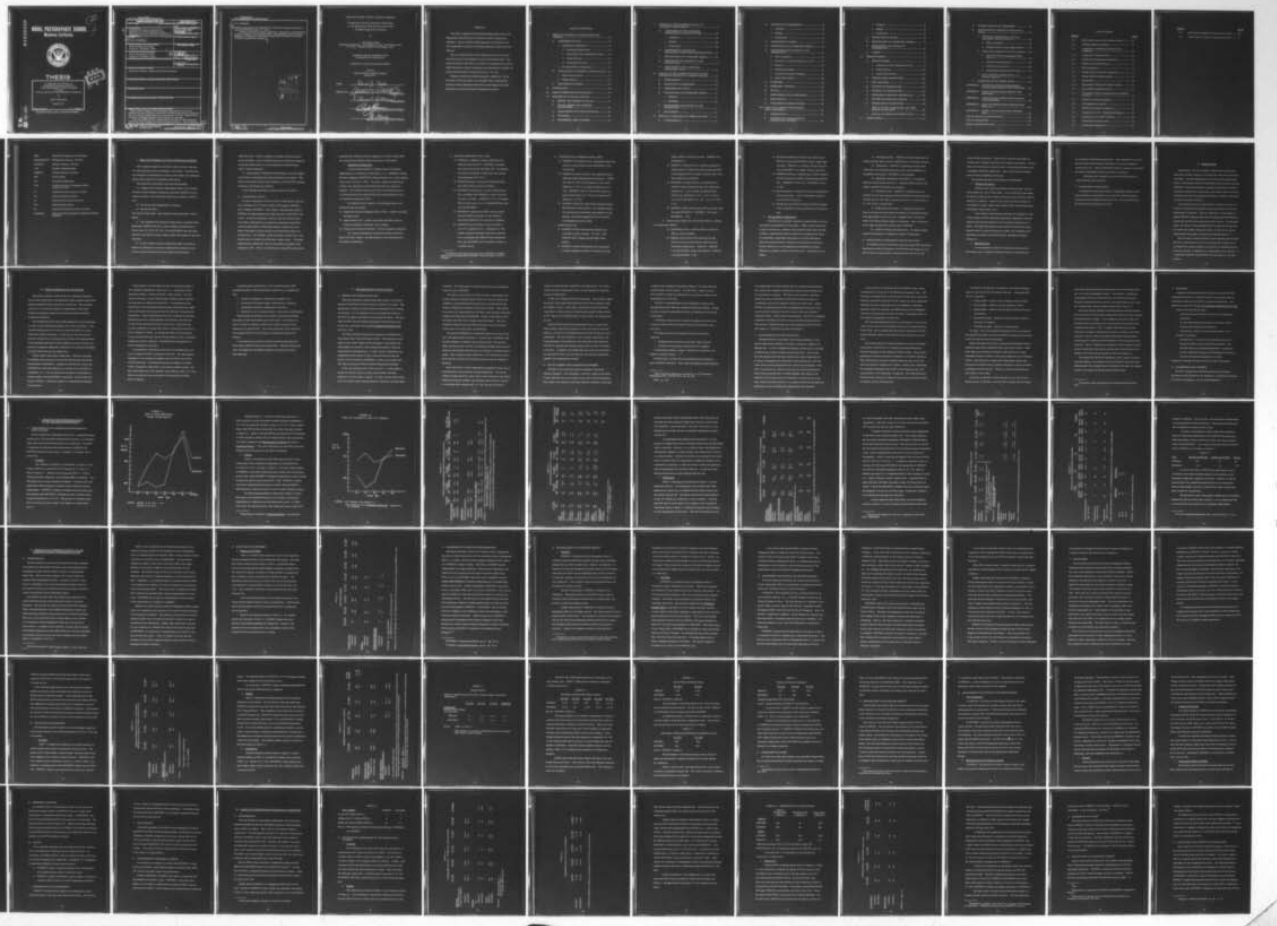
AD-A039 930 NAVAL POSTGRADUATE SCHOOL MONTEREY CALIF F/G 5/1
A COMPARATIVE STUDY OF ACQUISITION DEPARTMENTS IN TWO ENGINEERI--ETC(U)
MAR 77 D J NASH

UNCLASSIFIED NL

1 OF 2
AD
A039930



NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

A COMPARATIVE STUDY OF
ACQUISITION DEPARTMENTS IN
TWO ENGINEERING FIELD DIVISIONS
OF THE
NAVAL FACILITIES ENGINEERING COMMAND

by

David Julian Nash

March 1977

Thesis Advisor: J. C. Tibbitts

Approved for public release; distribution unlimited.

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER / 2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER (9)
4. TITLE (and Subtitle) (4) A Comparative Study of Acquisition Departments in Two Engineering Field Divisions of the Naval Facilities Engineering Command	5. TYPE OF REPORT & PERIOD COVERED Master's Thesis; March 1977
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) (10) David Julian Nash	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 (11) Naval Postgraduate School Monterey, California 93940	12. REPORT DATE Mar[illegible] 1977
	13. NUMBER OF PAGES 162 (12) 163p.
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report) Unclassified
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

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

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

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

This thesis compares the Acquisition Departments of two of the Engineering Field Divisions of the Naval Facilities Engineering Command. The two entities studied appeared at first glance to be very comparable in output but strikingly different in input resources required.

Data was collected from various official sources and from personal interviews of the managers in each of the organizations. The evaluations made in the thesis were based on quantifiable and unquantifiable information

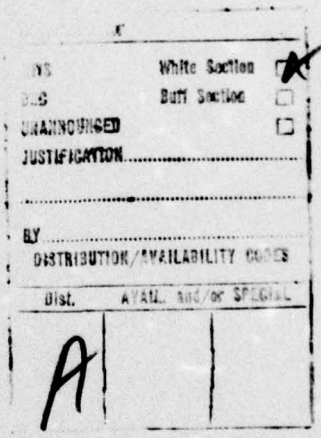
next page

20. (continued)

cont

collected regarding each organization's methods for design and procurement of facilities for the U. S. Navy.

Findings involved the relative likenesses, differences, and efficiencies of the two entities, and concluded with a recommended system for better allocation of resources to the Engineering Field Divisions by the Naval Facilities Engineering Command.



Approved for public release; distribution unlimited

A Comparative Study of Acquisition Departments in Two Engineering Field Divisions of the Naval Facilities Engineering Command

by

David Julian Nash
Lieutenant Commander, Civil Engineer Corps, United States Navy
B.S.E.E., Indiana Institute of Technology, 1965

Submitted in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
March 1977

Author David J. Nash

Approved by: Jonathan C. Tibbitts Jr.
Thesis Advisor

James D. Suttinger
Second Reader

Chairman, Department of Administrative Sciences

Dean of Information and Policy Sciences

ABSTRACT

This thesis compares the Acquisition Departments of two of the Engineering Field Divisions of the Naval Facilities Engineering Command. The two entities studied appeared at first glance to be very comparable in output but strikingly different in input resources required.

Data was collected from various official sources and from personal interviews of the managers in each of the organizations. The evaluations made in the thesis were based on quantifiable and unquantifiable information collected regarding each organization's methods for design and procurement of facilities for the U. S. Navy.

Findings involved the relative likenesses, differences, and efficiencies of the two entities, and concluded with a recommended system for better allocation of resources to the Engineering Field Divisions by the Naval Facilities Engineering Command.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

SUMMARY OF ABBREVIATIONS AND TERMS USED

A/E	Architect-Engineer (a design firm)
CAB	Command Advisory Board
CMP	Command Management Plan
CMS	Construction Management System (a computerized reporting system)
DADS	Deficiency Analysis Data System
DMIS	Design Management Information System
DYL-260	Method of generating customer derived computer reports from data banks of DMIS
EFD	Engineering Field Division
EIC	Engineer in Charge
ESR	Engineering Service Request
FY	Fiscal Year
GULFDIV	Gulf Division, NAVFAC
IPMS	Integrated Program Management System
MCON	Military Construction Navy
MILCON	Military Construction (all Services)
MIS	Management Information System
NAVFAC	Naval Facilities Engineering Command
PCE	Program Cost Estimate
ROICC	Resident Officer in Charge of Construction

SIOH	Supervision Inspection and Overhead
SOUTHEASTDIV	Southeastern Division, NAVFAC
SOUTHDIV	Southern Division, NAVFAC
TOP	Tentative Operating Plan
WESTDIV	Western Division, NAVFAC
WIP	Work In Place
09A	Acquisition Department
09A2	Acquisition Project Management Office (a part of an 09A)
02	Contracts Division (a part of an 09A)
04A	Design Management Branch
04	Design Division (a part of an 09A)
04D	Deputy Design Director
05	Construction Division (a part of an 09A)
Z-planning	Funds provided for planning of MCON and MCNR programs

I. EXECUTIVE SUMMARY OF MAJOR POINTS AND FINDINGS

This summary chapter is provided for those who have time only to review the major points and findings in this thesis. For those who are interested, documentation for points in this chapter plus additional details will be found in the remainder of the thesis.

The objectives of this thesis were basically threefold:

(1) compare the Acquisition Departments (09A's) of the Western Division, Naval Facilities Engineering Command (WESTDIV) and the Southern Division, Naval Facilities Engineering Command, (SOUTHDIV),

(2) look for universal applicability of findings,

(3) educate the author.

The results of this thesis, with respects to these objectives, were as follows:

(1) The comparison of Acquisition Departments in absolute terms showed that WESTDIV has had a larger workload over the period of Fiscal Year (FY) 1972 to FY 1976, but that SOUTHDIV has been more efficient on the whole in terms of dollar output with respect to resources consumed.

(2) A more realistic method of measuring output or activity is needed for evaluating an Acquisition Department's performance and resource needs at the Naval Facilities Engineering Command

(NAVFAC) level. If future workload to staffing conversion factors can be developed, a more equitable allocation of resources among the Acquisition Departments in various Engineering Field Divisions (EFD's) might be possible.

(3) All personnel of WESTDIV and SOUTHDIV were most helpful to the author in developing the background data for this thesis. The author considerably enhanced his knowledge of NAVFAC EFD working procedures and extends his gratitude.

A more detailed elaboration of these results is as follows.

A. COMPARISON OF EFD's

A surface examination of the two EFD's reveals the fact that despite comparable FY 1976 Work in Place (WIP) figures (WESTDIV - $247.9 million, SOUTHDIV - $226 million), the personnel ceiling of WESTDIV was approximately 60% higher than that of SOUTHDIV (589 to 369). It must be recognized, however, that the resource input/work output relationship in an Acquisition Department organization cannot be based solely on WIP output during a single Fiscal Year. Some of the output in a given Fiscal Year will provide outputs over several years. For example, design work done on future year's construction must be funded out of this year's inputs (costs). To further complicate the relationship, there is the problem of program work compared to WIP. That is, an EFD that has a high WIP but low future

program load certainly cannot be compared to an EFD with low WIP but a large future program solely on the basis of WIP output.

1. Quantitative Comparisons

It was decided therefore to compare the two Acquisition Departments on a division by division basis, (i. e., WESTDIV's Design Division compared to SOUTHDIV's Design Division, etc.) over a period of five years (FY 1972 - 1976). To do this, outputs or measures of activity were selected for each division and data was collected to compare. The Contracts Division (02) was not reviewed because it was decided early in the research phase that staffing difference was not significant between the EFD's.

For those divisions compared, the following outputs were considered most meaningful:

(1) - Acquisition Project Management Office (09A2) - number of projects and dollar value.

(2) Design Division (04) - number of projects and dollar value (in terms of estimated construction cost) of design.

(3) Construction Division (05)/ROICC - WIP and number of contracts.

As a result of quantitative comparisons based on the above factors and other aspects, the following facts were determined over the period of comparison.

a. Acquisition Departments (09A in total)

(1) WESTDIV's workload in terms of WIP grew 16% while the staff grew 20%. SOUTHDIV's workload grew about 40% and the staff grew 10%. (No attempt was made to determine if staff sizes were correct at the beginning of FY 1972.)[1]

(2) WESTDIV has put in more total WIP than SOUTHDIV ($957 million versus $757 million).

(3) SOUTHDIV's productivity in terms of WIP per man year was higher than WESTDIV's in four out of the five years surveyed. (WESTDIV's .25 to .30 million WIP per man versus .25 to .43 million WIP per man year for SOUTHDIV.

(4) SOUTHDIV's expense rate (SIOH costs less plans and specs/WIP) in Program IV was relatively lower than WESTDIV's for each year's workload.

(5) WESTDIV has three times as many activities to serve (221 compared to 77). Information on total number of projects managed could not be obtained but it is estimated that WESTDIV had considerably more than SOUTHDIV due to the greater number of activities served.

---

[1]It should be noted that in the near future WESTDIV's workload appears to be growing while SOUTHDIV's workload will be level or decrease.

b. Acquisition Project Management Office (09A2)

(1) WESTDIV's Acquisition Project Management Office has grown at a more rapid rate than SOUTHDIV's (44% versus 25%).

(2) Program (in terms of Fiscal Year programs) load at both Acquisition Departments has decreased. (WESTDIV from FY 1973 of $240 million to a low of $109 million in FY 1977 to an expected $233 plus in FY 1979. SOUTHDIV from FY 1972 of $80 million to a high of $188 million in FY 1972 to an expected $133 million for FY 1979).

(3) WESTDIV's Office has some locally assigned tasking that SOUTHDIV does not have, (e.g. Budget Preparation and execution monitoring, goal progress record keeping, and all data preparation for the Construction Management System (CMS).

c. Design Division (04)

(1) WESTDIV's Design Division has produced more total dollars worth of design. (FY 1974 - 1976 WESTDIV $950.2 million and SOUTHDIV $542 million).

(2) WESTDIV's Design Division has more consultation and other engineering support to provide due to the

larger number of activities served. (WESTDIV 221, SOUTHDIV 77).

(3) WESTDIV's Design Division is leading in improving design quality as evidenced by their pioneering effort in such things as Post Occupancy Reviews (now a NAVFAC Program for all EFD's).

(4) SOUTHDIV's Design Division is considered more efficient and has produced designs less expensively (design cost). (Cost of Plans and Specifications (MCON only) WESTDIV FY 1975 - 5.5%, FY 1976 - 5.6% versus SOUTHDIV's FY 1975 - 4.6%, FY 1976 - 4.4%).

