheduling program was representative of computer industry vehicle scheduling programs and the authors used IBM only because the activity researched in this study utilized it. The program was believed to be of excellent quality as 20 man years went into its development and it was currently being successfully utilized in organizations throughout the world.

13. Although a substantial number of the line items delivered by BALD were mailable, any reduction in BALD transportation costs would be offset by increased cost to the government for postal service.

The above assumptions have been made to assist the authors in discussing the alternatives selected in this study. They should be kept in mind while reading the chapters that follow.

IV. ALTERNATIVES

The Naval Supply Center, Oakland, was the largest such activity in the U.S. Navy, yet in its functions and types of materials processed it was virtually identical to other supply activities. It did a greater volume of business than most supply activities, and it has suitable vehicles to perform that level of operation. Its vehicles were similar to those used at naval shore installations and the utilization of these vehicles at NSC Oakland was likewise indistinguishable from vehicle utilization elsewhere. Therefore, although this analysis pertains directly to NSC Oakland, there exists the strong possibility that the conclusions may be applicable elsewhere. With the above information in mind the following alternatives were considered.

A. ALTERNATIVE ONE - CONTINUE TO USE THE CURRENT SYSTEM

The current system was described in detail in Chapter II of this paper; therefore, only the advantages and disadvantages of that system will be discussed in this section.

1. Advantages:

a. The current system works - it provided excellent service to NSC's customers. Most customers received deliveries every workday providing them with a well-distributed workload in their receiving sections.

b. By continued use of the current system there would be no need to change procedures or retrain personnel.

The personnel unrest that has frequently resulted during major reorganizations would be avoided.

c. If the current system was continued, possible lengthy negotiations with PWCSANFRAN over the method of assigning vehicles (Class "B" vs. Class "C") would be avoided. That could be a significant problem if the discussion concerned Class "B" assignment with NSC Oakland drivers but not so significant if the discussion concerned Class "B" assignment with PWCSANFRAN drivers.

d. The current system required a minimum amount of packing and marking of cargo.

e. Because the cargo received minimum packing and was placed loose on pallets under the current system, it was easy to add or delete items from the shipment.

f. The current system, because of minimum packing, permitted the customer to easily identify critical receipts.

g. The cost of transportation utilized by the BALD section has been well documented in PWCSANFRAN Fund Status Report No. 3A86. Budgeting for the next year's transportation cost would be simplified by using that data.

2. Disadvantages:

a. The current system was expensive and the cost of transportation service provided to NSC Oakland by PWCSANFRAN was projected to cost 16.5 percent more in Fiscal Year 1976 than the cost in Fiscal Year 1975.

b. The current system results in unnecessary expenditure of funds on occasion due to trailers having been stranded at outlying activities.

c. Under the current system personnel ordering transportation services have been charged with the responsibility of making timely deliveries but have not been held accountable for the cost of transportation utilized. BALD personnel were not told how much money was spent when the bills were received from PWCSANFRAN.

d. As a result of cargo receiving a minimum of packing generally it has been impossible to stack cargo in the delivery vans. Therefore, cube utilization was far from optimum under the current system of operation.

e. As a result of minimum packing there was a possibility of losing paperwork which documented the shipment, damage to the material or delivery of the material to the wrong activity. Discussions with BALD personnel indicated that very little cargo has been damaged or mis-delivered in the past due to limited packing. BALD personnel also stated that no reports of lost paperwork had been received. Regardless of past experience the possibility of loss or damage was higher under the current system than it would have been if more packing were provided. The chance of pilferage was also increased by the lack of packing.

f. The current system required warehousemen to weigh and calculate the cube of each piece of cargo to be delivered by BALD. BALD office personnel sorted the paperwork from incoming material by delivery site and totaled the weight and cube. A visual check of the material was still required to determine how many trailers would be required to deliver the cargo.

g. The current system did not provide for radio communications between BALD personnel and the truck drivers. The PWCSANFRAN transportation office dispatcher had a radio with which to contact the truck drivers. In order for BALD personnel to communicate with drivers in route it was necessary to relay information through the transportation officer dispatcher. The possibilities for delays in passing urgent information and for errors by using that system were obvious.

h. The current system resulted in deliveries of cargo by Navy truck to an activity in excess of 100 miles from NSC Oakland. That activity was the Naval Postgraduate School, Monterey, California. Pages two through twenty-one of Ref. 15 stated that cargo would not be transported in government-owned and operated vehicles in excess of 100 miles except in cases of military necessity or when the cargo could be loaded upon a vehicle that was being transferred to another activity.

B. ALTERNATIVE TWO - THE UTILIZATION OF VEHICLES ON CLASS "B" ASSIGNMENT WITH PWCSANFRAN DRIVERS

Under this alternative BALD would be assigned vehicles on a full-time basis rather than by the hour. Vehicles on Class "B" assignment would be rented on a monthly custody rate rather than the current hourly rate. BALD would continue to be charged the same hourly rate for drivers as under the current system. BALD would be required to pay the drivers for forty hours each week plus any overtime hours utilized.

Under this alternative only the number of tractors, trailers and drivers required to meet BALD's average workload would be assigned on a full-time basis. Peak workloads would

continue to be handled by Class "C" assignment of vehicles and drivers. The advantages and disadvantages of this alternative are as follows:

1. Advantages:

a. The hourly cost of vehicles utilized under this alternative would be lower than those under the present system if the tractors were operated in excess of 121 hours per month and trailers in excess of 118 hours. This savings was calculated as follows:

$$\frac{\text{Truck, 7-1/2 ton, Monthly Rental Rate} \quad 320.00}{\text{Truck, 7-1/2 ton, Hourly Rental Rate} \quad 2.65} = 121$$

Therefore, the break-even point was 121 hours and once that number of hours was exceeded it was cheaper to rent vehicles by the month. Similar calculations were accomplished to determine the 118 hour break-even point for trailers.

b. This alternative would permit BALD to have better control over the drivers delivering BALD material because the same drivers would be utilized each day.

c. Better utilization of vehicles would also be possible under this alternative because the vehicles could be staged in the BALD work area. This would eliminate the need to pay for unproductive travel time between PWCSANFRAN and the BALD area each time a vehicle was called out or returned. This savings would amount to approximately thirty minutes per vehicle each day.

d. This system would provide excellent service to NSC's customers. Most customers would receive deliveries

every workday providing them with a well-distributed workload in their receiving sections.

e. As a result of this alternative's similarity to the current system there would be no need to change procedures or retrain personnel. The personnel unrest that frequently results during major reorganizations would be avoided.

f. That system required a minimum amount of packing and marking of cargo.

g. Because the cargo received minimum packing and was placed loose on pallets under that system, it was easy to add or delete items from the shipment.

h. That system, because of minimum packing, permitted the customers to easily identify critical receipts.

i. Under that system cost of transportation utilized by the BALD section would be well documented in PWCSANFRAN Fund Status Report No. 3A86. Budgeting for the next year's transportation cost would be simplified by using that data.

2. Disadvantages:

a. The major disadvantages of this alternative would be the difficulty of fully utilizing the vehicles assigned on a monthly rental basis. Tables 4 through 7 show that the number of vehicles used by BALD varied significantly from day to day. With the high cost of PWCSANFRAN drivers that could prove to be a major disadvantage with this alternative.

b. In accordance with page eleven, in enclosure one of Ref. 16, when vehicles were rented from PWCSANFRAN on a monthly basis credit would only be given for downtime in excess of three working days. Therefore, any time a vehicle was

down for scheduled or unscheduled maintenance, BALD would be paying for it for the first three days it was down and might have been required to rent another vehicle to handle the workload.

c. This system would result in unnecessary expenditure of funds on occasion due to trailers having been stranded at outlying activities.

d. Under this system personnel ordering transportation services were charged with the responsibility of making timely deliveries but were not held accountable for the cost of transportation utilized.

e. As a result of cargo receiving a minimum of packing, it was generally impossible to stack cargo in the delivery vans. Therefore, cube utilization was far from optimum under this system of operation.

f. As a result of minimum packing there was a possibility of losing paperwork that documented the shipment, damage of the material or delivery of the material to the wrong activity. The chance of pilferage was also increased by the lack of packing.

g. That system required warehousemen to weight and calculate the cube of each piece of cargo to be delivered by BALD. BALD office personnel sorted the paperwork from incoming material by delivery site and totaled the weight and cube. A visual check of the material would still be required to estimate how many trailers would be required to deliver the cargo.

h. This alternative did not provide for radio communications between BALD personnel and the truck drivers. In order for BALD personnel to communicate with drivers in route it was necessary to relay information through the Transportation Officer dispatcher. The possibilities for delays in passing urgent information and for errors by using that system were obvious.

i. That system resulted in delivery of cargo by Navy truck to an activity in excess of 100 miles from NSC Oakland.