(5) WESTDIV's Design Division has grown at a more rapid rate than SOUTHDIV's. (WESTDIV - 32% versus SOUTHDIV's - 11%).

d. Construction Division (05) and Resident Officer in Charge of Construction (ROICC)

(1) Distribution of size of ROICC offices (in terms of WIP per year) is similar.

(2) Staffing in both Construction Divisions and both ROICC's has grown less than the respective total Acquisition Departments. (Code 05's: WESTDIV 6.9% and SOUTHDIV minus 10%; ROICC's: WESTDIV 9.8% and SOUTHDIV 9.7%).

(3) Productivity defined as WIP per man (Code 05 and ROICC) is close with SOUTHDIV having a slight edge. (Average - WESTDIV $.56 million WIP per man year versus SOUTHDIV $.62 million WIP per man year).

(4) WESTDIV maintains a slightly larger "Staff Overhead" (Code 05 personnel to ROICC personnel) than SOUTHDIV. (WESTDIV 11.2% to 13%. SOUTHDIV 8.6% to 11.4%).

(5) Mix and number of contracts for the two organizations is about equivalent. (60% to 70% Station Contracts, 30 to 40% EFD Contracts).

(6) Overall the construction divisions and ROICCs appear fairly comparable in terms of efficiency and effectiveness.

2. Non-quantitative comparisons

Several factors generally considered unquantifiables were also reviewed during preparation of this thesis. These included difference in type of contractors, problems with Acquisition Department working facilities, organizational maturity differences resulting from effects of consolidation, geographic distribution of workload differences, historical workload growth, differences in unionization of EFD personnel, differences in area employment possibilities and finally, differences in quality of design and construction. Conclusions are as follows.

(1) Working Facilities - WESTDIV's physical separation of design branches leads to built-in inefficiencies in the Design Division.

(2) Unionization - WESTDIV is partially unionized which could affect cost of doing business due to the reduced flexibility of assignment of personnel. SOUTHDIV is not unionized.

(3) Geographic Distribution of Workload - no significant difference found between the EFD's. (Individual ROICC offices' geographic workload distribution not reviewed.)

(4) Workload Growth - WESTDIV's workload has grown steadily over the years analyzed while SOUTHDIV's has been basically constant until FY 1975 when it increased from $114.6 million WIP in FY 1974 to $201.8 million WIP.

(5) Employment Possibilities - Comparing Federal Pay Scale to average per capita income and looking at Government employment opportunities in the two areas, it appears that it is easier to attract and hold profesional people in Charleston. This is evidenced by the higher professional turnover rate at WESTDIV.

(6) Quality of Design and Construction - No totally reliable statistical information is available on quality of construction.

B. APPLICATION OF FINDINGS AT THE NAVFAC LEVEL

An equitable system of allocating resources among EFD Acquisition Departments should be developed at the NAVFAC level based on a system of output to required input conversion factors that do not rely

solely on WIP projections. These factors would be most helpful in turning future workload projections into staffing requirements. Further, these conversion factors would be useful in evaluating performance and in building a defensible budget base. This is particularly important with Zero Base Budgeting in the future.

Two possible systems are proposed for consideration.

1. Expense rate factors

Expense rates could be developed presenting dollar resource requirements per unit of output dollar. Such an approach would negate the effect of inflation since resource and output costs should be affected uniformly by inflation. Expense rates would be stated as dollars of cost/dollars of output (where output would be WIP, Final Design effort, Preliminary Design effort, etc.).

Fund resource requirements could then be developed for each Division within an EFD Acquisition Department organization from the expense rates and then totalled for the Acquisition Department as a whole. The final EFD budgetary totals should be derived from these expense rates but should be adjusted to reflect such intangible work-generators as number of activities served, geographic workload spread, etc.

2. Staffing Factors

A second approach would be to develop conversion factors that would convert workload to staffing directly for all Divisions of

the Acquisition Department organization. If this approach is used, the figures would require periodic adjustment to account for inflation in construction costs. Again, adjustments would be required to incorporate the effect of geographic spread and number of activities.

This approach is already in use at the NAVFAC level for certain divisions such as design.

C. EDUCATION OF THE AUTHOR

It should be evident that the author's knowledge regarding operational procedures and problem areas of NAVFAC EFD Acquisition Departments has multiplied many times over. This thesis objective has been met with unequivocal success.

II. INTRODUCTION

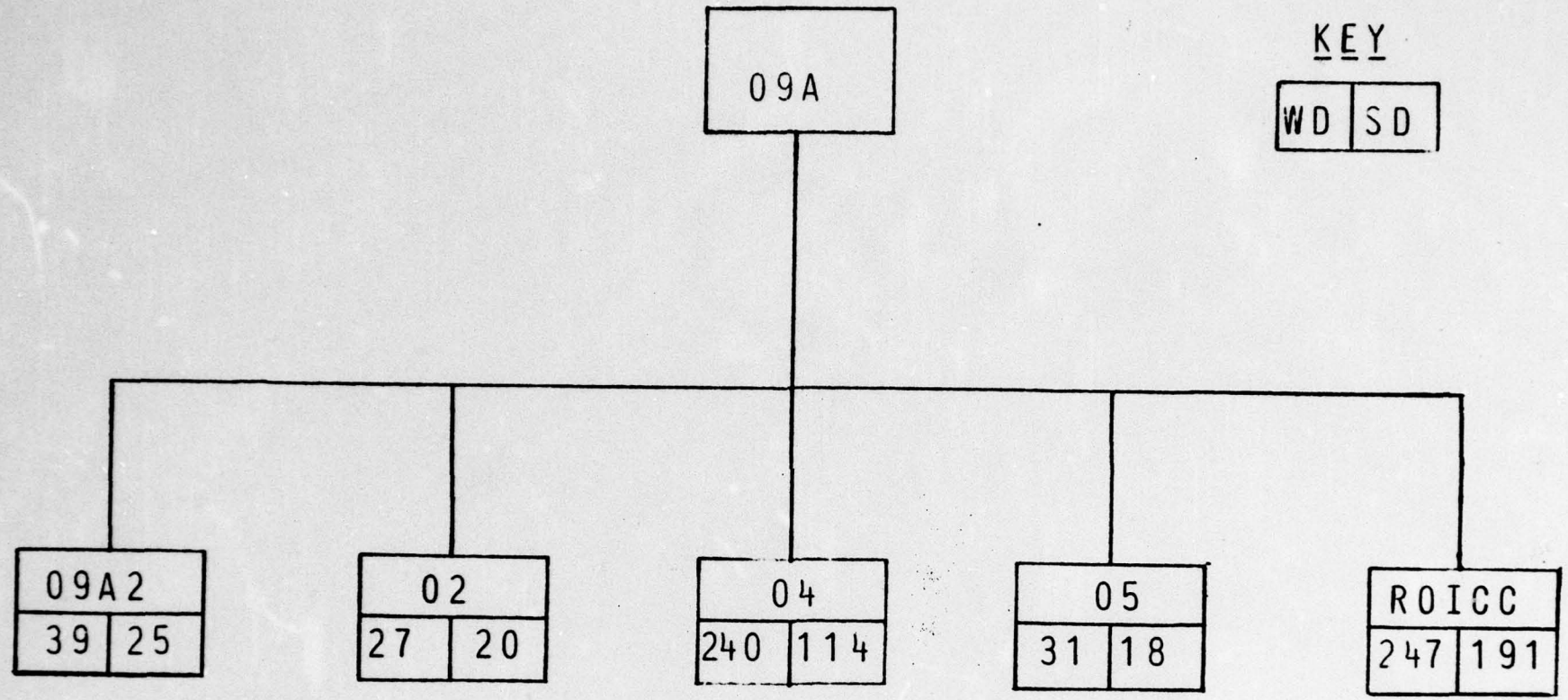
The problem - why do two similar organizations who have the same basic quantity of output in one fiscal year have such a diversity in staffing? The two organizations are the Acquisition Departments (09A's) of the Southern Division (SOUTHDIV) and the Western Division (WESTDIV) of the Naval Facilities Engineering Command (NAVFAC). The output referred to is construction work in place which is the overall final product that the organization provides in support of the Naval Facilities Acquisition Program.

The problem can best be appreciated by referring to Figure 1.1 where the comparison of manpower within each of the two Code 09A departments is displayed. From an initial look, it would appear as though WESTDIV required about 58% more people than SOUTHDIV but placed only about 9% more construction work in place. As one might guess, the subject is not that simple and it is hoped that by the time the reader has finished reading this thesis, he will have a clearer understanding than might be obtained from viewing Figure 1.1.

The true value of studies like this is that something may be found that aids in the allocation of scarce resources; that a better way to accomplish the assigned tasking is discovered; or something may be found that provides an impetus for an improvement in the system. It is hoped that WESTDIV and SOUTHDIV use this thesis for just this purpose.

FIGURE 1.1

FISCAL YEAR 1976 MANNING AND WIP COMPARISON



TOTAL 09A CIVILIANS
WD-585
SD-369

SOURCE: Manning - Calendar year 1975 Manpower Listings

WIP - Fiscal Year 1976 Goal Progress Report

TOTAL WIP
$248 Mil.
$228 Mil.

The thesis begins with a statement of the basis of research and the objectives of the thesis. Next, the background of the Naval Facilities Engineering Command and its EFD's are discussed. This background briefly describes how NAVFAC accomplishes its tasks in the acquisition of facilities for the U. S. Navy. The results of the comparative study of the two Acquisition Departments are then reviewed on a divisional (Project Management, Design Division, and Construction Division) basis. The next section discusses the unquantifiable factors that were encountered in the research. The thesis is closed by the discussion of some of the observations and recommended actions that surfaced as a result of the research.

In closing this introduction, the author wishes to extend his gratitude to all those personnel of NAVFAC, WESTDIV, and SOUTHDIV who gave so freely of their time and advice during the preparation of this thesis.

III. BASIS OF RESEARCH AND OBJECTIVES

The primary objective of this thesis is to attempt to determine why two like organizations with apparently similar outputs require such different amounts of input resources to do their job. The secondary objective is to review any findings for applicability to the entire facilities acquisition process as practiced by the Naval Facilities Engineering Command.

The original approach to the problem appeared to involve determining if the two Acquisition Departments were really comparable. This required finding measures of resource input and product or service output that could be compared. A prime concern was that any data must be reviewed over a sufficient period of time to be representative. It was anticipated that there would be differences in the statistics and that each Acquisition Department would have to be analyzed individually to find the differences and the similarities.

Various means were used to collect data. Extensive searching by telephone was necessary to track down those persons who had the desired data or information. Funding was obtained for a visit to the SOUTHDIV for three days followed by a two day visit at NAVFAC in Washington, D.C. The trip proved very beneficial, particularly in getting insights into how SOUTHDIV is operated. Several trips were made to WESTDIV, which also resulted in considerable development of information.

Questionnaires were developed for each of the Division Heads of the Acquisition Departments under study (i.e., Acquisition Project Management Office, Contracts Division, Design Division and Construction Division) to ensure that the same questions were asked and the same data was collected in both EFD's. No questionnaire was constructed for the Contracts Division because the decision was made in the early stages of the research that the difference in manning was insignificant. These questionnaires were not as effective as had been hoped because of the varying degrees of seriousness with which the Division Heads approached the task of answering. Some took time to reply completely in writing while others returned the questionnaire partly completed or blank. An attempt was made to fill in the gaps during personal interviews with the Division Heads so that a reasonable comparison could be conducted. Questionnaires and responses are found in Appendixes A through C.

A questionnaire containing six questions was developed for a survey of a sample of ROICC's assigned to each EFD. The questionnaire (Appendix D) was developed to attempt to get the field's view of how its EFD performed. The evaluation system was based on a number rating (1 through 10) rather than a word rating (excellent to bad). All those interviewed were Civil Engineer Corps Officers of the U. S. Navy which gave them all some commonality of background and similar basis of judgment.

In preparing the questionnaire, it was considered that an EFD provides the ROICC with the following to enable him to accomplish his task:

1. Resources (manpower, administrative support, etc.)
2. Contractural Documents (plans, specifications, contracts)
3. Consultation Assistance (design and construction)
4. Authority to Act (on change orders or construction modifications)

Therefore the six questions were framed to attempt to determine the quality of support provided in each of the areas. No attempt was made to weight the findings by dollar work in place per year or the experience of a given ROICC. The results indicated a fairly consistent view amongst ROICC's and the reader can extend the results as he chooses.

A very good source of data was found in the many personal interviews held at NAVFAC and at each of the EFD's. All those interviewed were very helpful and all followed through on providing the written data requested.

IV. BACKGROUND OF NAVFAC AND EFD

A. HISTORY AND TASKING OF NAVFAC

Before discussing any specifics about the system, a brief background of the NAVFAC and how it does its business is in order. This background is slanted to briefly inform the unfamiliar and to refresh the initiated. It is not intended as an all encompassing treatise on NAVFAC but rather a backdrop for the ensuing discussion. The facts about NAVFAC and the Command Management System found in this section were excerpted from FY 1977 Command Management Plan, NAVFAC, P441.

The Naval Facilities Engineering Command was established as the Bureau of Navy Yards and Docks in 1842. This embryonic group under its first Chief, Captain Lewis Warrington, was assigned the responsibility for the Navy Yard including all facilities, labor and transportation contained therein. In 1862, the Navy Department was reorganized and the Bureau of Navy Yards and Docks became the Bureau of Yards and Docks (BUDOCKS), a name it was to hold until 1966 when it became the Naval Facilities Engineering Command.

In the years following 1862, the face of the U. S. Navy began to change and with the coming of steam powered ships, the shore facilities of the Navy began to expand. By 1890, the Navy had several yards and stations with a growing amount of waterfront and ship repair

facilities. The construction of all these facilities was accomplished under the eye of BUDOCKS.

The nature of the Bureau of Yards and Docks' responsibility was further enlarged during the period (1900-1911) when its mission was modified to include planning and supervision of construction for the Bureau of Medicine and Surgery and the Marine Corps. This tasking was added to the responsibility for the Navy Yards and other designated stations previously held by BUDOCKS. Finally, all the Public Works' activities in the Navy were brought under this Bureau. This was a significant change because previously the Bureau having cognizance of the activity was responsible, not BUDOCKS.

The growth of BUDOCKS was especially impressive during World War I and again during World War II. In both cases, BUDOCKS' staffing grew tenfold in a relatively short period of time. During these times, the Bureau was involved in tremendous buildups which required numerous new facilities and then post-war disposal of countless excess assets. Also, during and after World War II, the construction moved away from the continent and for the first time into the far reaches of the world.