C. ALTERNATIVE THREE - THE UTILIZATION OF VEHICLES ON CLASS "B" ASSIGNMENT WITH NSC OAKLAND DRIVERS

Under this alternative BALD would obtain and operate vehicles under the same procedures as in alternative two but the drivers would be NSC Oakland employees instead of PWCSANFRAN employees. The advantages and disadvantages were:

1. Advantages:

a. The major advantage of this alternative was a large reduction in the cost of BALD transportation. That reduction would be obtained because BALD would utilize NSC Oakland truck drivers to deliver cargo and would no longer pay PWCSANFRAN approximately $6,500 each month for applied overhead charges. The calculations follow:

MONTH	DRIVER HOURS
October 1975	1498
November 1975	1265
December 1975	1249
January 1976	1434
February 1976	1141
TOTAL	6587

$$\frac{\text{Total Hours}}{\text{Number of Months}} \times \text{Applied Overhead Rate} = \text{Average Monthly Overhead Expense}$$

$$\frac{6587}{5} \times \$4.91 = \$6468.43$$

The annual reduction in applied overhead expense would be approximately $77,621.16, or 24 percent of the annual BALD transportation cost.

The driver hours in the calculations above were extracted from the monthly PWCSANFRAN FUND STATUS Reports, Number 3A86. The $4.91 per hour applied overhead was obtained from page three in enclosure one in Ref. 16.

b. Better utilization of vehicles would also be possible under this alternative since the vehicles could be staged in the BALD work area. That would eliminate the need to pay for unproductive travel time between PWCSANFRAN and the BALD area each time a vehicle was called out or returned. That savings would amount to approximately thirty minutes per vehicle each day.

c. The hourly cost of vehicles utilized under this alternative would be lower than those under the current system if the tractors were operated in excess of 121 hours per month and trailers in excess of 118 hours.

d. This alternative gave BALD complete control over the drivers that delivered BALD material since the drivers would be NSC Oakland employees.

e. That system would provide excellent service to NSC's customers. Most customers received deliveries every

workday which provided them with a well-distributed workload in their receiving sections.

f. That system required a minimum amount of packing and marking of cargo.

g. Because the cargo received minimum packing and was placed loose on pallets under that system, it was easy to add items or to delete them from the shipment.

h. That system, because of minimum packing permitted the customer to easily identify critical receipts.

2. Disadvantages:

a. The major disadvantage with this alternative was that PWCSANFRAN would not be able to eliminate the expenses which resulted in the applied overhead that had to be distributed between BALD and other PWCSANFRAN customers. These expenses included salaries of PWCSANFRAN supervisors, accounting personnel, secretaries, file clerks, and other administrative expenses that could not be identified to a particular function. It was easy to see that these expenses could not be reduced as a result of NSC Oakland providing drivers for the BALD operation. Therefore, PWCSANFRAN would have to increase the charges to all customers in order to compensate for the loss of applied overhead previously collected from BALD for PWCSANFRAN drivers.

b. A significant disadvantage of this alternative would be the problem of fully utilizing the vehicles assigned on a monthly basis. Tables 4 through 7 show that the number of vehicles used by BALD varies significantly from day to day.

c. In accordance with page eleven in enclosure one of Ref. 16, when vehicles are rented from PWCSANFRAN on a monthly basis, credit would be given only for downtime in excess of three working days. Therefore, anytime a vehicle was down for scheduled or unscheduled maintenance BALD would be paying for it the first three days it was down and might have to rent another vehicle to handle the workload.

d. This alternative would have required a major change in PWCSANFRAN policy, and it would have established a precedent that could be followed by other PWCSANFRAN customers. It was, therefore, probable that it would result in a lengthy negotiation between PWCSANFRAN and NSC Oakland. The negotiations may or may not have resulted in NSC Oakland being granted authority to provide drivers for PWCSANFRAN vehicles assigned on a Class "B" basis.

e. If PWCSANFRAN authorized this alternative, it would have been necessary for NSC Oakland to obtain an increase in their manpower allowance. This increase could allow them to hire and train drivers. However, any future reduction in force action imposed by higher authority could result in reducing the number of drivers available to deliver BALD cargo.

f. This alternative would result in lower visibility of transportation costs because the driver's salaries would be hidden in the BALD wages.

g. That system would result in unnecessary expenditure of funds on occasion due to trailers having been stranded at outlying activities.

h. Under that system personnel ordering transportation services were charged with the responsibility of making timely deliveries, but were not held accountable for the cost of transportation utilized.

i. As a result of cargo receiving a minimum of packing, it was generally impossible to stack cargo in the delivery vans. Therefore, cube utilization was far from optimum under that system of operation.

j. As a result of minimum packing, there was a possibility of losing paperwork that documented the shipment, damage of the material, or delivery of the material to the wrong activity. The chance of pilferage was also increased by the lack of packing.

k. That system required warehousemen to weigh and calculate the cube of each piece of cargo to be delivered by BALD. BALD office personnel sorted the paperwork from incoming material by delivery site and totaled the weight and cube. A visual check of the material would still be required to determine how many trailers would be required to deliver the cargo.

l. This alternative does not provide for radio communication between BALD personnel and the truck drivers. In order for BALD personnel to communicate with drivers in route it was necessary to relay information through the Transportation Office dispatcher. The possibilities for delays in passing urgent information and for errors by using that system were obvious.

m. That system would result in deliveries of cargo by Navy truck to an activity in excess of 100 miles from NSC Oakland. NAVSUP regulations stated that cargo would not be transported in government owned and operated vehicles in excess of 100 miles except in cases of military necessity or when the cargo could be loaded upon a vehicle that was being transferred to another activity.

n. The potential savings from this alternative would have been lower if it were found that the number of drivers hired by BALD would have to be supplemented by PWCSANFRAN drivers due to illness or peak workloads unless warehousemen were trained to function as part-time drivers.

D. ALTERNATIVE FOUR - CONTRACT UTILIZING COMMERCIAL TRUCKS WITH NSC DRIVERS

Page 95 of Ref. 1 spoke to the question of using public transportation as follows:

> The main drawback to using public transport is the reduced control, particularly delivery times to customers, which may affect the service level that can be offered. Despite this disadvantage, the merits of public transport may include cost savings and they should be investigated fully before a company acquires its own vehicles. The most successful decisions result from the analysis of every possibility.

This alternative leads into the lease or own controversy. Is it more cost advantageous to lease trucks from an outside source or for the Navy to continue to purchase vehicles and manage them through Public Works Centers (PWCs)? For civilian organizations, as examined in page 772 of Ref. 11, this option takes on a different aspect. Matz explains:

> A lease arrangement may be available as an alternative to investing in a capital asset. If so, this possibility should be evaluated by determining the incremental annual cost of leasing versus purchasing. The after-tax savings should be sufficient to yield the desired rate of return on the anticipated purchase price.

The government does not have to worry about the tax consideration as does the private sector, and the following guidance on page 10 of Ref. 12 has been provided on the subject of commercial vehicle usage:

> Commercial transportation facilities shall be used to the maximum extent when efficient and economical service can be made available without detriment to the military mission. The economic feasibility of motor vehicle hire shall be based on a cost comparison which must realistically demonstrate that the cost of obtaining vehicles or services from commercial sources is less than the comparative cost of using Navy-owned motor vehicles. Consideration shall be given simultaneously to the economic feasibility of renting vehicles from the General Services Administration Interagency Motor Pools, where available.

Reference 6 showed that the General Services Administration (GSA) essentially leased its vehicles for a monthly charge, not unlike a commercial lease. Included in its rates are costs normally encountered by the user: gas, oil, lubricants, tires, minor maintenance, and garaging. Additional charges were levied to cover indirect expenses such as depreciation, fixed equipment, office space, comptroller services, and management. Payments were generally calculated on a monthly basis for each vehicle leased and were of the form, X dollars per month plus Y cents per mile.

It was generally agreed that there were three types of lease agreements. Of these, the full service maintenance

lease appeared to be the most popular. Under this agreement, which can run up to 60 months, the lessor included in the cost all tires, batteries, maintenance, and other normal expenses in the monthly charge. Gas and oil may or may not be included. Substitute vehicles to replace any that break down may also be incorporated in the lease.

The net lease, which was the cheapest of the leases, was usually written for the same periods as the full service maintenance lease. The vehicle was supplied by the lessor, but all the services and maintenance were provided by the user. Only a small amount of all leases fall into that category.

Another major lease arrangement was an agreement similar to the full service maintenance lease. The lessee only provided the driver and the vehicle was normally returned to the point of pickup daily for storage and servicing. That was different from the full service maintenance lease in that the full service maintenance lease, the vehicle was maintained on the user's premises. This last lease was usually undertaken for short periods and came close to approximating a vehicle rental. A lease of that kind was often used to maintain on-time deliveries during peak operational periods, thus preventing delays of urgent material.

There are variations of these leases available depending on the lessor, but the three discussed above were utilized the most. Limiting the discussion to the types just mentioned, it became apparent that the latter two lease agreements appeared to have obvious disadvantages in terms of Navy

requirements. The full service maintenance lease will be utilized from this point as the one best suited for Naval transportation services.

In brief, transportation personnel were to provide safe, adequate vehicles where they were needed, when they were needed, and at the lowest possible cost. To meet that objective, vehicles could be purchased through DOD sources, leased through GSA, or leased through commercial agencies. The commercial and GSA lease agreements were quite similar. However, GSA rental charges included the cost of gasoline and oil, while commercial full service maintenance contracts with the government generally did not. There were other differences in the commercial area which will be pointed out in later paragraphs.

The advantages of leasing were favorably displayed in current periodicals and nearly always leave the reader with the impression that the ultimate solution should support leasing. That was because the literature was generally written by the leasing organizations and was intended to persuade customers to use their services.

Reference 18, used by one of the commercial firms contacted during the research phase of this study, contained the following wording:

> Do you run your trucks or do they run you? Owning and running a fleet of trucks is a complicated business, right?
>
> But it isn't your business. You just got stuck with it. Running trucks is Ryder's business. We can get you unstuck. Look at the things a Ryder Full-Service Lease does for you.

> Ryder buys the right trucks for you. Then Ryder starts taking care of everything.

At the end of the quote, lists of what the company did, the advantages of leasing, and the question, "When do we start?" were beautifully printed and accompanied by colored photographs. That type of marketing approach places the question in the customer's mind as to whether the job can be done by the owning organization as well as it could be done by the leasing company. It established the lessor as the expert, it elaborated on the strong points, and it tried to convince the reader that all the lessor wanted to do was help the potential customer's organization to do its job more efficiently. There was no mention of the fact that the lessor was in business to make a profit.

With the above in mind, what were the advantages of a lease agreement? Under a given set of circumstances, there were a number of advantages to leasing as opposed to purchasing which could be documented.

1. Advantages:

a. Prominent among the advantages to leasing over purchasing which could be realized by civilian establishments was the certain tax advantage inherent in leasing. The capital freed up for investment through leasing could also provide a greater rate of return for the company, rather than having to utilize it in the outright purchase of equipment. These two factors were not actually realizable by government agencies; DOD Instruction 7041.3 required that the interest theoretically foregone (which reflected private sector

investment opportunities actually foregone) in the expenditure of government funds be reflected in the cost analysis through use of a discount rate policy.

The instruction outlined policy guidance for economic analysis of proposed programs. Of particular relevance to the analysis conducted in this study is the requirement contained in paragraph 4.b.(2), subparagraphs (a), (b), and (c), relative to the requirement to discount future financial costs and benefits. The discount rate prescribed was 10 percent which "represents an estimate of the average rate of return on private investment before corporate taxes and after adjusting for inflation." Of the prescribed discount rate, therefore, approximately seven percent represented interest earned through investment and two to three percent constituted a constant dollar price inflator.

b. The lessor would provide its expertise in the analysis of the current system and recommend the right number of trucks, the right size trucks, and order exactly what was required for accomplishment of the organization's mission. In other words, the lessor would act as consultant to improve the customer's delivery system. Most leasing organizations provide a free survey of a company's transportation and delivery systems. Proposals are made with the hope of gaining a new account.

c. Budgeting was easier as the vehicle costs could be predetermined. There was no guess work in deriving costs and the totals could be presented to the budgeters.

d. There was reduced workload in the administrative area for the client. The record keeping, property and maintenance forms were eliminated. The lessor handled all the paperwork. That could reduce the number of personnel in the lessee's organization which, in turn, would save money.

e. The requirement for stocking repair parts, maintenance facilities, and garage personnel was waived because the lessor assumed those responsibilities.

f. Efficiency was improved through new equipment. The vehicles were replaced after the specified number of miles or years of service were reached by the vehicle. The lessor was required to insure that the machinery was in safe working order.

g. Lease arrangements could contain provisions for additional vehicles, as needed, to meet peak workload demands. That feature could be incorporated at minimal cost.

h. Executive time was freed for more important management functions. The responsibility for buying, servicing, replacement, and salvage of vehicles was turned over to the lessor.

i. It was easier to dispose of a poor lessor than a poor fleet manager. Leases were written in terms of months; managers were hired in terms of careers. The manager was further protected by unions and the judicial process that required substantiation of poor performance for extended periods of time which could be difficult to obtain if predecessors did not properly document faulty actions.

j. Leasing companies have been administering driver safety programs in compliance with Department of Transportation (DOT) and Public Utilities Commission (PUC) regulations. Included in that were road tests, eye tests, written examinations, seminars, and safety awards. All paperwork involved in each area was also undertaken by the lessor.

k. The lessor painted the trucks ordered for the lessee according to the customer's desires. Advertising has thereby been gained while the vehicle was on the road. The trucks have been kept clean and any body work touched up as required. That feature helped promote the activity's image in the community and, in turn, enhanced public relations.

l. Substitute vehicles could be available in case any of the originals broke down. That meant no loss in service due to faulty equipment and no additional cost for the standby vehicle.

m. Leasing could be advantageous as a hedge against inflation. The contractual commitment could be made in terms of years. That being the case, the expenditures would be paid off in devalued dollars with the agreement being made in terms of current dollars. This policy would backfire if the agreement were not made in a time of rising inflation.

n. Every leasing company claims it can handle the job for the contracting organization at a lower cost than if the establishment procured its own vehicles and provided the same services as the lessor.

o. With leased trucks and the command's own drivers, complete control over the destination and routing of vehicles

was available to the supply center's local delivery systems. Some lessors will provide brackets for citizen band radios in their tractors at no additional charge. That facilitated maximum vehicle utilization by up to the minute contact with the drivers.

p. The supply center would be able to hire its own drivers if an increase in the NSC manpower authorization were obtained from higher authority. As newly hired personnel, the driver's wage rate would be lower than the current operators in PWC's driver pool. The NSC drivers would also eliminate the expensive overhead and labor charges currently being administered by PWC. The hourly wage for one hour of straight time currently being paid by the NSC is $13.67. In Ref. 16 that total was broken down as follows: driver, wage grade 8, step 3, $6.45, accelerated by 35.8% for a subtotal of $8.76 and then $4.91 in applied overhead.

With the exception of points a and b, the advantages just expressed were applicable to the Naval Supply Center, Oakland BALD operation.

2. Disadvantages:

a. For a leased vehicle to better the cost of a government-owned vehicle, maximum utilization of that equipment must be made. Analyzing the usage rate of 7-1/2 ton tractors by BALD, it was determined that an average of 7 per day were being utilized. Those seven divided into the total miles driven came out to approximately 13,000 miles per year per tractor. It would be nonproductive and non-cost effective

to lease such vehicles with that low usage. The discussion in Ref. 17 verifies this point as the following notes.

> The thing to do is use fewer tractors and utilize them better, thus bringing down the cost of operating the vehicle. The company will be happy to analyze the BALD system and make a detailed report to the Officer in Charge (OIC) on a lease agreement that will be dedicated to the center's needs.

Fewer tractors will jeopardize customer service and Uniform Military Material and Issue Priority System (UMMIPS) standards. The objective of the Naval Supply Center was to deliver merchandise to the local customers when it was required and within the prescribed time frames. This necessitated the use of a larger fleet of vehicles. Commercial firms could possibly reduce the number of tractors and trailers, thus gaining better utilization to make a lease competitive. They could also revise the delivery schedule; however, customer service would suffer.