Since World War II, more challenges have appeared and the nature of the facilities construction has changed significantly. The Korean Conflict brought with it the construction of more facilities in the Pacific. Following the Korean Conflict, the onslaught of the Cold War created an increasing need to project the U. S. Navy into the World and to

continue to modernize her capabilities in the Space Age. As a result of this increase of operational needs, the requirements for facilities increased significantly.

In 1964, the Vietnam War had its beginnings. This conflict created the need for Navy supervised construction that would eventually reach $1.8 billion in value. In this effort, the Bureau of Yards and Docks supervised a civilian contractor combine that reached its peak activity in 1967 when over two million dollars of construction was being placed per day.

Today NAVFAC still has the responsibility for an annual multi-million dollar construction program but many new facets to facilities planning, construction, and maintenance have made the job ever more challenging. The new parameters such as energy conservation, pollution abatement, noise abatement, and many others have called for NAVFAC to continue improving the quality of the services it provides to the Navy. In addition, the overall reduction in the size of the Navy has required NAVFAC to be ever alert for new and more economical methods of accomplishing its tasking.

B. NAVFAC TASKING AND COMMAND RELATIONSHIP

NAVFAC is one of the five systems commands in the Naval Material Command. The Commander, NAVFAC, reports to the Chief of Naval Material who in turn reports to the Chief of Naval Operations. This chapter and authority of the Naval Material Command is described

in detail in the Command's organization Manual,[1] for those who wish to delve deeper into the subject. For this thesis, suffice it to say, the Command is primarily responsible for the material support of the operating forces of the Navy.

NAVFAC's responsibilities are also delineated in detail in the aforementioned Naval Material Command Organization Manual. Among the many assigned responsibilities listed, the following are of interest in this thesis:

"Providing architectural and engineering design and construction of the Navy shore facilities and fixed surface and subsurface ocean structures.

Providing technical and managerial advice and assistance regarding:

1. facilities minor construction and major repair projects;

2. facilities fire protection engineering and fire fighting.

Programming, planning, design, construction, acquisition, and disposal of family housing . . . ."[2]

NAVFAC plays a pivotal role in the planning and acquisition of shore facilities in the Navy. It has a part in preparing annual programs

---

[1]Naval Facilities Engineering Command, FY 1977 Command Management Plan, NAVFAC P441, pp. A5-A10.

[2]Ibid., p. A-12.

for consideration by various entities that are involved in the iterations that a given year's military construction program passes through prior to presentation to Congress. NAVFAC is then involved in testifying before the various committees in the Senate and House as they are considering a given year's Military Construction (Navy) Bill. Finally, NAVFAC is charged directly with accomplishing the acquisition of the various projects included in the Navy's part of that year's Military Construction Bill. (Under certain circumstances, NAVFAC accomplishes acquisition of facilities for other services and governmental agencies.) This tasking is fulfilled through use of the Engineering Field Divisions (See Chapter IV, Section E) and their subordinates.

C. MANAGEMENT STYLE AND OBJECTIVES

Although NAVFAC is the oldest of the system commands, it has always endeavored to maximize its ability to manage in a modern and efficient way. In 1959, it adopted the program concept where it grouped its efforts into a series of product and service areas. This concept has been massaged over the years and has been neatly integrated into a system of Management by Objectives recently embraced by NAVFAC. Today there are nine programs that are used by the Commander, NAVFAC, to set priorities, allocate resources and evaluate performance. Each of these programs has a Program Manager that assists in the definition of the program goals and objectives, forecasts future workload, allocates internal resources to accomplish objectives and appraises performance towards meeting the assigned goals and objectives.

A key document in communicating the Command's goals, plans, and allocation of resources is the Command Management Plan. This document is published yearly and provides the field with an Objectives Plan that outlines the objectives for the coming year and an Operating Plan that cites the achievements to be accomplished, establishes priorities within the command, and details goals to be accomplished. The basis of this document and thus NAVFAC's management policy is the system of Management by Objectives.

The Command Management Plan is not developed in a vacuum but rather is the result of an interchange between the Command Advisory Board (CAB), who is charged with advising the Commander NAVFAC, and the operating entities in the field that will actually carry out the work.

The process allows for tentative allocation of resources through an internal (to NAVFAC H. Q.) iterative interchange between the Program Managers and the Command Advisory Board. This internal generation of resource allocation culminates in a Tentative Operating Plan (TOP) which is produced sometime after mid-year review and sent to the field for comment and reclama. Based on this interchange, the Command Management Plan (CMP) is then finalized by the CAB and presented to the Commander for approval. The CMP permits the individual field commands to apply the total resources allotted to them in whatever manner they deem best.

In addition to the allocation of resources, the CMP promulgates goals for each activity for the coming fiscal year. These goals fall into four categories:

1. Product goals - refers to major tangible output to clients.
2. Service goals - refers to service provided to clients.
3. Support goals - refers to internal effort to produce services and products.
4. Improvement goals - measures of actions taken to improve efficiency or response.
5. Performance goals - measures of effectiveness.

The goals cited in the Command Management Plan are mandatory and individual activities do not have flexibility in dealing with the goals as they do with the resource allocations.

Some of the goals do not have a measurable relationship between output and input and are identified with a given level of effort. Other goals which are indicators of Command wide output are not input identified and thus are valid for measuring production but not efficiency. Finally, some goals have a measurable relationship between input and output and could be used to measure efficiency or derive workload to staffing conversion factors. However, presently these goals are used solely to track output.

Evaluation or appraisal of field activities is not a structured or formal process at NAVFAC, since NAVFAC considers that the danger

exists that detailed appraisal can become an end in itself rather than a part of a prudent management system. (At all levels, including the Commanding Officers of field activities, the CMP and particularly the goals contained therein can serve a very useful function as a measure of performance and as a target towards which to strive.)[3]

One of the inherent dangers of the goal system is that all attention may be focused on meeting goals and the basic objectives of the organization then become secondary. It was apparent during the research for this thesis that two problems may be arising now with regards to the Command goal system. First, it appears that there may be some definitional problems regarding what actually is included in that being measured. Second, with the competition spurred by the publication of goal progress, meeting the goals appears to be becoming the prime requisite. That is, information or decisions on how or what to do may be more influenced by how they fit into the plan to meet the goals than whether or not the decision is prudent or best in the long run.

The progress by NAVFAC in finding the correct goals (or measuring stick) appears very iterative and is proceeding at a prudent speed. Although goals have changed since the inception of the idea, the changes seemed to be logical and moving towards improvement.

---

[3] The points in this section have been excerpted from NAVFAC P441.

D. PROGRAMS

A final bit of background deemed necessary about the NAVFAC management system is to discuss briefly the two programs that are of interest in the study of an EFD's Acquisition Department. The following is taken from the FY 1977 Command Management Plan, P441.

Program III (interalia) provides:

- technical direction and quality control of all engineering and design.
- for the formal facilities engineering and design criteria.
- Engineering/Architectural consultation.
- management, training, and engineering support costs.

Program IV provides:

- administrative, contractural, and technical services to execute the Navy's annual construction program. This includes all facets of program management, contractural actions, production of plans and specifications for construction and construction management in the field.

Program IV consumes the most resources of the two programs.

E. ENGINEERING FIELD DIVISIONS

NAVFAC's Engineering Field Divisions have three primary functions as field activities for the Command, (1) facilities acquisition, (2) facilities management, and (3) facilities planning.

There are presently six EFD's located throughout the United States as follows:

Northern Division - Philadelphia, Pennsylvania

Chesapeake Division - Washington, D. C.

Pacific Division - Pearl Harbor, Hawaii

Atlantic Division - Norfolk, Virginia

Southern Division - Charleston, South Carolina

Western Division - San Bruno, California

All EFD's have a Facilities Management and a Facilities Planning Department, each of which handles their respective part of the EFD mission. Of interest in this thesis is the Acquisition Department (09A) which is responsible for facilities acquisition.

Each Acquisition Department has four major entities;

1. Acquisition Project Management Office (09A2) which handles the project management function.
2. Contract Division (02) which performs the contractural tasks required in the procurement of facilities.
3. Design Division (04) which is responsible for the design of facilities to be constructed.
4. Construction Division (05) which provides the construction management and surveillance during the construction of facilities. This it accomplishes in concert with another entity (outside the 09A) on the jobsite, the Resident Officer In Charge of Construction (ROICC).

In 1970, NAVFAC decided to reorganize and consolidate some of the smaller EFD's into the six listed above. The two EFD's under study in this thesis were formed during that reorganization. Southern Division was formed at Charleston through the consolidation of Southeast Division (located in Charleston, S. C.) and Gulf Division (located in New Orleans, La.). At the same time, Western Division was formed at San Bruno as a result of consolidation of three EFD's, Southwest Division in San Diego, California, Western Division in San Bruno, and Northwestern Division in Seattle, Washington. The important fact about consolidation that is pertinent to this thesis is that both EFD's under consideration went through the same organizational experience at about the same time.

V. RESULTS OF THE COMPARATIVE STUDY OF THE ACQUISITION DEPARTMENTS

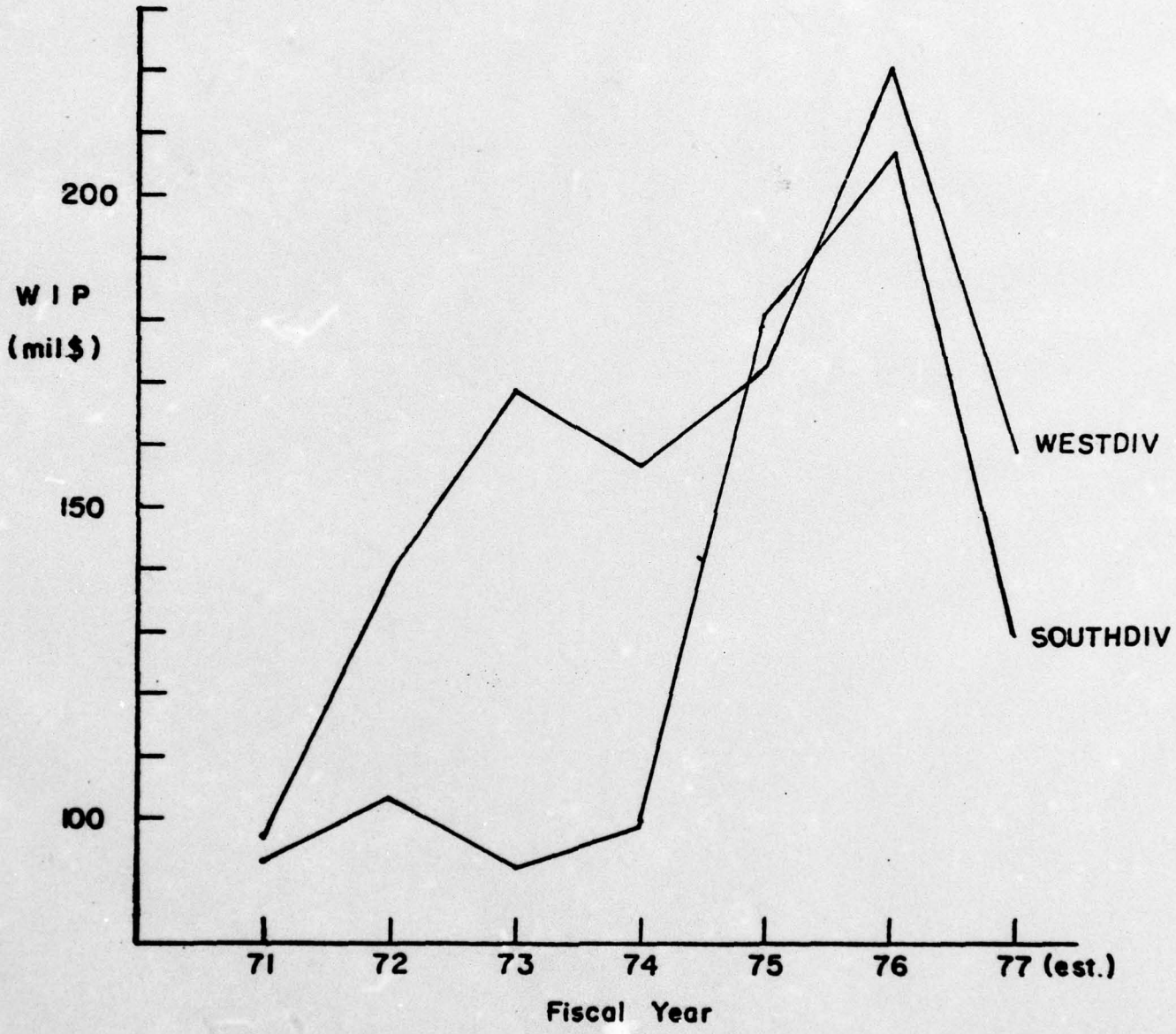
A. COMPARISONS OF THE ACQUISITION DEPARTMENTS AS TOTAL ENTITIES

The two entities have comparable inputs (cost), comparable outputs (construction), and equivalent organizational structures, so it logically follows that the Acquisition Departments are comparable. The effort of comparing the total Acquisition Departments of WESTDIV and SOUTHDIV focused on three areas (1) workload, (2) staffing, and (3) productivity.

1. Workload

The workload for WESTDIV and SOUTHDIV in dollars of work in place (WIP) over a period of FY 1972 through FY 1977 (est.) is shown in Figure 5.1. Shown is income-bearing WIP (i.e., WIP on which Supervision, Inspection, and Overhead (SIOH) is collected). The WIP figures have not been adjusted for inflation. Of major note is the significantly differing patterns of growth of the workload for the two organizations. WESTDIV's workload in absolute terms has been growing gradually while SOUTHDIV's workload was fairly constant until it increased significantly in FY 1975. This pattern of workload growth will be discussed in greater depth in the Chapter on unquantifiable factors.

FIGURE 5.1
WORK IN PLACE ($MILLIONS)
ACTUAL INCOME BEARING



SOURCE: NAVFAC 01 FY 1972 - 1977
NAVFAC 05 FY 1971

Although Figure 5.1 is useful in indicating where the two EFD's started (in terms of absolute workload) following consolidation (FY 1971) and where the workload is going in FY 1977, a more realistic look at total WIP (income-bearing plus non income-bearing) is shown in Figure 5.2. Shown is the total WIP for the period of FY 1972 through FY 1976 adjusted to reflect July 1971 dollars based on the Construction Cost Index compiled by the Engineering News Record and shown in Business Statistics.[1] The gross WIP figures for both EFD's have been deflated by the same figure for the sake of uniformity.