The Navy commissary at Oakland is currently using two commercial, two axle road ranger, cabover, 13 speed tractors at a cost of $306 per week. The average mileage was 657 miles per week. Multiplying that weekly rate by four and that same rate again by fifty-two, the monthly rate of 2,628 miles and the yearly rate of 34,164 miles per vehicle respectively were derived. Doing the same thing with the weekly charge, a monthly cost of $1,224 and a yearly expenditure of $15,912 were developed. Driver costs were not included and it can be readily seen that the cost was significantly higher than the cost of obtaining comparable vehicles from PWCSANFRAN.

b. Another point was that the NSC would be dependent on another organization for the servicing of vehicles. A commercial company could have union problems and the center's mission would be hampered because of it. Mechanics refusing to cross picket lines set by a union like the Teamsters could prevent necessary maintenance from being performed.

c. Many of the advantages that accrue to the civilian organization through leasing do not benefit the government agency. The government can usually buy gas and oil cheaper than commercial firms, its mechanics are on duty 24 hours a day, and military personnel do not get overtime pay for work performed after regular working hours.

d. Personnel expenses of the supply center would be increased. Hiring costs and salaries of the new drivers might be more than the corresponding decrease in administrative personnel.

e. Short-term agreements are costly. It costs $55 per day and ten cents per mile for a 7-1/2 ton, two axle tractor, and $66 a day and twelve cents a mile for a 7-1/2 ton, three axle tractor based on a yearly mileage rate of 13,000 miles per vehicle. A 42 foot trailer costs $20 a day. These figures are considerably higher than PWC charges. Again, it should be pointed out that the only way for leasing to be competitive is over the long run on a negotiated agreement specifically suited to the customer's requirements.

f. The command did not have complete control over how the equipment was used.

g. Military maintenance and service would not be available 24 hours a day as it was under the current system.

h. The leased vehicles could not be altered or utilized according to the owner's desires unless approved by the commercial firm.

E. ALTERNATIVE FIVE - CONTRACT TO UTILIZE COMMERCIAL TRUCKS, DRIVERS, AND DISPATCHER (DRAYAGE CONTRACT)

1. Advantages:

a. The NSC would not have to hire new personnel, and the commercial company would make all deliveries in accordance with the center's wishes.

b. The budget expenses could be well planned out in advance. Each cost was spelled out in the contract, for example, a truck of five ton capacity or more with driver (actually a 7-1/2 ton tractor) on regular time would cost $30.71 per hour. The overtime rate (over eight hours) would be $36.31 and the holiday rate equated to $41.92 per hour, as stated on page 15 of Ref. 4.

c. The contract could be written in such a manner that the NSC's specific requirements were included. The period covered by the contract was usually one year. If the company did not perform to the required standards, the NSC was not stuck with the organization for an extended period of time. As in the case for lease versus own, it was easier to dispose of a poor carrier than to revamp a faultering career oriented transportation division.

d. The supply center was not required to pay any vehicle maintenance expenses. That burden rested with the trucking company.

e. Community relations were enhanced by assisting local industry with government contracts. This was particularly true in times of a depressed economy.

2. Disadvantages:

a. Once the contract was agreed to, the firm making the deliveries was bound to the terms as stated. The problem being that it was all the company was held to. The organization was under no obligation to do anything outside the contract provisions. If an unexpected contingency developed, like an oversize load, after working hours, or on a holiday, the cost was usually prohibitive; and the government paid premium prices for the additional service. That meant that the contract administrator must cover all possible contingencies.

b. While the contract stated what the carrier was to do, there was a loss of control when a function was shifted from a parent organization to an outside source. There was no more frustrating an experience than to have an extremely important casualty reported item (CASREP) not meets its UMMIPS time frames because of something that was out of the manager's direct control, but for which he was held responsible.

Whenever an important function was contracted out to another activity, this situation loomed as a potential problem. The mere fact that the contracted organization's phone might be out of order or busy could cause a communication breakdown which might result in a missed delivery deadline.

c. One of the basic items whenever a government contract has been bid upon was the question of whether or not the lowest bidder is the best one for the job. That point could be debated at great length, but the Navy has to deal with the problem. There has also been pressure to use small business firms. The fact remains that, in many instances, the small operator is not always as well equipped to handle the task at hand as a large corporation. The sheer magnitude of an organization with its extensive resources can often offset the low bidder's price by its having had the equipment available to do the job when it was required.

F. ALTERNATIVE SIX - USE OF COMMERCIAL OR CONTRACT CARRIERS WITH A GOVERNMENT BILL OF LADING (GBL) FOR EACH LOCAL DELIVERY

1. Advantages:

a. That means of doing business was currently being utilized by an existing NSC, and in that activity's opinion, has been quite successful.

b. The expense of PWC drivers, or the hire of NSC drivers, could be alleviated. The carriers involved would provide the drivers and rigs to do the job. This alternative, similar to alternative five, would be handled on a contract arrangement, but with a pool of companies instead of just one. When a delivery was ready, the NSC would alert one of the firms in the pool to send a rig to pick up the cargo. That was usually done on a rotating basis within delivery zones so no one organization would get more business than any other. This feature kept all eligible companies happy and distributed government expenditures throughout the local community.

c. The billing procedure was also different, since the transportation costs were charged to Transportation of Things, Navy, instead of coming out of the operating funds (OPTAR). That would free up a substantial OPTAR amount for other needed items at the center.

2. Disadvantages:

a. The administrative workload would jump considerably. More personnel would be required to handle the influx of paper. Costs of that operation would not be small. It has been stated that the cost of preparing a single GBL is approximately $75 in administrative and management expense.

b. Apparent in this alternative was the fact that there was a loss of control over the delivery function. This was amplified because there were multiple companies with which the deliveries were arranged and no single source with whom differences could be resolved. Inherent in this was the necessity for a sophisticated communication system, ensuring that priorities were met and goods were delivered. A monitoring capability must be incorporated otherwise keeping track of deliveries would become a nightmare. High priority items were generally picked up by the requisitioner because of lack of responsiveness in that delivery system.

c. The fact that the carriers were in business only as long as they made a profit, could lead to a conflict in delivery priorities. The trucking company knew what the Navy contract would pay, and if the firm could get a haul for more money elsewhere, who would get the best service? This type of

situation becomes more probable because of the fact that no one carrier has been held accountable for deliveries.

V. SUMMARY AND CONCLUSIONS

A. SUMMARY

This study began with a recognition of the Navy's need to optimize the utilization of limited resources. It was noted that although the BALD system was providing excellent service, the possibility for improvement did exist. The questions to be answered were: (1) What is it costing NSC Oakland to provide the current level of delivery service? (2) What alternative method will provide service equivalent to the current system at a lower cost or provide better service at the same cost as the present system?

These questions were to be answered by examining retained records at NSC Oakland and PWCSANFRAN as well as observing delivery operations and interviewing personnel involved in the deliveries. Alternative methods of delivering cargo were to be evaluated and the advantages and disadvantages of each alternative were to be compared to the current system.

In Chapter II the current delivery procedures and costs were analyzed. It was noted that the type and quantity of vehicles utilized by BALD varied drastically from day to day.

Chapter II also pointed out that while NSC Oakland rented vehicles with drivers from PWCSANFRAN on an as-needed basis, another Naval Supply Center obtained required transportation by a different means.

Chapter IV discussed alternatives that could be utilized by BALD to deliver cargo to NSC Oakland customers and their advantages and disadvantages.

B. CONCLUSIONS

While examining the current BALD operation, many advantages and disadvantages were noted. The fact that the current system provided excellent service to NSC Oakland customers was strong motivation for continuing to use it rather than an untested system. This was particularly true if some or all of the advantages noted in Chapter IV of this paper could be eliminated or their impact reduced. By attempting to find workable solutions to the disadvantages found in the current system, the authors believed that it would be possible to avoid the pitfall described on page 548 of Ref. 8.

> A basic, sometimes critical, mistake by management in the application of analytic techniques to logistics problems is the tendency to compare model output, particularly from optimizing models, with the results produced by the company's current methods of doing things, without regard to whether the results are the best that could be obtained under the current method.

It was a fact that many of the disadvantages in the current system could be eliminated or their impact reduced by modifying existing procedures. The cost of the BALD operation would be lowered as a result.

The current system, even prior to the modifications discussed above, provided delivery service at a cost to the Navy that was equal to or lower than the cost that could be expected from the other alternatives that were evaluated.

It is, therefore, the authors' conclusion that Alternative One - continue to use the current system is the proper course of action.

Additional justification for not selecting any of the other alternatives was as follows:

1. Alternative Two - the Utilization of Vehicles on Class "B" Assignment With PWCSANFRAN Drivers:

This alternative was rejected because its success was predicated upon BALD fully utilizing vehicles and drivers assigned on a monthly basis. Fluctuations in vehicle utilization as shown in Tables 3 through 7 and the probability of vehicle downtime indicates that full utilization of vehicles and drivers assigned on a monthly basis would be impossible.

2. Alternative Three - the Utilization of Vehicles on Class "B" Assignment With NSC Oakland Drivers:

This alternative was rejected because it would reduce the cost of the BALD operation only at the expense of other Navy activities. This could result in serious financial problems when activities operating on tight budgets were suddenly faced with increased transportation costs due to higher applied overhead charges.

3. Alternative Four - Contract to Utilize Commercial Trucks With NSC Drivers and Dispatcher:

This alternative was rejected because the cost of obtaining tractors and trailers from commercial firms was more expensive than renting them from PWCSANFRAN. A quick comparison between the rates listed on Table 8 and the lease rates obtained for commercial vehicles favored the use of PWC vehicles by a significant margin. The following calculations illustrate that comparison:

Type Vehicle	Lease Cost	PWC Cost
Tractor, 7-1/2 ton	$55 and $.10/mile	$21.20 day and $.15/mile
42' trailer	20	8.80 (2 20' trailers)
TOTALS	$75 and $.10/mile	$30.00 and $.15/mile

It was apparent that the Navy cost of one 7-1/2 ton tractor and two twenty foot trailers excluding mileage charges was cheaper by $45 a day than one 7-1/2 ton tractor and a forty-two foot trailer from a commercial firm. Also, the tractor would have to be driven more than 900 miles per day in order to reach the break-even point for use of the commercial vehicle to become cost effective. The most mileage put on a tractor in one day during the period October 1975 through February 1976 was 236 miles. Therefore, it was apparent that the use of the Navy vehicle was a better arrangement than the use of a leased vehicle from a commercial source.

This alternative also required PWCSANFRAN to increase the applied overhead rate it charged other customers. BALD's fluctuating vehicle requirements would have also made this alternative impractical.

This alternative could require lengthy negotiations between top PWCSANFRAN and NSC Oakland management personnel. It would also mean that the number of employees on the NSC Oakland payroll would be increased. If the number of NSC Oakland employees were to be reduced in the future, due to a reduction in force imposed by a higher authority, part of the reduction could come from BALD drivers. Under the current system, BALD does not have that potential problem because the drivers are PWCSANFRAN employees.

4. Alternative Five - Contract to Utilize Commercial Trucks, Drivers (Drayage Contract):

This alternative was rejected because it was more expensive than the current system. The following calculations

provide comparison of the cost of this alternative with the current operation:

a. Cost of Shipments to Monterey Using Navy Truck

Cost of driver (8 hours at $13.67)	$109.36
Rental of tractor (8 hours at 2.65)	21.20
Mileage charge for truck (225 miles at 0.15)	33.75
Rental of trailer (8 hours at 0.55)	4.40
TOTAL	$168.71

b. Cost of Shipments to Monterey Using Drayage Contract

Cost of truck and driver (8 hours at $30.71)	$245.68

It is obvious from the calculations shown above that it was significantly cheaper to use PWC vehicles than vehicles obtained under a drayage contract. The rates for the Navy vehicle were obtained from pages three, five and six of Ref. 16 and the rate for the drayage vehicle came from page 15 of Ref. 4.

A second major disadvantage with the drayage contract was that it might not be responsive to the customer's requirements. Under the current system BALD could request a vehicle from PWCSANFRAN and expect to receive it within thirty minutes. The GSA Drayage Contract allows the contractor to delay commencement of service up to twenty-four hours after placement of the order for transportation.

5. Alternative Six - Use of Commercial Carriers Paid for by Government Bills of Lading:

This alternative was rejected because the majority of NSC Oakland's customers would not receive the timely and reliable service that the current system provided. Daily shipments

would have to be discontinued because of the volume of additional paperwork and administrative effort involved in processing GBL's. According to Ref. 5, cost of processing GBL's was $75 each and considering the number of activities that BALD delivered to each day the cost of this system would be prohibitive. BALD personnel stated that cargo was delivered to an average of fifty activities each workday. The cost of processing the GBL's to deliver cargo to that number of activities would be $3750. The charges for the commercial carriers utilized would be additional and would vary based upon the weight, cube and location of the activities involved.

VI. RECOMMENDATIONS FOR IMPROVING THE CURRENT OPERATION

The major disadvantage with the current BALD operation was its high cost. The following recommendations would help reduce the cost of the BALD operation and still provide NSC Oakland customers with excellent service.

A. STRANDED TRAILERS

In order to eliminate the unnecessary expense of paying for trailers that were stranded at outlying activities, some additional clerical effort would be required. Whenever the necessity to leave a trailer at an outlying activity existed, the PWCSANFRAN driver should be required to return to the BALD office to provide BALD personnel with the USN number of the trailer and its location. That information should be recorded on a status board and retained until the trailer has been returned.

It was recommended that the Shipping Division Director or one of his officer assistants communicate with all BALD customers periodically to inform them of the need to expedite offloading of delivery vehicles. It should also be emphasized to PWCSANFRAN drivers and BALD customers that trailers would not be left at outlying activities unless it was impossible to offload the trailer within a reasonable time frame. BALD personnel must coordinate the return of the trailers and expedite their movement when necessary. Records of customer performance should be maintained and follow-up action taken

when appropriate. If that problem were to continue, it is recommended that the customers be required to pay the rental charges for trailers that must be left for offloading.

B. TRAINING OF BALD PERSONNEL

All personnel involved in ordering transportation services should become familiar with Ref. 16, which lists the rates PWCSANFRAN charges for vehicles and drivers. Copies of any future changes to this instruction should also be routed to the BALD section.

Copies of the monthly PWCSANFRAN Fund Status Report Number 3A86 and the Monthly Transportation Rental Charges Report Number 5H88 should be routed to the BALD section each month. Report Number 3A86 lists the cost of drivers and vehicle rental services obtained by BALD from PWCSANFRAN. Report Number 5H88 provides the following data for each vehicle used by BALD during the report month: equipment code, USN number, date utilized, hours utilized, miles utilized, mileage charges and rental charges.

BALD personnel could then spot check the Monthly Transportation Rental Charges Report to verify its accuracy and to monitor the results of efforts to reduce the number of stranded trailers. That report could also be used to identify possible cases whereby vehicle utilization might be improved. For example, the following data was extracted from the January 1976 report:

Equipment Code	USN Number	Date	Billed Hours	Billed Miles	Cost*
0604	96-32021	1/ 2/76	8	15	$132.81
0604	96-34519	12/24/75	8	8	131.76
0604	96-34519	12/31/75	8	16	132.96
0614	96-28996	1/20/76	4	2	67.96
0614	96-28996	1/20/76	3	5	51.36
0614	96-28997	1/27/76	8	15	137.21

*Cost was calculated as shown in the following example:

Driver (8 hours at $13.67)	$109.36
Truck Rental (8 hours at $2.10)	16.80
Mileage Charge (15 miles at $0.15)	2.25
Trailer Rental (8 hours at $0.55)	4.40
TOTAL	$132.81

The Shipping Division Director or one of the branch officer assistants should also be routed copies of the reports discussed above for review. BALD personnel must then determine the reason for apparent cases of low vehicle utilization and advise the Shipping Division Director of the reason for them and of action taken to improve future utilization.

Once BALD personnel have been made aware of the cost of obtaining transportation services, receive reports to monitor actual expenses, and were aware that management was also monitoring transportation costs, better utilization would result.

C. CUBE UTILIZATION AND CARGO PROTECTION

In order to improve the cube utilization in trailers used by BALD it is necessary to pack the material in a container that is sturdy enough to permit the cargo to be stacked. Tri-Wall Container, National Stock Number 8115-00-774-6562 measures 39 inches deep, 40 inches wide and 48 inches in length could be used. The majority of pallets used by BALD measure

40 inches by 48 inches. That container is easily assembled, constructed of fiberboard, and sturdy enough to permit stacking.

Since BALD personnel sorted incoming cargo by destination and placed it on pallets, it would have required a minimum of additional effort to place it in a Tri-Wall Container. The containers could be banded to pallets to permit stacking. In addition to improved cube utilization the possibility of damaged material, lost paperwork or mis-delivered material would be reduced.