2. Staffing

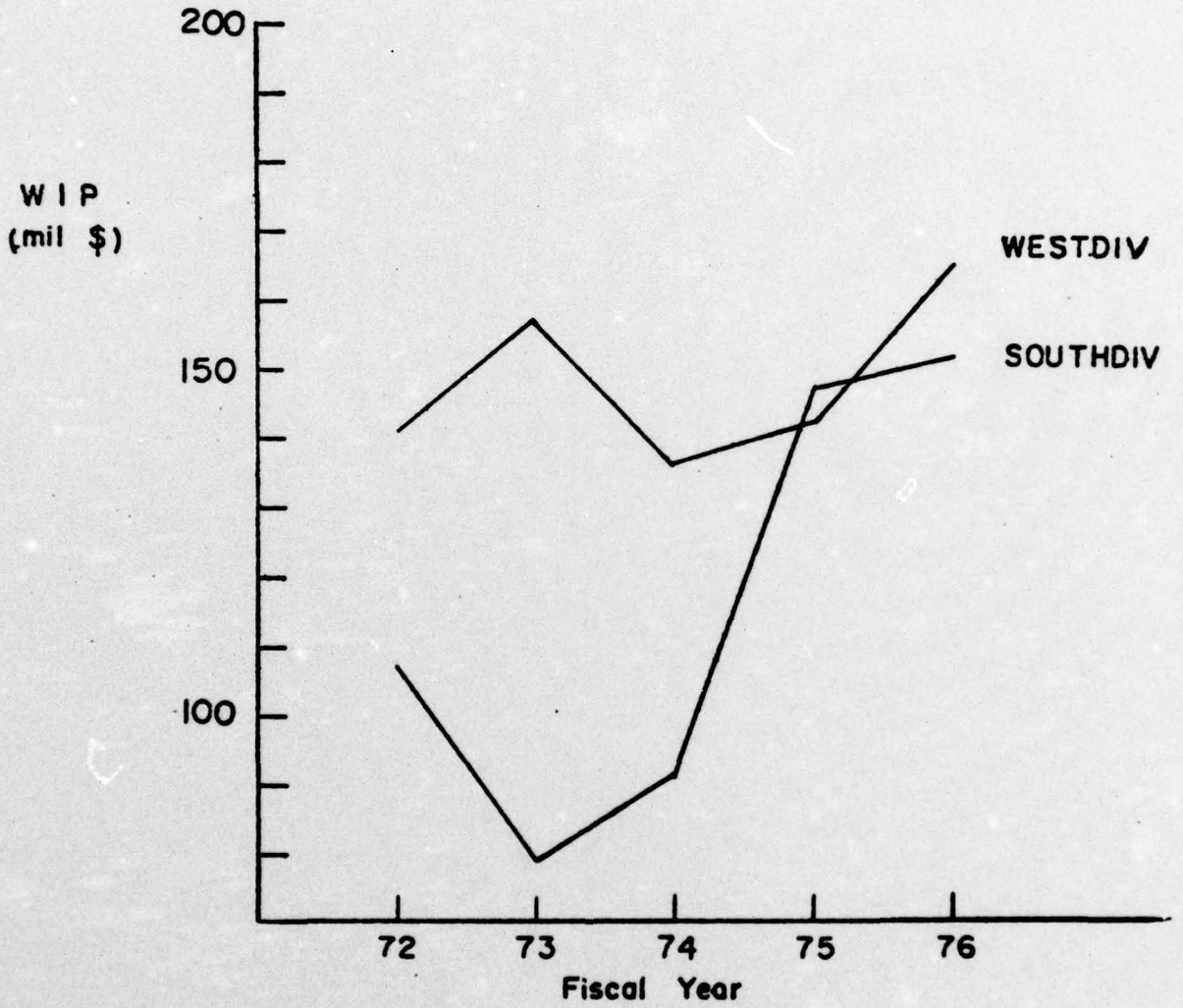
Table 5.1 illustrates the total WIP output and total civilian staff growth of each Acquisition Department over the period from FY 1972 to FY 1976. As shown in Table 5.1, the total civilian staffing of WESTDIV's Acquisition Department grew by about 20% and the output grew by 16%, while SOUTHDIV's Acquisition Department's staff increased by about 10% and the output grew by 40%. Thus, WESTDIV's staffing grew faster proportionately than their workload while SOUTHDIV's total staff grew at about one-quarter of their overall workload increase.

An interesting phenomenon is illustrated in Table 5.2 where the growth of the individual divisions in the respective Acquisition Departments is compared to the total department growth. In WESTDIV's case, the Design Division's (04) staffing has grown by about 32%

---

[1]Department of Commerce, Business Statistics, varying years.

FIGURE 5.2
TOTAL WIP (ADJUSTED TO JULY 1971 DOLLARS)



SOURCE: WIP figures from Figure 5.1
Cost deflator from Business Statistics, Department of Commerce

TABLE 5.1

STAFF GROWTH VERSUS TOTAL WORKLOAD GROWTH

	FY 1972	FY 1973		FY 1974		FY 1975		FY 1976		FY 1972-76
	No.	No.	%Change	No.	%Change	No.	%Change	No.	%Change	%Change(rounded)
STAFF (total 09A)										
WESTDIV	489	521	6.5	521	0	572	10	585	2	19.6
SOUTHDIV	336	320	(4.8)	304	(5)	338	11	369	9	9.8
WORKLOAD										
WIP (mil $ unadjusted)										
WESTDIV	156.3	187.1		170.2		196		247		
SOUTHDIV	118.9	94		114.6		201.8		228.1		
WIP (mil $ adjusted to July 1971 dollars)										
WESTDIV	142.3	158.2	11	136.9	(13.5)	142.8	4.3	165.3	15.8	16
SOUTHDIV	108.3	79.5	(26.6)	92.2	16	147	54.4	151.5	3	40

SOURCE: 1) WIP FY 1972-76 based on information from NAVFAC 01 WIP adjusted using construction cost index published in Business Statistics 1975.

2) Manning figures from manpower listings for calendar year 1971 through 1975.

3) WIP for FY 1972 from WESTDIV and SOUTHDIV Construction Division.

TABLE 5.2

STAFFING GROWTH BY DIVISIONS

	FY 1972	FY 1973		FY 1974		FY 1975		FY 1976		Total FY 1973-76	
	No.	No.	%Change	No.	%Change	No.	%Change	No.	%Change	No.	%Change
09A2											
WESTDIV	27	31	14.8	34	1	37	8.8	39	5.4	12	44.4
SOUTHDIV	20	20	0	20	0	22	1.1	25	13.6	5	25
02											
WESTDIV	25	25	0	25	0	27	8	27	0	2	8
SOUTHDIV	18	16	(11)	16	0	19	18.8	20	5.3	2	11
04											
WESTDIV	182	195	7.1	201	3	233	15.9	240	3	58	31.9
SOUTHDIV	103	105	1.9	100	(4.8)	113	13	114	.9	11	10.7
05											
WESTDIV	29	30	3.4	31	3.3	31	0	31	0	2	6.9
SOUTHDIV	20	19	(5)	19	0	17	(10.5)	18	5.9	(2)	10)
ROICC											
WESTDIV	225	239	6.7	228	(4.6)	243	6.6	247	1.6	22	9.8
SOUTHDIV	174	160	(8)	147	(8.1)	166	12.9	191	15.1	17	9.7
TOTAL 09A's											
WESTDIV										96	19.6
SOUTHDIV										33	9.8

Source: Manpower listings for years stated.
()- indicates negative growth

and the Acquisition Project Management Office (09A2) has grown by 44% while the total Acquisition Department (09A) has grown by 20%. For SOUTHDIV, only one division, Code 09A2 (25%) grew at a rate significantly more than the entire Acquisition Department's growth of about 10%.

In contemplating the statistics discussed above, it is not intended to suggest that a given organization should grow proportionately with its work load. However, it is of value to look at the magnitude of staff growths compared to output growths and consider this as one fact in a total evaluation. Growth of a division at an accelerated rate could mean a conscious effort by management to change the emphasis of an organization is underway, or that one division is better at negotiating with top management for increased manpower. It could also imply that the division may be more inefficient than the rest.

3. Productivity

Table 5.3 massages the information of Table 5.1 to show productivity figures. The information in the top half of the Table indicates the relative mix of workload between income-bearing and non income-bearing WIP. The figures shown have all been deflated to July 1971 dollars for comparison of actual workload. Using the total WIP figures and the total civilian staffing of each Acquisition Department shown in Table 5.1, productivity figures were calculated for both departments for the period. The total WIP production rates

TABLE 5.3

COMPOSITION OF WORKLOAD AND PRODUCTIVITY COMPARISON

	FY 1972	FY 1973	FY 1974	FY 1975	FY 1976	Average
WORKLOAD						
Mil $ Adjusted						
INCOME BEARING						
WESTDIV	127.6	143	126.8	125.9	147.0	
SOUTHDIV	94.4	77.8	80	132.1	137.2	
NON-INCOME BEARING						
WESTDIV	14.7	15.2	10.1	16.9	18.3	
SOUTHDIV	13.8	1.7	12.1	14.9	14.3	
TOTAL						
WESTDIV	142.3	158.2	136.9	142.8	165.3	
SOUTHDIV	108.3	79.5	92.2	147	151.5	
PRODUCTIVITY ($ Mil WIP/man year)						
Income Bearing						
WESTDIV	.26	.27	.24	.22	.25	.25
SOUTHDIV	.28	.24	.26	.39	.37	.31
TOTAL						
WESTDIV	.29	.30	.26	.25	.28	.28
SOUTHDIV	.32	.25	.30	.43	.41	.35

Source: WIP 1973-76 Table 5.1 and information provided by NAVFAC 01, FY 1972 provided by 05 WESTDIV and 05 SOUTHDIV.
Manning - Table 5.1.

are more meaningful since they represent the entire output of the organization. Note that in only one out of the five years was SOUTHDIV's productivity rate less than WESTDIV's.

A method of efficiency analysis presently being implemented by NAVFAC is the concept of expense rate. The concept compares the cost of the Acquisition Department chargeable to SIOH divided by the income-bearing work put in place. The costs used do not include the cost of plans and specifications but do include program management costs, contract administration costs and the cost of construction management. Table 5.4 presents the expense rates for the two EFD's from FY 1967 to FY 1977 (est.).[2] It should be noted that in only one occasion (FY 1969) does SOUTHDIV's rate exceed that of WESTDIV. In NAVFAC's Command Management Plan for FY 1977, different expense rate targets are contemplated based on the economies of scale (i.e., larger workload, smaller expense rate). Using the bands of upper and lower workloads and expense rates, the lower portion of Table 5.4 shows that SOUTHDIV's expense rate was consistently below the minimum or in the low end of the range. Conversely, WESTDIV was consistently in the high end of the band.

A final comparison that would reflect on cost of manpower is shown in Table 5.5 where the grade level distribution within each

---

[2]Expense rates before FY 1970 are a summation of the EFD's later consolidated.

TABLE 5.4

COMPARISON OF EXPENSE RATES

Expense Rate (%)	FY 1967	FY 1968	FY 1969	FY 1970		FY 1973	FY 1974	FY 1975	FY 1976	FY 1977 (est.)
WESTDIV	4.3	3.9	3.4	3.8	consolidation	2.8	3.0	3.0	2.7	3.2
SOUTHDIV	3.4	3.0	3.5	3.7		3.4	2.8	1.8	1.9	2.8

Source: FY 1967 - 70 and 73 through 75, Code 05, NAVFAC
FY 1976 and 1977 calculated from information provided by NAVFAC Code 01

Expense rate = $\frac{\text{amount of costs charged to SIOH}}{\text{income bearing WIP}}$

Compared to Target

WESTDIV				
Actual	2.8	3.0	3.0	2.7
Target	2.3-3.1	2.3-3.1	2.3-3.1	2.3-3.1
SOUTHDIV				
Actual	3.4	2.8	1.8	1.9
Target	3.2-4.0	3.2-4.0	2.0-2.8	2.6-3.4

Source: Targets from FY 1977 Command Management Plan NAVFAC P-441.

TABLE 5.5

GRADE LEVEL COMPOSITION COMPARISON

	09A2		02		04		05		ROICCS	
	SOUTH DIV %	WEST DIV %	SOUTH DIV %	WEST DIV %	SOUTH DIV %	WEST DIV %	SOUTH DIV %	WEST DIV %	SOUTH DIV %	WEST DIV %
Clerical/Miscellaneous (GS 1 to GS 5)	28	22	50	44.5	22	11.5	28	28	23	20
Subprofessional GS 6 to GS 10)	4	16	20	18	5	6	0	3	53	55
Professional (GS 11 to GS 15)	68	62	30	37.5	73	82.5	72	69	24	25

HIGH GRADE POSITION (GS 13 - 15) COMPARISON (TOTAL EFD IN NUMBER OF POSITIONS)

	WESTDIV	SOUTHDIV
GS 13	28	28
GS 14	14	10
GS 15	2	3

SOURCE: Calendar Year 1975 Manpower Listing

division is displayed. As can be seen, the distribution of grade levels in each organization is about equivalent. This leads to the conclusion that no imbalance in grade structure exists.

One major consideration to keep in mind when comparing these two Acquisition Departments is that WESTDIV has about three times the number of major activities to serve in its area of responsibility as does SOUTHDIV. The number of activities served by SOUTHDIV and WESTDIV are as follows in Table 5.6.

TABLE 5.6

EFD	MAJOR ACTIVITIES	MINOR ACTIVITIES	TOTAL
WESTDIV	160	62	221
SOUTHDIV	54	23	77 [3]

As can be seen above, WESTDIV has three times as many activities to serve which certainly impacts on the manpower in the Acquisition Department required to do the job. However, as will be discussed later the consultation requirements do not dictate three times as many people, nor does it require three times as many man years to meet its requirements.

The parameters used in this general comparison are considered adequate for this part of the study; however, it is not implied that WIP is necessarily the best measure of an Acquisition Department's

---

[3] FY 1977 Command Management Plan, NAVFAC P441, p. C-78.

workload. Much design and program management effort does not contribute WIP until later years. In addition, design consultation and small construction projects add workload, yet do not materially affect WIP figures. Therefore, a comparison of Acquisition Department organizations should go further, by including comparison within the respective organizations. This will be done in future chapters.