D. CARGO WEIGHT AND CUBE

Storage Department personnel were marking the weight and cube on paperwork covering each line item sent to BALD for delivery. Pages 5 through 34 of Ref. 14 stated that it is not necessary to provide that information on items weighing forty pounds or less. It also permitted weight and cube data for work-measurement reporting to be calculated by sampling.

During the months of October 1975 through February 1976 BALD processed an average of 15,500 line items a month. Based on observations of cargo handled in the BALD section, it was estimated that sixty percent of the line items delivered weighed forty pounds or less. A significant reduction could be made in the Storage Department's workload by deleting that requirement. Therefore, it is recommended that the Storage Department discontinue providing weight and cube on items under forty pounds.

E. BALD ADMINISTRATIVE PROCEDURES

Under the current procedures BALD personnel removed one copy of the paperwork from each line item received. This paperwork was sent to the office where it was divided into three groups: shore stations, USS ships, and USNS ships. In the next step in the operation the documents were divided by activity and finally be delivery zone. The weight and cube of cargo on hand for each activity and zone was then totaled. After these totals were obtained, the vehicles required to deliver the cargo were ordered from PWCSANFRAN. Schedules showing the loading sequence for the cargo were also prepared. Once the USN Number of the trailer that would be used to deliver the cargo was known, the paperwork necessary to establish the proof-of-shipment file was prepared.

It has been recommended that the above procedure be discontinued and that the paperwork be processed in accordance with the following: Upon receipt incoming material should be placed on pallets or in Tri-Wall-Containers designated by activity. The pallets should be stored by delivery zone until sufficient cargo was accumulated to justify delivery. Most zones generate enough cargo to warrant daily deliveries. The decision that sufficient cargo was on hand to warrant delivery should be based upon the number of pallets rather than on the old system of totaling weight and cube. Only when cargo was unusually large or heavy would actual weight and cube require special attention. That system was being utilized at NSC San Diego, and it was praised as a work saver by the Delivery Section Supervisor.

Once the decision has been made to deliver cargo to a particular zone, one copy of the paperwork should be removed from each line item in the shipment. That paperwork along with a coversheet showing the number of pallets for each activity would be forwarded to the office. The paperwork should already have been divided by activity because of the manner in which the material was stored. The office personnel would then order the transportation required based upon the pallet count on the coversheet and any comments concerning unusual shaped or heavy cargo. They then would prepare a loading sequence listing from the data shown on the coversheet.

Paperwork for hazardous material such as acid and flammable liquids as well as highly pilferable items (such as clothing) would be forwarded to the office separated from the paperwork covering general cargo. The paperwork would be identified by a coversheet indicating hazardous or pilferable cargo, as appropriate. The number of pallets of each type of material to be delivered to each activity would also be included on the coversheet.

Office personnel should process this paperwork similar to the general cargo paperwork, but in addition they will prepare Transportation Control Movements Documents (DD1384) for each activity receiving that type cargo.

These documents should be used to establish Proof-of-Shipment files for hazardous or highly pilferable material. Proof-of-Shipment files for the general cargo being delivered would be established by forwarding to the Data Processing Department one copy of the paperwork for each line item

delivered along with a coversheet (12ND NSC 4480/11). The coversheet indicated the date shipped, the mode of shipment and the USN Number of the trailer utilized. The procedures outlined above would reduce the clerical workload of office personnel sufficiently to more than offset the additional effort that might be required to monitor vehicle utilization/ cost and expedite return of trailers dropped off at outlying activities.

F. DIRECT RADIO COMMUNICATIONS WITH DRIVERS DELIVERING BALD CARGO

It was noted during the research that BALD personnel could only communicate with the enroute drivers by relaying information through the PWCSANFRAN transportation dispatcher. In order to overcome this problem it has been recommended that PWCSANFRAN be requested to initiate correspondence to Naval Facilities Engineering Command to obtain an allowance and funding for the necessary radio equipment for the BALD section. The proper procedures for requesting the allowance and funding are contained on pages 70 and 71 of Ref. 12.

G. TRANSPORTATION OF CARGO TO MONTEREY, CALIFORNIA

The BALD system has been utilizing PWCSANFRAN trucks to deliver cargo to Monterey. However, as the following calculations indicate, it is cheaper to deliver cargo to Monterey by using common carrier instead of contract carriers or a Navy truck.

1. Cost of Shipment Using a Common Carrier.

A review of BALD records for January and February 1976 indicated that the average shipment from NSC Oakland to

Monterey weighed 23,000 pounds. The cost of shipping that amount of cargo by common carrier on a government bill of lading (GBL) was calculated as follows:

$\frac{23,000 \times .37}{100}$	=	$85.10
Average processing cost for a GBL		75.00
TOTAL		$160.10

The cost of .37 per hundred weight (CWT) and average processing cost of $75.00 per GBL were obtained from Ref. 5.

2. Cost of Shipment Using a Contract Carrier

Truck and driver (8 hours at $30.71) $245.68

The rate for the contract carrier came from Page 15 of Ref. 4.

3. Cost of Shipment Using a Navy Truck

Cost of driver (8 hours at $13.67)	$109.36
Rental of truck (8 hours at 2.65)	21.20
Mileage charge for truck (225 miles at 0.15)	33.75
Rental of trailer (8 hours at 0.55)	4.40
	$168.71

Therefore, it is recommended that only common carriers be used for the Monterey deliveries.

In addition to saving the Navy money on each shipment by using a common carrier paid for by a GBL, NSC Oakland should charge the entire cost of Monterey shipments to the "Transportation of Things, Navy" appropriation rather than charging NSC Oakland operating funds. NAVSUP established that appropriation to provide financing and accounting for all charges incurred for the transportation of material for the account of the Navy. In accordance with Chapter 2, page 44, and Chapter 4, page 5 of

Ref. 15, it is proper to charge this appropriation for the cost of commercial carriers utilized to transport Navy-owned material between Naval activities which were not within the same commercial zone or metropolitan area.

The probability was quite high that a cost analysis would show that it also was cost effective to ship cargo to Stockton, California, and to Tracy, California, by commercial vehicles paid for by GBL's. The charges for shipments to those activities would also be a valid charge to the "Transportation of Things, Navy" allotment. It is recommended that BALD personnel conduct the above cost analysis.

H. AUTOMATED VEHICLE SCHEDULING PROGRAM

The advantages of VSP substantially outweigh the disadvantages and it is recommended that NSC Oakland evaluate the possibility of automating its scheduling and routing functions.

Should the scheduling and routing of the BALD operation prove to be beneficial, the entire NSC Oakland transportation function should be analyzed to see if application of its prescribed mission could be facilitated through automation. The potential cost savings and improved service could prove well worth the effort expended in the feasibility study.