B. COMPARISON OF ACQUISITION DEPARTMENT DUTIES AND RESPONSIBILITIES

The respective organizational manuals define the duties of the Acquisition Departments in an almost identical manner. The incumbent basically acts for the EFD's Commanding Officer in the areas of design, construction and contracts (except utilities and real estate). He is the Program III and IV Manager for the EFD. Finally, the Head of the Acquisition Department is charged with the effective utilization of resources and the efficient operation of his organization.[4,5]

C. ORGANIZATION TO ACCOMPLISH TASKING

WESTDIV has an assistant to the Acquisition Department Head. This military billet Code 09AA in his duties acts for the Code 09A in his absence. WESTDIV has a Code 09A1 also who is to act in the

---

[4]SOUTHDIV Organization and Functional Manual, SOUTHDIV Instruction, 5450.1L, p. 32.

[5]WESTDIV Organization and Functional Manual, WESTDIV Instruction, 5450.1A, p. 276b.

normal acquisition coordination officer role in dealing with annual resource requirements, developing the Acquisition Departments financial plans and monitoring the department's progress towards goals.[6]

SOUTHDIV has a Code 09A and a Code 09A1 only. The Code 09A1 at SOUTHDIV functions as an assistant to the Code 09A in addition to his duties as Code 09A1.[7]

D. MANAGEMENT AND CONTROL OF THE ORGANIZATION

The styles of management in use at both Acquisition Departments could best be described as management by exception. Both Code 09A's delegate authority to act and allow their Division Heads to manage their areas without undue interference. In the interviews with civilians with long tenure at both Acquisition Departments, it was decided that this style had been basically prevalent for many years.

E. CONCLUSIONS IN THE ACQUISITION DEPARTMENT AREA

From the quantitative standpoint based on a total output of WIP, WESTDIV appears to be less efficient. This finding should be tempered with the following facts: (1) SOUTHDIV's workload was relatively constant until two years ago when it increased significantly in a short period of time, while (2) WESTDIV's workload has been on the general increase during the period which allowed for a gradual increase in staff.

---

[6]Ibid., pp. 28-29

[7]SOUTHDIV Organization Manual, op. cit., p. 33

VI. RESULTS OF THE COMPARATIVE STUDY OF THE ACQUISITION PROJECT MANAGEMENT OFFICES

A. COMPARABILITY

The best measures of activity in the Acquisition Project Management Offices are considered to be dollar value of the program under management coupled with the number of projects comprising that dollar total. There are some problems when trying to define the program under management; however, as long as a project is open there is a possibility of an action and therefore the dollar value and the number of projects are considered a practical measure of activity within an Acquisition Project Management Office.

One familiar with this office may wonder about some of the tangential activities that may not be reflected in terms of the above measures. One area that is monitored under the NAVFAC Command Plan is the administration of the Collateral Equipment Program for initial outfitting of Military Construction projects (MCON and MCNR). This area is not considered to have a major impact on the workload of an Acquisition Project Management Office due to the amount of work involved. In support of this contention, consider that two people at SOUTHDIV managed over nine million dollars of collateral equipment procurement and one man year was used to manage over five million dollars at WESTDIV in FY 1977.[1]

---

[1]NAVFAC Program IV Goal Progress Report, Fiscal Year 1976, p. 26.

Another area of workload that is not addressed directly in the measure of output selected for the Acquisition Project Management Office is Engineering Service Requests (ESR) received from the various activities in each EFD's area of responsibility. An unsuccessful attempt was made to collect data on how many ESR's were being handled by each of the two offices, but the information was not available. The problem stems from the fact that there may be some difficulty with a lack of a common definition as to what constitutes an ESR. Regardless, it is considered that the workload caused by ESR's is not significant in relation to the entire workload of the Acquisition Project Management Office. This observation is supported by WESTDIV's estimate that handling ESR's requires approximately two man years. SOUTHDIV had no specifics concerning the resource impact of the requirement but considered it negligible.

Another area of the Acquisition Project Management Office business that is not considered in the measures is how many Architect Engineer (A/E) contracts are handled. The number of A/E contracts is directly related to dollar value and number of projects so there is no need to monitor this facet individually. Finally, Shore Electronics' projects are more numerous at WESTDIV but still require only one man year. At SOUTHDIV, the requirement is approximately one-tenth of a man year for this type project. Thus it is logical to assume that this specialty does not have a significant effect on the Acquisition Project Management Office's workload.

B. QUANTITATIVE COMPARISON

1. Staffing and Workload

Table 6.1 presents some comparative data for the Acquisition Project Management Office of each Acquisition Department. One thing that could be deduced from looking at Table 6.1 is that both offices seem to be growing and this growth appears unrelated to program size. As would be anticipated, the figure for million dollars of program per man is falling as staff is increased and workload decreases. The phenomenon shown would be even worse if the value of the programs was expressed in constant dollars based on a given Fiscal Year (say 1974). Both workloads would show a more pronounced decrease than indicated now.

It had been hoped that figures on the number of projects associated with the program figures could be compared also. Unfortunately, only one of the offices was able to provide that data so a comparison was not possible.

Based on the information shown in Table 6.1, and smaller growth rate indicated in Table 5.2, SOUTHDIV appears the more efficient using limited mathematical comparisons. However, this judgment is based on sketchy data and is mitigated by some of the subsequently discussed differences in tasking.

TABLE 6.1

09A2 COMPARISON

	FY 1972	FY 1973	FY 1974	FY 1975	FY 1976	FY 1977	FY 1978	FY 1979
Program Value								
SOUTHDIV	80	145	188	151	125	135	107	133[1]
WESTDIV	-	240	191	172	152	109	221	233[2]
Staffing								
SOUTHDIV	20	20	20	22	25			
WESTDIV	27	31	34	37	39			
Projects per Man Year $Value/MY (MIL$/MY)								
SOUTHDIV	4	7.2	9.4	6.9	5			
WESTDIV	-	15	5.6	4.6	3.9			

SOURCES (1) 09A2 SOUTHDIV

(2) WESTDIV ltr. ser. 013/155 of 14 May 1976.

Figures for FY 1977 through 1979 could change based on new major programs emerging in WESTDIV's area.

C. COMPARISON OF DUTIES AND RESPONSIBILITIES

The duties described in each of the respective EFD's organization manuals are almost identical for the two Acquisition Project Management Offices. In reality, there are some significant differences that contribute to WESTDIV's higher staffing. The Office at WESTDIV has the responsibility for budget preparation, execution plan preparation, and budget execution monitoring for the entire Acquisition Department. This is not true at SOUTHDIV where this work is handled by several people (some outside the Acquisition Department) as a secondary part of their primary jobs. Another task lodged in WESTDIV's Acquisition Project Management Office that is not found at SOUTHDIV is the centralized data keeping for input into local reports and for the Construction Management System. The MIS Section of the Support Branch does this data massaging in addition to keeping memorandum accounts on all the projects being handled at WESTDIV. In SOUTHDIV, this accounting function is handled by the Comptroller and the data massaging is done within the respective divisions. Another unique area is WESTDIV's special project management group within the Support Branch that functions as a liaison between Program Managers and Major Claimants. This function at SOUTHDIV is handled by the individual Project Managers.[2,3]

---

[2]SOUTHDIV's Organization Manual, op. cit., pp. 34-35.

[3]WESTDIV's Organization Manual, op. cit., pp. 30-31.

D. ORGANIZATION TO ACCOMPLISH TASKING[4]

1. WESTDIV

WESTDIV's Acquisition Project Management Office is organized along program lines basically with each type of program managed by one of the branches (Navy, Medical, and Special). In addition to the Project Management branches there is an A/E Professional Services Office with six employees that provides assistance in executing, slating, and selection of A/E's and in subsequent contract negotiation. This includes acting as Recording Secretary for the Board for Contract Awards.

The Shore Electronics at WESTDIV is handled by two individuals. About half of these two individual's time is spent in working on Shore Electronics and they may be assigned other type projects as time and workload permit.

Another special entity in WESTDIV's Acquisition Project Management Office is the Support Branch. This group contains thirteen people and has various tasks. Four people are involved in data preparation for the Construction Management System and for local reports, and in keeping memorandum accounting records on all projects underway. Another four people are involved in the dual role of

---

[4]Information in this section and Section E is taken from questionnaire replies and personal interviews with the Division Heads.

managing the acquisition of collateral equipment and in performing a liaison role between individual Project Managers and Major Claimants concerning funding matters in the Special Projects area. Finally, the clerical pool composed of four people is located in this Support Branch. The Support Branch supervisor and part of his staff are deeply involved in the budgeting and budget execution monitoring for the entire Acquisition Department.

2. SOUTHDIV

SOUTHDIV's Acquisition Project Management Office is organized by Major Claimants and activities. The Project Managers are divided into three teams with each team having a team leader. For every three Project Managers, there is an Assistant Project Manager assigned. The duties of these assistants are basically clerical and messenger type duties - they prepare synopses for the Commerce Business Daily concerning future A/E contracts and they write the various reports (from Project Manager's rough notes) for the numerous boards required to award an A/E contract. The rest of the dealings concerning A/E contracts that the WESTDIV A/E branch handles are taken care of by the Project Managers at SOUTHDIV. Shore Electronics is not a major effort at SOUTHDIV and is handled as a part time assignment by one Project Manager. He estimates that this work consumes about 10% of his time during the year. Two people handle the collateral equipment program at SOUTHDIV. The clerical support is provided out of a pool as in the WESTDIV case.

A new entity within the SOUTHDIV Acquisition Project Management Office is called the Work Input Control Center. The function of this two-person group will be to monitor work in the Acquisition Project Management Office, to schedule meetings and negotiations for A/E contracts, and to track the progress of the organization toward the Command Management Plan goals.

E. MANAGEMENT AND CONTROL OF THE ORGANIZATION

The major managerial problems that confront the Acquisition Project Management Office are assignment of workload and periodic balancing of workload among the Project Managers.

At WESTDIV, the assignment of work is dictated mostly by the type of project involved, (e.g., a Medical Program would go to the Medical Program's Office). The final decision as to who gets a given project within a group is made by the Director, Acquisition Project Management Office (with input from the Branch Managers). Also, the Director, using his own judgment, and the feedback he receives from the branch heads, periodically does the balancing of workload. If an unnoticed imbalance occurs, the Branch Managers are expected to advise him.

SOUTHDIV's projects are assigned either by the station at which it is located or the Major Claimant that is sponsoring the project. The Director of the Acquisition Project Management Office, in concert with the three team leaders (one for each major subdivision of Project

Managers), periodically looks at workload balance among Project Managers. In the recent past, the Director tried a scheme of balancing workload by assigning points for the various aspects of a Project Manager's load. These points were such things as number of projects, type of projects, dollar value of the projects, number of ESR's handled, etc. By weighting the points given for each area, the workload was balanced by equalizing the number of points for each Project Manager. The major failing of this system was that it did not take into account the life of a project nor did it allow a difficulty factor for the complexity of a project. At the time the author was in Charleston visiting SOUTHDIV, the Acquisition Project Management staff was talking about improving their system to take into effect the above aspects of the Project Manager's work.

SOUTHDIV seems to be trying to get a grasp on controlling the workload balance through a new entity called the Work Input Control Center (WICC). The hopes of management are that they can balance the workload of the Project Managers through some innovations in scheduling. Thus far, they have worked out a schedule of standard manhour figures based on project size that allows them to estimate the man days required for each step in moving a project from the day it assigned to SOUTHDIV until the A/E contract for design is awarded. This schedule will be beneficial in assuring that a project gets to design commencement at the proper time in assessing a Project Manager's workload.

A second part of the WICC mission will be the monitoring of the Acquisition Project Management Office's progress on its goals and to do the data preparation for the NAVFAC automated reports that affect the office.

If this WICC concept works, it should be most effective in improving efficiency and preventing crisis caused by a project that has slipped unnoticed.

Another interesting idea being tried at SOUTHDIV Acquisition Project Management Office is the Assistant Project Manager concept. As described briefly in the organization section, the Assistant Project Manager relieves the Project Manager of some of the more routine tasks that do not require engineering or managerial abilities. This allows the Project Manager to devote more of his time to more technical or higher level problems that require his expertise. The long range goal of this program is fewer Program Managers at a GS 11 or 12 level and more assistants at the GS 6 - 9 level. This would of course lower the annual cost of doing business but the reaching of this goal will take some time.

WESTDIV's Acquisition Project Management Office takes some of the load off the Project Managers through the help of the Architect Engineer Professional Services Branch. This group handles much of the routine work for the A/E selection and negotiation process for the Project Managers. Further, easing of the load for Project Managers

is provided by the Support Branch through its memo accounting and tracking of funds for the various Project Managers.

F. CONCLUSIONS

One area where both Acquisition Project Management Offices expressed great interest but agreed that little or nothing systematic was used, is the problem of converting workload to staffing. Both of the incumbents agreed that it is very difficult to derive any concrete methods of deciding how many people are needed to do the job. It appears that they both use a great deal of personal judgment coupled with feedback from their upper echelon managers in deciding how to staff. There also was a general consensus that number of projects and dollar value of projects would be a good measure of output (or activity) in a project management entity. This data would have to be seasoned by the number of activities served to properly reflect how busy the organization was. Unfortunately, of the parameters mentioned above, the number of projects over the recent past was unavailable from one of the EFD's so a comparison by the mutually agreed measures was impossible. (The data shown in Table 6.1 and discussed in Section VI B was all that was reasonably available.)

Due to the lack of numerical data and to the complexity of the tasks performed by the Acquisition Project Management Office, it is very difficult to make a meaningful comparison of the two entities. However, the workload in terms of program size and the additional activities

serviced by WESTDIV justify some of the difference in staffing between SOUTHDIV and WESTDIV's Offices. Harder to quantity is the differential caused by the additional tasking that WESTDIV's Office has. This extra tasking includes the data preparation for all of the Acquisition Department for the Construction Management System Reports, the duties involving budget preparation, execution plan preparation, and budget execution monitoring for all of the Acquisition Department, and finally, the manual keeping of data on the Acquisition Department's progress towards the Command Management Plan goals. A final reason for the additional people at WESTDIV's Acquisition Project Management Office is the extra work that is being done over and above that done at SOUTHDIV, including memo accounting on all projects and liaison with the Special Projects Management Group in the Support Branch.

It is hoped that this discussion will provide some stimulus of thought and encourage some cross fertilization of ideas between the two Acquisition Project Management Offices of the respective EFD's. No criticism is intended of either organization.

VII. RESULTS OF COMPARISON OF DESIGN DIVISIONS (04)

A. COMPARABILITY

The best measures of output of a Design Division are considered to be:

1. dollar value of design
2. number of projects completed
3. consultation

Consultation involves providing engineering assistance, fire protection surveys and engineering, and air field pavement surveys. The workload created in this area is basically a function of the number of activities served. As stated in Chapter V, WESTDIV has three times as many activities to serve as does SOUTHDIV. However, as will be discussed later, the consultation requirements do not dictate three times as many people.

Prior to moving into the quantitative comparison, a discussion of a present system for estimating the Design Division staffing levels based on anticipated workload seems prudent. The subject system was created by NAVFAC's Assistant Commander for Engineering and Design (Code 04) and is basically a computer-based model that converts workload in dollar's worth of design to man years required to accomplish that work. The basis of the conversion system is man year conversion rates that are applied to the anticipated workload to give an estimate of technical man years required. The workload is broken up into various types of

design work such as final plans and specifications, post construction award support, 30% design, etc. Each area has its conversion factors and each is further divided by in-house design and A/E design. The staffing conversion figures are based on rates that were empirically developed at SOUTHDIV. To the technical man years required are added man years for other program support, design management, and some other miscellaneous requirements. Finally, the total man years required are increased to account for leave to give the number of people needed for the coming year.

The one problem with this system is that the loop is not closed by looking at end-of-year figures on actual work and manpower required to do the work. This feedback would help improve the conversion factors plus give a review of how close the EFD's estimate of anticipated workload matched with actual workload. NAVFAC's Design Division is contemplating reviewing these figures at the end of the Fiscal Year and closing the loop. This will form the basis for a "Design WIP" monitoring that will allow some comparison of Design Divisions in the future.

The difference in consultation load previously discussed is handled by assigning each EFD the required man years to do the consultation. For SOUTHDIV, this consultation has represented 6 to 10% of the total Design Division man years, while at WESTDIV, the consultation has consumed 16 to 19%. These figures are based on past experience and

conform to the point made earlier that the number of man years required in this area is not directly proportional to the number of activities served.

It was originally hoped that the use of this existing workload-staffing conversion system would make the comparison of the two Design Divisions relatively simple. It was anticipated that if both EFD's used the same conversion factors and that each Design Division was staffing to the manning figure derived, the difference in size of staff would clearly be the function of different workloads. Unfortunately, the system is still in the evolutionary stages and neither Design Division has been staffed in accordance with the results produced by the system.

B. QUANTITATIVE COMPARISONS

The total data required to make an accurate thorough comparison of the Design Divisions over the desired period of FY 1972 to 1976 was not available.

1. Workload

Table 7.1 displays the workload of each Design Division in terms of dollar value (based on estimated construction cost). The portion of the Table labelled "reported output" states the figures that were supplied by the respective Design Divisions. WESTDIV's numbers contained project preparation work (e.g., PCE's, PED's, etc.) funded by Z-planning money which SOUTHDIV's figures did not; therefore, WESTDIV's figures were adjusted and are shown as "adjusted

TABLE 7.1

DESIGN DIVISION WORKLOAD COMPARISON
(All figures in millions of dollars based on ECC)

	FY 1972	FY 1973	FY 1974	FY 1975	FY 1976
Reported Output					
WESTDIV	N/A	N/A	372	594.6	551.3
SOUTHDIV	97	94	159	204	179
Adjusted Output (without project preparation work)					
WESTDIV	N/A	N/A	212.5	263.9	473.8*
SOUTHDIV	97	94	159	204	179

Source: SOUTHDIV's 04 and WESTDIV's 04.

*This number is problematical.

N/A - not available

output." The adjusted figure for WESTDIV in FY 1976 appears problematical when compared to the two previous years.

As can be seen, WESTDIV's design workload exceeded SOUTHDIV's in every one of the three years compared.

2. Staffing

Table 7.2 illustrates the staffing growth of the two Design Divisions over the period. The top section of the chart shows that WESTDIV's Design Division grew about three times faster than SOUTHDIV's Design Division. When compared to the growth rate of the total Acquisition Department, WESTDIV's Design Division grew much faster than its total Acquisition Department (19.6%) and SOUTHDIV's Design Division grew at about the same rate as its Acquisition Department (9.8%). To use the staffing figures in calculating productivity of each entity, it was necessary to eliminate inconsistencies in the data due to the differences in number of activities served and in project preparation work of the two entities. The adjusted staffing numbers are shown in the lower portion of Table 7.2.

3. Productivity

Using the adjusted workload figures in Table 7.1 and the adjusted staffing of Table 7.2, productivity figures were calculated (Table 7.3). Except for FY 1976, SOUTHDIV's Design Division has had a higher relative design output per man year during the three year comparison period.

TABLE 7.2

DESIGN DIVISION STAFFING GROWTH

	FY 1972	FY 1973	FY 1974	FY 1975	FY 1976	Period Growth
Unadjusted						
WESTDIV	182	95	201	233	244	31.9%
SOUTHDIV	103	105	100	113	114	10.7%
Adjusted for other Program Support *						
WESTDIV (82.5%)	N/M	N/M	166	192	198	
SOUTHDIV (92%)	N/M	N/M	92	104	105	
Further Adjusted for Project Preparation Support **						
WESTDIV			159.1	177.6	194.6	
SOUTHDIV			87.3	100.3	101.4	

* Percentages discussed in text

** Average of $23 million of design per man used to estimate manpower required to do project preparation work. This number taken as average from FY 1977 Staffing Requirements Plan (04 NAVFAC).

SOURCE: Unadjusted - Table 5.2
Adjusted for other program support and project preparation - calculated by author using information from FY 1974 CMP, 04C NAVFAC and 04 WESTDIV.

TABLE 7.3

PRODUCTIVITY

(Based on staffing adjusted for other program support and project preparation)

	FY 1974	FY 1975	FY 1976	AVERAGE
Productivity (Million dollars design per man year)				
WESTDIV	1.3	1.5	2.4*	1.8
SOUTHDIV	1.8	2.0	1.76	1.9

Source: Table 7.1 and 7.3

*This number is considered problematical when considered with previous years' figures.

One factor that would affect productivity is the amount of in-house design work. Table 7.4 illustrates the amount of reportable in-house design work.

TABLE 7.4

Percentage of Design Work Done in-house

	FY 1972	FY 1973	FY 1974	FY 1975	FY 1976
WESTDIV	14.1%	10.3%	10%	13%	23.7%
SOUTHDIV	14.3%	24%	20.8%	23.1%	16.9%

Source: NAVFAC's (Code 04)

These percentages are calculated by comparing the number of technical man hours spent on in-house design with the total number of technical man hours available in a Design Division. (There are some NAVFAC restrictions as to what type of work qualifies as reportable and these will be discussed in later sections of this chapter.) Both Design Division Directors state that generally an additional 10 to 15% of their technical man hours is spent on in-house design that does not qualify as reportable. Since this variance applies equally to the two entities, Table 7.4 is considered representative for comparative purposes.

Another aspect that illustrates relative efficiency is the cost of plan and specifications. This facet has only been officially measured for two years and addresses only MCON funded work. The respective costs are as follows:

TABLE 7.5

Cost of Plans and Specifications

	FY 1975	FY 1976
WESTDIV	5.5%	5.6%
SOUTHDIV	4.6%	4.4%

Source: NAVFAC's (Code 04)

The percentage is calculated based on cost incurred divided by the authorized project amount. For the two years cited, WESTDIV is running about one percentage point above SOUTHDIV.

An additional measure of productivity is expressed in the percentage of plans and specifications completed on time. This statistic has only been kept for two years also and is as follows:

TABLE 7.6

Percentage of Plans and Specifications Completed on Time

	FY 1975	FY 1976
WESTDIV	43%	60%
SOUTHDIV	64%	83%

Source: NAVFAC's (Code 04)

The percentage is calculated using the number of project plans and specifications completed divided by the number planned for completion.

Finally a statistic that could affect productivity is the number of projects comprising a design load. The number of projects completed by each Design Division is as follows:

TABLE 7.7

Number of Projects Completed*

	FY 1974	FY 1975	FY 1976
WESTDIV	379	383	483
SOUTHDIV	315	302	228

*Project preparation work not included

Source: Design Divisions of WESTDIV and SOUTHDIV

As can be seen, WESTDIV has had a larger number of projects but in relation to the magnitude of the respective workloads (Table 7.1), the two divisions appear most comparable.

Based on this quantitative comparison it is concluded that (1) WESTDIV has produced a greater quantity of design that SOUTHDIV during this period, (2) WESTDIV's Design Division has grown at a more rapid rate than its total Acquisition Department while SOUTHDIV's Design Division has grown at about the same rate as its Acquisition Department, and (3) SOUTHDIV has probably been more efficient in its design production.

C. COMPARISON OF DUTIES[1]

As in the case of the other entities in the Acquisition Departments, the two Design Divisions have almost equivalent descriptions of duties.

---

[1]Information for this section found in Organization Manuals for each EFD.

They are both responsible for the production of plans and specifications and for the provision of consultation (ESR's, Fire Protection, etc.). SOUTHDIV's Design Division does have one additional assignment levied by NAVFAC which is the design of Jet Engine Test Cells for the entire Navy.

D. ORGANIZATION TO ACCOMPLISH TASKING[2]

Both divisions have almost identical organizations with nine branches. Some branches are organized around the various engineering disciplines, (civil, electrical, etc.) and some are based on miscellaneous tasks such as fire protection and design management.

One variance is the Code 04D (Deputy Design Director) branch found at WESTDIV. The incumbent in this position acts for the Director of the Design Division in his absence and is additionally charged with quality control. He and his five subordinates are involved in such things as the station folios (a compilation of facts about a station that affects design), and joint field inspections with the Construction Division and A/E during the progress of construction to give the designer a chance to view his work first hand and answer any on-site questions. Another area of Code 04D involvement is the Post Occupancy program conducted on repetitive type facilities after construction is complete and the facility

---

[2] Information for this section and section E taken from questionnaire responses and personal interviews.

is occupied for some time by the customer. This program, pioneered at WESTDIV, is used to determine if any recurring design errors are taking place that could be avoided in future designs.

E. MANAGEMENT AND CONTROL OF THE ORGANIZATION

1. Work assignment

At WESTDIV, the Director of the Design Division or his representative selects the lead branch to handle a project when the design requirement first becomes known. The Branch Manager then designates the Engineer in Charge (EIC) who will head the design team directly and advises the EIC's Branch Manager.

At SOUTHDIV, the Code 04A (Design Management Branch) selects the EIC. The lead branch from whence the EIC will come is chosen based on the type of project and the EIC is then selected based on availability. The work loading of each EIC is found using a DYL 260 report that SOUTHDIV has devised. The DYL 260 program is a relatively new aspect of the EFD Management Information System that allows each EFD to format reports and have access to data already available in the data banks of the Design Management Information System.

2. Decision to do work in-house or by A/E

At WESTDIV, the decision to do work in-house is made as the result of discussions between the Director of the Design Division and

the Branch Managers. The decision is based on several factors concerning a particular project. One factor is whether or not the project is applicable to the goal of 25% design in-house set by NAVFAC through the Command Management Plan. To qualify for application towards this goal, a project must be challenging and have an estimated construction cost of $500,000 or greater. Two other deciding factors are time constraints of the project and whether or not it is funded out of expiring funds. Also, a project may be uneconomical to design by A/E due to size or type of work. After considering all these factors, the projects to be designed in-house are selected.

SOUTHDIV selects its projects for in-house design as the result of Code 04, Code 04A, and Branch Manager discussions. Upcoming MILCON projects are reviewed and candidates are selected. For expiring fund projects, the decision is made when the requirement becomes known. The in-house decision at SOUTHDIV is based on type of work, applicability to NAVFAC's Command Management Plan goals, and finally, location of the project. The location is considered because travel to the site will be necessary during design so the closer to Charleston, the more inexpensive the design may be.

3. Reviews

It was anticipated at the outset of the research for this thesis that one or the other Design Divisions might be doing a more detailed review of plans and specifications before allowing them to be put out for

procurement action. This anticipation turned out to be false. Both Design Divisions conduct functional reviews on designs unless some serious problems are found. (Functional review implies checking the plans and specifications to see if they meet the intent of the project and fulfill the requirements of the eventual user.) When problems are found, then a more detailed technical review will be conducted where the engineering aspects of the design are closely scrutinized.

4. Monitoring Workload

The Design Division at WESTDIV uses the Design Management Information System (DMIS) EIC report that gives them a breakdown by EIC of projects and their present status. At SOUTHDIV, the Design Division uses the DMIS reports and a locally derived DYL-260 report. The Design Director at SOUTHDIV personally uses the DMIS Exception Report that keeps him abreast of milestones.

It should be noted that both Design Division Directors expressed a great interest in seeing that design milestones are met. According to the Goal Progress report each came close to meeting the goal of getting 95% of the current year's plans and specifications completed by 30 June 1976. Specifically, SOUTHDIV's rate was 94% and WESTDIV's rate was 92%.

5. Converting Workload to Staffing

Both Design Division Directors stated that they use the NAVFAC staffing model (discussed earlier) to convert their workload to

staffing. This fact was difficult to confirm because the staffing model is still in the process of evolution and neither of the two Design Divisions have ever been staffed in accordance with the model output.

As to distribution of the staff among branches, each Design Division Director states that this is done based on experience. The basic division of the Design Division personnel among the various branches in each EFD is shown in Table 7.8. As can be seen, there is some difference in the makeup of each Design Division.

6. Design Status Reports

One of the areas that was reviewed as a probable source of difference was the maintenance of manually kept design status reports. There was only an insignificant difference. WESTDIV maintains one report that requires one man year and SOUTHDIV has no manually maintained reports.

F. FACILITIES

One difference at WESTDIV that is perceived (by those involved) to have a great effect on efficiency is the separation of the Design Division entities among different buildings. With the division divided among five two-story buildings, coordination of design effort and the supervision of the branches is more difficult. Conversely, SOUTHDIV's Design Division is all on one floor and when the Design Director steps out of his office he can see most of the people in his organization.