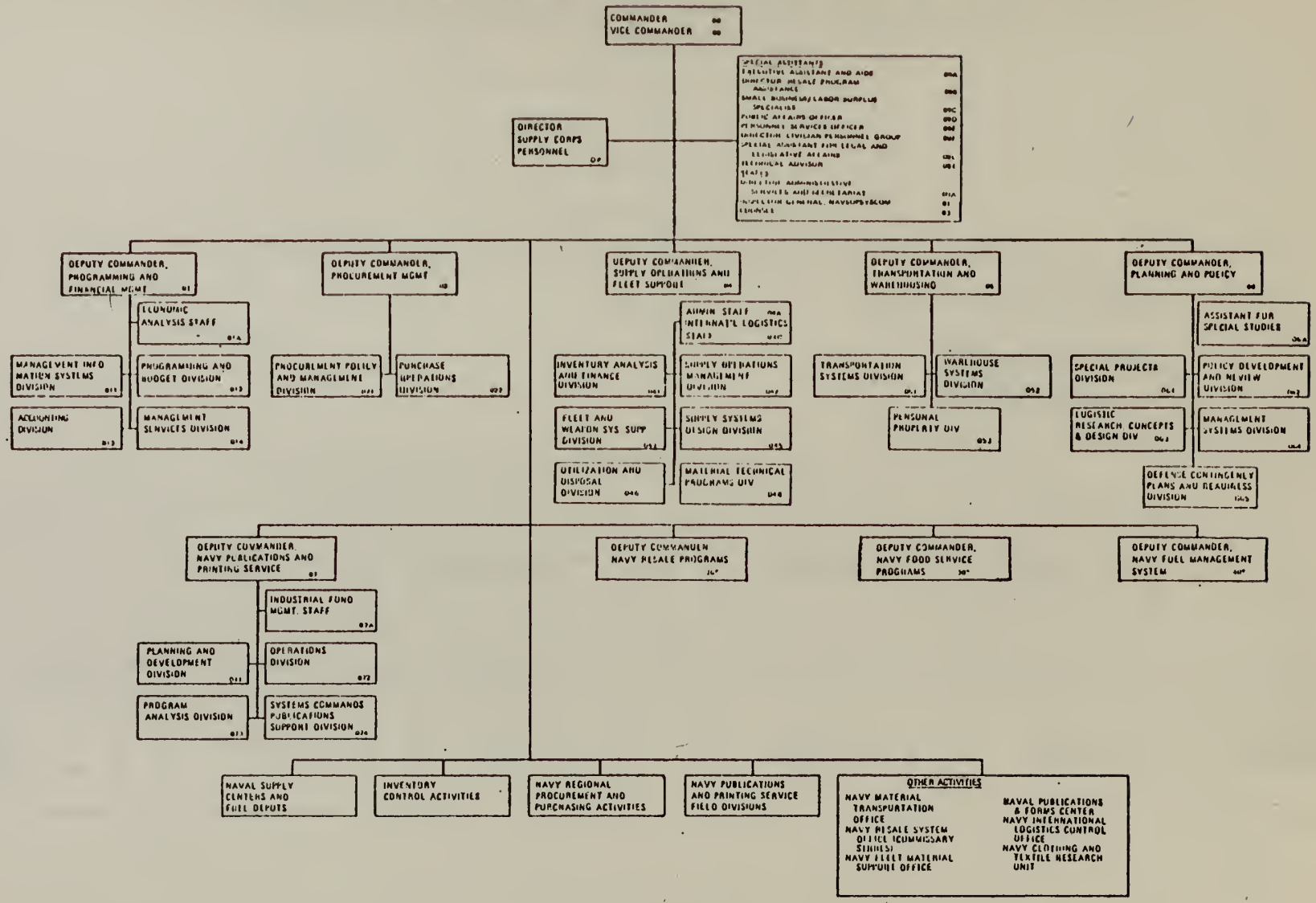
I. RECOMMENDATIONS FOR FURTHER STUDY

Many of the recommendations that were made to improve the BALD operation could also be applied to the transportation functions in other sections at NSC Oakland. It is recommended that the transportation operations throughout NSC Oakland be completely analyzed and that the recommendations contained

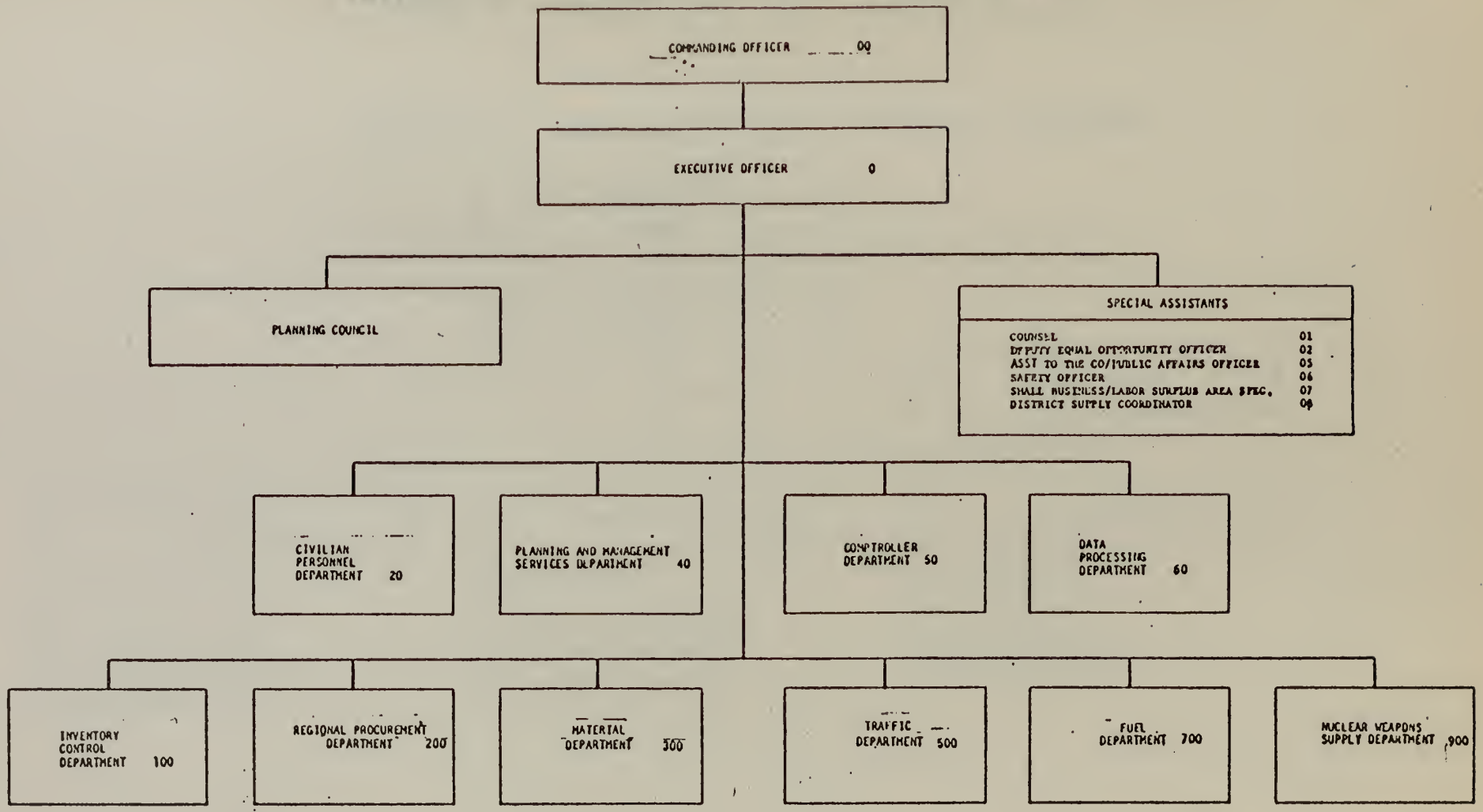
here in regard to the BALD operation be considered for use in the other sections.

One major question that the proposed further study could answer is - Should all NSC Oakland transportation functions utilizing PWCSANFRAN vehicles be placed under one central manager?