TABLE 7.8

04 COMPARISON BY BRANCH

04 Design Division	04	04A	04B	04D	401	402	403	404	405	406	407	408	411
WESTDIV	2	22	2	6	38	28	27	27	31	23	16	9	11
SOUTHDIV	2	10	1	0	18	9	16	11	11	18	6	4	8

SOURCE: Manpower listings for calendar year 1975.

04	Design Director
04A	Assistant for Design Management
04B	Assistant for Value Engineering
04D	Deputy Director and Staff
401	Architectural Branch
402	Structural Engineering Branch
403	Mechanical Engineering Branch
404	Electrical Engineering Branch
405	Civil Engineering Branch
406	Specifications Branch
407	Cost Engineering Branch
408	Fire Protection Branch
411	Soil Mechanics Branch

G. PERSONNEL TURNOVER

As predicted prior to commencing the research, the turnover of professional people is higher at WESTDIV where an average 10% to 14% turnover in engineering staff occurs yearly. At SOUTHDIV, only 6% to 8% of the professional staff is lost each year on the average. The clerical turnover is about the same (18 - 20%) for both Design Divisions. This increased technical turnover at WESTDIV must affect the efficiency of the operation because of the learning curve required to educate a new engineer in the NAVFAC method of design.

H. TRAVEL

It was originally hoped that this area might provide some information on the difference in staffing of the two Design Divisions. Unfortunately, one Design Division could not produce the data in this area so a precise comparison was impossible. Regardless, it is reasonable to assume that WESTDIV travels more because of:

a. SOUTHDIV's policy of selecting projects close to Charleston for in-house design in order to minimize travel.

b. WESTDIV's greater involvement in post occupancy inspections and joint Code 04, Code 05, and A/E inspections of projects.

I. MANAGEMENT STYLE COMPARISON

WESTDIV's Design Division appears to be managed on a more decentralized basis with more authority at lower levels. This may be

true as a result of a management style on the part of the Director or it may be the result of the size of the organization. On the other hand, the Design Division at SOUTHDIV is more tightly controlled from the top by Code 04 and Code 04A.

J. ROICC SURVEY

An interesting result of the ROICC survey (Appendix D) is that at both EFD's the ROICC's hold the design quality in relatively low esteem. Although no scientific comparison can be drawn between the rater's view in each EFD, it was felt that during the conduct of the survey that the design of SOUTHDIV was held in the lower esteem of the two entities. This subject touches on quality which is further discussed in the chapter on Unquantifiables.

K. CONCLUSIONS ON THE DESIGN DIVISIONS

In conclusion, it is logical to conclude that SOUTHDIV's Design Division is probably a more efficient design organization than WEST-DIV, based on the many reasons discussed above.

Further, SOUTHDIV is probably more adept at controlling costs and getting the work done on time. WESTDIV, on the other hand, appears to be a leader in improvement of quality of design, and has produced more dollars' worth of design over the period being considered.

VIII. RESULTS OF CONSTRUCTION DIVISION/ROICC COMPARISON

A. COMPARABILITY

Of all the entities in an Acquisition Department, the Construction Division probably has the most defineable measures of input and output and is easiest to compare. Their input is cost and their output is construction. The best measure of activity or output for a Construction Division is the dollar value of total WIP tempered by the number of contracts that generated that WIP. However, the number of contracts is impossible to measure accurately because it varies during a given year as new contracts are started and existing contracts are completed. Therefore, since no meaningful number can be derived, the Construction Divisions will be compared based on total WIP only.

The two EFD's under study have a comparable number of ROICC Offices with SOUTHDIV having 20 and WESTDIV having 22.[1] Further, each EFD has a somewhat equivalent size distribution of offices. Table 8.1 shown below gives the relative distribution of each EFD's ROICC's for Fiscal Year 1976.

Another point of similarity is in geographic distribution of workload. Except for WESTDIV's Adak, Alaska, the geographic relationship of EFD to areas where their major work is located is very correspondent.

---

[1] Taken from manpower listings for 1975 for both EFD's.

TABLE 8.1

Size of Office	WESTDIV	SOUTHDIV
Large ($15 million WIP/yr.)	4	5
Medium ($5 to 15 million WIP/yr.)	8	4
Small (less than $5 million WIP/yr.)	10	11

Source: WIP figures provided by Construction Divisions at WESTDIV and SOUTHDIV.

B. QUANTITATIVE COMPARISONS OF THE CONSTRUCTION DIVISIONS

1. Workload

The workload for the Construction Divisions and ROICC's is represented by the construction work put in place. The figures for workload shown in Table 8.2 have been deflated to July 1971 dollars (as done in Table 5.3) to attempt to filter out inflation. Further, total workload (income bearing WIP plus non-income WIP) has been used since this reflects the actual production of output. When reviewing the following comparisons, it should be kept in mind that in FY 1975, SOUTHDIV's WIP took a quantum jump of over 60% from the previous year.

2. Staffing

The staffing figures shown in Table 8.2 were shown previously in Table 5.2. It is interesting to note that the Construction Divisions and the ROICC's of the two EFD's grew at a significantly lesser rate

TABLE 8.2

COMPARISON OF 05's - WORKLOAD AND STAFFING

	FY 1972	FY 1973	FY 1974	FY 1975	FY 1976	% Change
Workload (MIL $ WIP adjusted to July 1971 dollars)						
WESTDIV	142.3	158.2	136.9	142.8	165.3	
SOUTHDIV	108.3	79.5	92.2	147	151.5	
Staffing						
05						
WESTDIV	29	30	31	31	31	6.9
SOUTHDIV	20	19	19	17	18	(10)
ROICC						
WESTDIV	225	239	228	243	247	9.8
SOUTHDIV	174	160	147	166	191	9.7

SOURCE: WIP from Table 5.1
Staffing from Table 5.2
( ) - denotes negative growth

TABLE 8.3

COMPARISON OF 05's STAFF OVERHEAD*

	FY 1972	FY 1973	FY 1974	FY 1975	FY 1976
WESTDIV	11.4%	11.2%	12%	11.3%	11.2%
SOUTHDIV	10.3%	10.6%	11.4%	9.3%	8.6%

*Overhead is defined 05 staff as a percentage of 05 and ROICC staffs combined.

than did the entire Acquisition Departments. On the divisions in the Acquisition Departments, the Construction Divisions grew at the slowest rate.

Another aspect of staffing is illustrated by Table 8.3 where the size of the Construction Division is compared to the size of the entire construction management arm of the EFD (i.e., Code 05 and ROICC). The percentages shown indicate the headquarter's allocation of the total manpower to be applied on construction management between the field operators and the EFD staff. It is interesting to note that SOUTHDIV's "Staff Overhead" rate is lower than WESTDIV's. This became particularly true in FY 1975 and 1976. It remains to be seen whether this is a transitory effect due to a rapid shift in workload or whether SOUTHDIV's figure will remain in the lower range. These figures are a reflection of management's policy concerning the optimum number of staff in the EFD's to effectively support the ROICC's in the field.

A final consideration in the staffing area is to look at the grade level mix in the two respective Construction Divisions and ROICC's. Recapped below from Table 5.5 is the breakout for each entity:

TABLE 8.4 - DISTRIBUTION OF GRADE LEVELS

	Clerical Miscellaneous GS 1-5	Subprofessional GS 6-10	Professional GS 11-15
Code 05*			
SOUTHDIV	28%	0%	72%
WESTDIV	28%	3%	69%
ROICC			
SOUTHDIV	23%	53%	24%**
WESTDIV	20%	55%	25%

*High grade positions (GS 13-15) are the same in each EFD.

**SOUTHDIV has four (4) high grade positions and WESTDIV has none.

From this table, it is reasonable to conclude that the composition is roughly equal.

3. Productivity

Using the WIP and staffing figures shown in Table 8.2, Table 8.5 was constructed to analyze the amount of WIP per man per year. The figures were calculated using (1) the total number in the Construction Division and ROICC offices, and (2) the ROICC's only. This area more than any other division is best measured in terms of productivity using WIP and people. The numbers indicate that SOUTHDIV lagged WESTDIV in productivity until Fiscal Year 1974. From that point on SOUTHDIV's productivity has increased markedly. On the other hand, WESTDIV's productivity has been fairly constant over

TABLE 8.5

PRODUCTIVITY COMPARISON (MIL $/MY)

	FY 1972	FY 1973	FY 1974	FY 1975	FY 1976	AVERAGE FY 1972-76
05 and ROICC						
WESTDIV	.56	.59	.53	.52	.59	.56
SOUTHDIV	.56	.44	.56	.80	.72	.62
ROICC ONLY						
WESTDIV	.63	.66	.60	.59	.67	.63
SOUTHDIV	.62	.50	.63	.88	.79	.69

SOURCE: Table 8.2

the years. The productivity figures shown support the contention that during the period reviewed SOUTHDIV had a higher productivity rate than did WESTDIV. This fact should be tempered by the fact of the high jump in workload in a short period of time which when coupled with the normal momentum of an organization caused the abnormally high rate in Fiscal Year 1975.

In summary, the quantitative data indicates that the growth of both Construction Divisions in comparison to the total Acquisition Departments was not inordinate; that management at WESTDIV uses a higher Code 05 to ROICC factor in allocating the construction management resources; that the grade level mix of positions is roughly equivalent in both Construction Divisions and ROICC's; and finally, in three out of the five years considered, SOUTHDIV's productivity rates of the Code 05/ROICC exceeded those of WESTDIV.

A final area reviewed but not presented in table form was the number of contracts and mix of contracts (Station and EFD) that generated the WIP. The data available indicated that at the end of Fiscal Years 1972 and 1973 WESTDIV and SOUTHDIV were fairly close in the number of active contracts on June 30, but beginning in FY 1974, SOUTHDIV's number was almost double that of WESTDIV's.[2]

The other aspect reviewed was the mix between number of station-awarded contracts and EFD contracts. Over the comparison

---

[2] SOUTHDIV's statistics from Fiscal Year reports issued annually by SOUTHDIV. WESTDIV's statistics from WESTDIV's Code 05.

period, the mix at WESTDIV was 60% station - 40% EFD, and at SOUTHDIV, it was 67% station - 33% EFD.[3]

C. DESCRIPTION OF DUTIES[4]

The duties of the two Construction Divisions are identical except that at WESTDIV, Code 05 is charged with the handling of contractor's inquiries concerning construction contracts which have been advertised and are awaiting bid opening. This function at SOUTHDIV is handled by the Contracts Division. The other exception is that the Construction Division at SOUTHDIV approves the first and last invoices for construction contracts. At WESTDIV this is handled by the Commanding Officer or his representative.

D. ORGANIZATION TO ACCOMPLISH TASKING[5]

The two Construction Divisions are very similar organizationally. Each is divided into branches that have responsibilities according to geographic boundaries. WESTDIV's Construction Division has three branches each with a Branch Manager and five to six people. SOUTHDIV has two branches each with a Branch Head and four people. In

---

[3] Ibid.

[4] Information excerpted from WESTDIV and SOUTHDIV Organization Manuals.

[5] Information for Sections D and E obtained from questionnaire responses and personal interviews.

addition, both have some special assistants for labor relations, safety, and quality control.

One difference between the two is that WESTDIV's Construction Division has a program analyst who "provides budgetary and statistical analyst services for all branches of the Construction Division."[6] From observation, it appears as though one of her main functions is preparing and monitoring the expense rate of the Construction Division and the ROICC's in the placing of WIP.

E. MANAGEMENT AND CONTROL OF ORGANIZATION

Both Construction Divisions manage by keeping a close watch on the expense rates for each ROICC plus total ROICC/Code 05 group, and the staffing is done basically by judgment. The idea of expense rate is a relatively recent tool and each Construction Division has a little different way of applying the concept. The individual ROICC's WIP figures used at WESTDIV are converted to a common base by multiplying the actual WIP by the reciprocal of the area cost factor. At SOUTHDIV, actual WIP is used in the expense rate computation. WESTDIV's method will understate the WIP and overstate the expense rate, but will reflect more accurately on an inter-ROICC comparison. On the other hand, SOUTHDIV's method more aligns with what NAVFAC

---

[6] WESTDIV Organization Manual, op. cit., p. 50.

AD-A039 930 NAVAL POSTGRADUATE SCHOOL MONTEREY CALIF F/G 5/1
A COMPARATIVE STUDY OF ACQUISITION DEPARTMENTS IN TWO ENGINEERI--ETC(U)
MAR 77 D J NASH

UNCLASSIFIED NL

2 OF 2
AD
A039930

END
DATE
FILMED
6-77

does when computing expense rates for each of the EFD's. Both methods have their advantages and disadvantages and appear equally workable.

The ROICC staffing at WESTDIV is based on a given block of staff (with a predetermined mix of people) which is allocated based on anticipated workload. The governing factors are inspectors - number of contracts; procurement people - contract type and volume; clerical - support required for professionals.

The ROICC staffing allocation at SOUTHDIV is based on the rough approximation of $80,000 to $90,000 WIP MCON per person per month and $40,000 to $50,000 WIP OMN per person per month. These conversions are applied to derive the total number of the staff at each ROICC office. The mix of type of skills is based on the experience and judgment of the Division Director.

Although both Construction Divisions are accomplishing this task by judgment rather than using staffing conversion factors, it appears that each has a feel for what is needed and is managing his staffing effectively.

F. CLOSING

In the ROICC survey described in Chapter III, both Construction Divisions were rated high by the ROICC's concerning the support provided by the Division. This support is defined as follows:

a. adequate resources to do the job (funds, people, material)

b. response to requests for assistance

c. support of field decisions

d. response to requests for additional project funds, additional design or authority to make changes.

As stated previously, one should resist the urge to make comparisons between the EFD's using the numbers found in the questionnaire results. It should be noted that questions two through five where the Construction Division is directly involved were significantly higher than one, where others are more directly involved.

There is one unquantifiable difference between WESTDIV and SOUTHDIV that could cause some of the difference in staffing. WESTDIV's inspectors are the members of a union while this is not the case at SOUTHDIV. The lack or presence of a union could cause a difference in the flexibility of assignment and reassignment of personnel. This problem was not investigated in detail.

The travel required of the two staffs is about equal according to the replies to the Construction Division questionnaire. About three man years are required for travel at WESTDIV and four to five man years for the group at SOUTHDIV. The working facilities at both Construction Divisions are not a hindrance and cause no inefficiencies, according to the respective Divisions. Staff turnover does not seem to be a problem at either the Code 05's or the ROICC's in both EFD's.