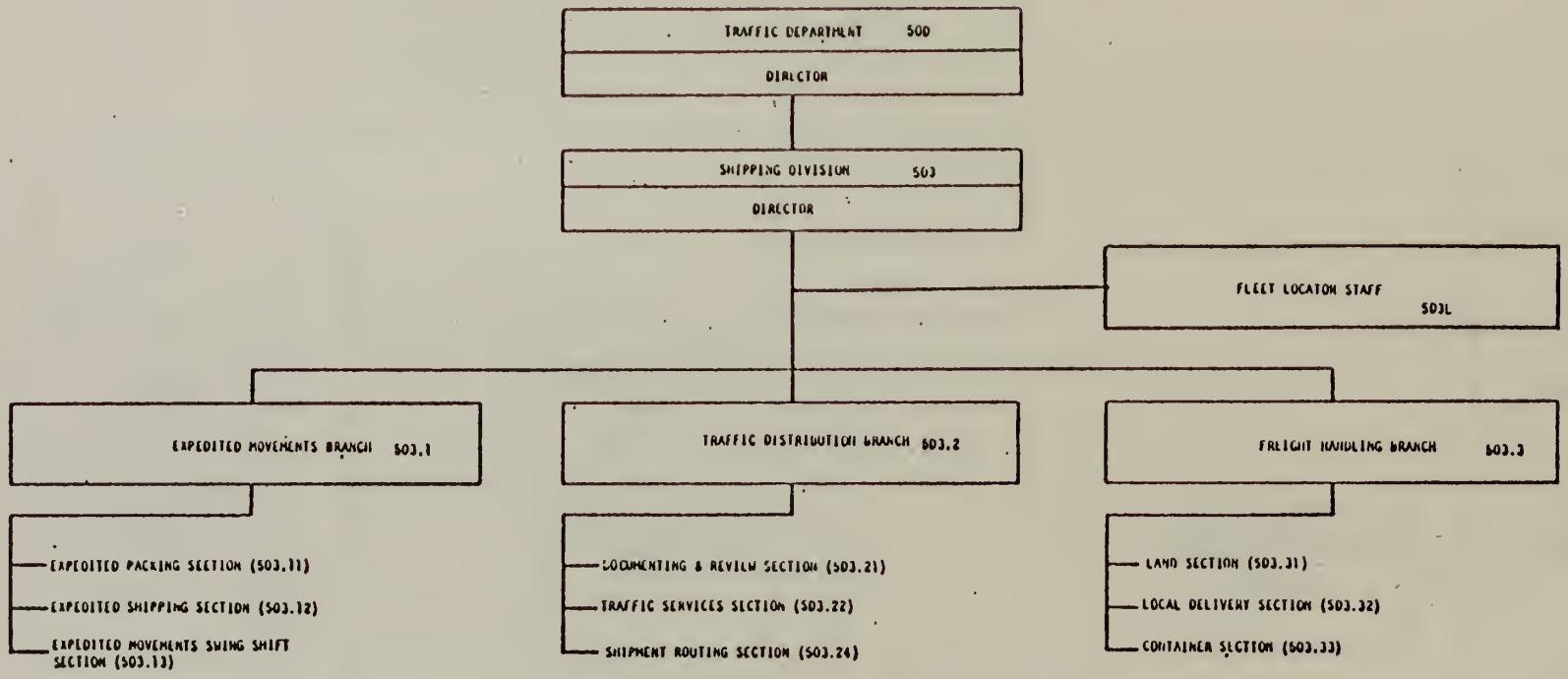
APPENDIX A: ORGANIZATION CHART - SYSTEMS LEVEL



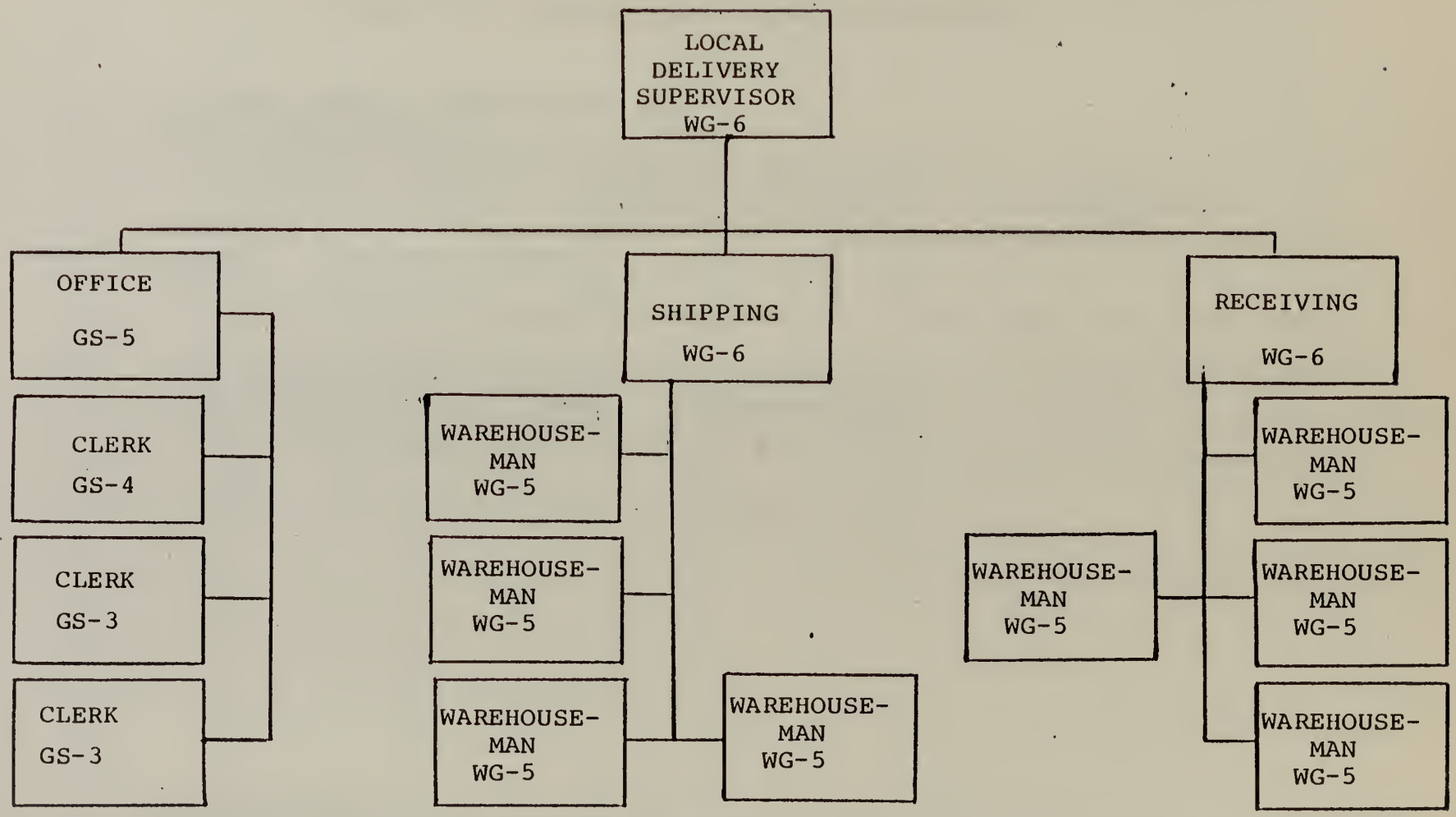
APPENDIX B: ORGANIZATION CHART - SUPPLY CENTER



APPENDIX C: ORGANIZATION CHART - TRAFFIC DEPARTMENT



APPENDIX D: ORGANIZATION CHART - BALD OPERATION



APPENDIX E: COVER SHEET (PROOF OF SHIPMENT)

COVER SHEET (PROOF OF SHIPMENT)CODE SHEET NO. 6

12ND NSC 4480/11 *(Rev. 11-72)*

DOC IDENT	1.POS. TYPE	2. SCN BLOCK GG	3. TIME SHIPPED	4. DATE SHIPPED	5. MODE	6. REGISTRY NUMBER
1-3	6	8-14	15-16	17-19	20	21-28
ZT9		SEE ATTACHED DOCUMENTS				

7. HOLD CODE	8. TIME OFFERED	9. DATE OFFERED	10. BATCH NUMBER	11. TOTAL NO. OF DOCUMENTS ATTACHED	12. PACKED BY
29	30-31	32-34	75-79		

REMARKS

Previous issues are obsolete.

APPENDIX F: VEHICLE SCHEDULING PROGRAM FEATURES

IBM SYSTEM/360 VEHICLE SCHEDULING PROGRAM (VSP) determines the routes a group of vehicles must travel to meet certain commitments in delivering service or products to customers at given locations. VSP enables more nearly optimal fleet use by balancing the basic variables of distance traveled, time and number of vehicles. VSP has two main programs. The Network Analysis Program accepts customer location information in either of two modes: true distances or geographic coordinates. Both modes reference closely knit zones such as shopping centers rather than actual customers and can accommodate up to 255 customers in each zone. The smallest system configuration provides for 730 zones minimum. The program analyzes a network representing the potential calling points and computes actual or approximate distances between all points. The Schedule Protection Program allows schedules to be tailored to meet specific demands of customer service and fleet utilization.

FEATURES: Some of the more important factors which can be taken into consideration, separately or in combination, include:

- Limited calling times by stop.
- Vehicle limits by calling point.
- Average time at all stops in addition to unloading operations.
- Additional time for an individual stop.
- Up to 255 different vehicle types and/or capacities.
- Average speed for the fleet.
- Earliest and latest fleet operating hours.
- Maximum route time by vehicle type.
- Maximum number of calls per route.
- Multi-compartment vehicles.
- Variable assignment of trailers to vehicles.
- Average unloading time for unit delivered.
- Dual specification of load, e.g., weight and volume.
- Multiple journeys for a vehicle in a day and multiple-day journeys.
- Traveling time between calls within a zone.

SYSTEM REQUIREMENTS: Systems/360 Model 30 with 32K storage, two 2311 Disk Storage Units, Card Reader, Printer, Console Printer.

This configuration is suited to routing fleets covering hundreds of delivery points. With core storage expanded to 64K or larger, and additional disk storage units, VSP/360 will schedule routes covering thousands of stops.

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