In conclusion, the two Construction Divisions and the respective ROICC's seem to be very comparable in most ways. SOUTHDIV's Construction Division and ROICC's appear more efficient as evidenced in the quantitative comparison section but WESTDIV's are not far behind. The Construction Division and the ROICC at each EFD are considered effective.

IX. UNQUANTIFIABLES

During the conduct of the numerous personal interviews necessary in the research for this thesis, many reasons were volunteered as to why one Acquisition Department was different from the other. Many of the same reasons were mentioned by several interviewees and all of the reasons were considered to be unquantifiable by those who raised the points. An attempt has been made to present the major points brought forth by the interviewees in addition to some further observations apparent to the author. Further, an attempt was made to quantify or corroborate as many as possible.

A. INNOVATIVENESS

1. Acquisition Project Management Offices (09A2)

SOUTHDIV's Acquisition Project Management Office seems more innovative in the area of trying to get work input, work control and workload balance under control. They seem keenly interested in new and better ways to improve the quality of their product and efficiency of operations. Although they are aware that they have a very difficult job in trying to manage such a multi-faceted task as project management, they seem ready to continue the search until they have a better grasp on the problems.

WESTDIV's Acquisition Project Management Office appears more innovative in the area of data analysis and data management. Their Management Analysis Section has much expertise in the data management area. This is supported by the fact that this section has been tasked by the Acquisition Department with quality control of the Construction Management System reporting and with other Management Information System (MIS) duties such as project status reporting and preparation of goal progress briefings. Whether appropriate to the Acquisition Project Management Office's function or not, the Support Branch also has much expertise in budget preparation and execution.

2. Design Division (04)

WESTDIV is probably more innovative in looking for ways to improve the quality of their output. Projects currently underway include the following: (1) preparation of station folios which will be the depository of all pertinent facts and figures that affect design for the activities served by WESTDIV, (2) life cycle costing which will be able to identify the most cost effective design of facility for the long term, (3) joint Code 04/05 field inspections during the course of construction to give the designer a more realistic view of construction problems and hopefully avoid similar design-caused construction problems on future contracts, and (4) post construction surveys that look at repetitive type facilities to see if any recurring design errors can be avoided in the future. A major portion of the Deputy Design Director's job is involved in quality control.

SOUTHDIV's Design Division is considered more innovative in getting control of work input, work scheduling, and project control. Accomplishments in assuring efficiency and effectiveness in design are as follows:

(1) Conversion factors (man year rates) were developed to convert anticipated workload to staffing requirements. These rates are now used by NAVFAC in their staffing model.

(2) The requirements of the DMIS have been integrated into the local needs for design management and a very effective total management information system has been developed.

(3) Data already stored in the DMIS data banks that can be sorted and formatted to suit the customer under the DYL - 260 program is being successfully used to aid in managing design.

(4) Actual manhours are monitored for design compared to estimated hours.

(5) Cost of design is monitored very closely and SOUTHDIV has a good idea of what each type (by fund source) should cost to design.

3. Construction Division (05)

SOUTHDIV's Construction Division is considered more innovative in looking for ways to reduce paper work and other less productive work for the ROICC's. A sample of this interest is shown in the adoption of a form (accompanied by an estimate) to fill in for all change orders $2500 or below (WESTDIV has subsequently adopted

this policy also). This is in lieu of a sometimes lengthy letter explaining the change order negotiations accompanied by two formal estimates.

WESTDIV's Construction Division's forte is evident in the area of trying to apply quantitative methods to monitoring workload and to converting workload for staffing. It is believed that they were the first of the two EFD's to use expense rates of ROICC's as a management tool. Also, the method of using the various area cost factors to convert WIP to some common denominator is unique, (although this is probably more useful at WESTDIV with Adak where the area cost is three).

B. CONSTRUCTION CONTRACTORS

An interesting theory advanced by one interviewee was the relationship of the nature of the typical contractor to the difficulty of doing business. One normally considers that the more "craftsman" type contractor is found in the Southern part of the United States. This aspect of professionalism may tend to make a contractor have more interest in getting the job done well and not in maximizing the number of change orders or claims concerning a given construction contract. Further, this "craftsman" bent may mean that the contractor's integrity is somewhat better so less inspection or surveillance by the Government is required.

Another aspect of the nature of the Southern contractor that may affect the cost of construction management is the degree of non-unionized firms. It was proposed by one interviewee that less unionization meant less problems on the job, thus less problems for the Construction Division and ROICC.

When considering the contractors in WESTDIV's area of responsibility, it is probable that some contractors may be more interested in the change order and claim aspects of a contract than in the South. The U. S. Navy has many more installations in California than in South Carolina so many contractors have been able to exist almost entirely on Navy contracts. With this specialization may come a certain sophistication that the contractor who only deals periodically with the Navy cannot acquire.

C. EFD FACILITIES

WESTDIV is located in several separate buildings in one general compound, while SOUTHDIV is all in one modern building. Initially, almost all the people interviewed at WESTDIV expressed their opinion that this problem of many buildings has had an adverse effect on the efficiency of the WESTDIV's Acquisition Department. From the Division Head questionnaire responses and the personal interviews conducted, it would appear that the only division of WESTDIV's Acquisition Department affected is the Design Division. All the other Division Heads

felt that this separation of offices is no impediment to the conduct of their business.

D. EFFECTS OF CONSOLIDATION

Both EFD's were formed as a result of consolidation of other smaller EFD's into fewer and larger EFD's. It was initially thought that this consolidation trauma may have affected one of the EFD's more than the other. There was no evidence found to support this thought during the research for this thesis.

SOUTHDIV was formed at the old site of SOUTHEASTDIV and very few people reportedly came from the other EFD (GULFDIV). Further, SOUTHEASTDIV's workload was many fold that of GULFDIV's so the problem was only one of making the larger of the two somewhat smaller.[1]

WESTDIV, on the other hand, was not formed at the site of the larger of the EFD's.[2] Therefore the problem became more complex because the group used to doing the greatest amount of work had to be enticed to move to San Bruno.

E. MATURITY OF ORGANIZATION

This aspect may be closely tied with the effects of consolidation discussed above, but it impressed the author so much that a separate

---

[1] NAVFAC 1970 Factbook, p. D-9, Feb. 1970.

[2] Ibid., p. D - 12.

section was considered noteworthy.

SOUTHDIV's Acquisition Department staff appeared to be very stable and mature. Everyone interviewed seemed to be aware of the goals and, probably more important, the primary product of the organization. The lateral communications are excellent between all levels of the organization and the "esprit de corps" of the entire organization seemed outstanding. (This aspect is probably the result of the fact that most of the employees come from the area and most of the engineers have been educated in one of the three engineering schools in the Charleston vicinity.) That is not to say there are not disagreements, but generally the tone of the organization is one of cooperation. Finally, due to the lack of better opportunities in the area, SOUTHDIV apparently attracts the best of those people available and these people come to stay.

WESTDIV seems to have had a more tumultous time since consolidation. Observation of their day to day conduct of business appears to indicate more of a crisis orientation to the management of problems. The "esprit de corps" does not seem as high as SOUTHDIV's, but that might be expected due to their greater size and rate of turnover. This observation may be accentuated now due to their apparent shifting and increasing workload. Finally, the organizational goals and products seemed less clear in the minds of the people interviewed at WESTDIV. Their thoughts seemed more focused on means

rather than the ends. Thus, WESTDIV is probably in the maturing process at this time.

F. GEOGRAPHIC WORKLOAD DISTRIBUTION

Several interviewees felt that one of the underlying reasons why the two Acquisition Departments were different was due to a differing geographic distribution of workload. Table 9.1 displays a comparison of FY 1976 workload to distance from the EFD. It should be noted that no attempt was made to study the geographic workload distribution within each individual ROICC office.

TABLE 9.1

ROICC Sites Compared to Distances from EFD

	0-300 miles	300-600 miles	600 + miles
Large (+15 million dollars WIP)			
WESTDIV	0	3	1
SOUTHDIV	2	1	2
Medium (5 to 15 million dollars WIP)			
WESTDIV	4	3	1
SOUTHDIV	0	1	3
Small (0 to 5 million dollars WIP)			
WESTDIV	4	4	2
SOUTHDIV	4	4	3

Source: WIP from WESTDIV's and SOUTHDIV's Construction Divisions. Distances estimated from Rand McNally Commercial Atlas and Marketing Guide, Ninety-Ninth Edition, p. 31, Rand McNally and Company, 1968.

As can be seen, both EFD's are about equivalent in distribution of workload and no one has an overwhelming imbalance of workload that is located far from the EFD, except for WESTDIV's Adak, Alaska ROICC office, which is the one medium size workload shown as being over 600 miles from the EFD.

G. PATTERN OF WORKLOAD GROWTH

The pattern of workload growth is very different for these two EFD's. WESTDIV's growth has been fairly constant (in real terms) over the years. This has enabled them to build their staff gradually as the years went by. In contrast, SOUTHDIV's workload was basically level until FY 1975 when it took a quantum jump. After two years at a relatively high rate, it appears to be on the wane back to the pre-FY 1975 level. This will mean SOUTHDIV will have made it through the peak load years without a large jump in manpower and thus will have no excess people on board to release when the workload lessens.

The WESTDIV trend is an example of "organizational momentum," which means that if an organization is in the habit of increasing every year, it will continue to increase. Similarly, an organization that has continued at a given level for a period of time usually does not increase staffing immediately when workload increases. Further, if this organization continues at the same level for some time during the increased workload, it may come to a point where it sees the future workload decreasing and will "hold the line" until that reduction arrives.

H. UNIONIZATION OF EMPLOYEES

WESTDIV has many employees who belong to a union and SOUTHDIV has none. Unionization removes some of management's flexibility with its human resources. This reduction of flexibility can affect the efficiency of the organization and also affect the "esprit de corps" of the employees. This unquantifiable aspect is most difficult to quantify.

I. COST OF LIVING, WAGE RATES, AND THEIR EFFECT ON TURNOVER

Although Government pay scales are equivalent throughout the United States, their comparison with local average income (and thus cost of living) affects greatly the turnover experienced. If the EFD is offering the higher paying jobs (relatively) in an area, good employees will be attracted and they will stay. Conversely, if the salaries offered are relatively low, the turnover rate at all levels will be higher.

The average annual per capita income for the Charleston area in 1975 was $4618.[3] The average weekly earnings in Charleston in August of 1976 were $181.04.[4] Conversely, the average annual per capita income in the San Francisco area was $6593 as cited in the same source. The average weekly earnings in the San Francisco area were $272.28.[5]

---

[3] Department of Commerce, Survey of Business Statistics, August 1976, p. 17.

[4] U. S. Department of Labor, Employment and Earnings, October 1976, p. 116.

[5] Ibid., p. 114.

Although these figures relate to all workers, not just engineers, they are good relative indicators of pay in the two locales.

It is therefore evident that it is easier to attract and keep a good employee at a given GS level in the Charleston area than it is in the San Francisco area.

J. QUALITY OF DESIGN AND CONSTRUCTION

Probably the most difficult factor to measure and the most important to consider when comparing outputs of the Acquisition Departments is the quality of the output produced. There have been two recent efforts to quantify the quality of design and construction. The first is contained in an unpublished Master's Thesis by LCDR Gregory A. Parker where he analyzed the Navy's facilities acquisition process.[6] In one of the chapters of the thesis, he attempted to relate quality of design to amount of effort available for each design. As a basis for his evaluation, he used data generated by the Deficiency Analysis Data System (DADS). DADS was instituted by NAVFAC in 1971 to attempt to provide a feedback system to alert management ot the major repetitive design errors discovered during the construction process. The purpose of the system was reportedly not to evaluate the end product but rather to identify problem areas. Using the system results as a basis, LCDR Parker developed a relative index for design quality.[7] SOUTHDIV's design

---

[6]Parker, G. A., Master's Thesis, Massachusetts Institute of Technology, Boston, 1975.

[7]Ibid., p. 141.

was rated slightly lower than WESTDIV's as a result of this comparison. However, it is doubtful that the field-generated reports that fed DADS were totally reliable. This contention is supported by the fact that DADS is being discontinued by NAVFAC because it has proved non beneficial. It is therefore theorized that due to a faulty basis, LCDR Parker's finding was probably not as meaningful as he had hoped.

Another attempt to quantify quality of product can be gleaned from the NAVFAC "Market Survey" conducted in the spring of 1975.[8] In this survey, Public Works Officers at 122 activities were asked to rate the performance of the major services provided by the EFD. They were asked to rate each area numerically from one to nine concerning performance and potential, separately. A performance index was then calculated by dividing the performance rating by the potential rating. For purposes of this thesis, the performance rating will be used for comparison.

There were ten areas concerning Program III and IV which are of interest in this thesis. The areas and the performance ratings are as follows in Table 9.2.[9]

---

[8]NAVFAC "Market Survey" 1975, pp. 33-50.

[9]Ibid.

TABLE 9.2

AREA	PERFORMANCE VALUE SOUTH	WEST
Program III		
1. Timely consultation engineering assistance	6.5	5.8
2. Conduct fire protection surveys	6.4	7.1
3. Conduct value engineering program	6.0	5.0
4. Provide designs that recognize energy conservation requirements	5.7	6.1
Summary (includes two areas not cited above)	6.4	6.1
Program IV		
1. Quality of support received by OICC/ ROICC or Construction Division	7.3	7.2
2. Proper attention to station generated comments and desires during design	6.8	5.9
3. Timely completion of projects	7.0	6.5
4. Proper consideration given to station requirements in establishing construction schedules	8.1	6.9
5. Provide in-house design and support of activity funded projects under $10,000	7.6	7.4
6. Provide satisfactory end product	7.1	6.6
Summary of all Program IV areas	7.3	6.8

One must be careful when forming conclusions based on this survey (especially when trying to compare two EFD's) because there is no

exact way to standardize the individual rater's judgment with that of another rater. However, one should consider that those doing the ratings were Civil Engineer Corps Officers which would tend to give the raters some commonality of background and exposure. Regardless, it appears reasonable to state that in Program III performance, the two Acquisition Departments appear fairly even. In Program IV, it is fair to state that SOUTHDIV's customers held its performance in a little higher regard than did WESTDIV's customers in regard to its service.

A less grand approach to determining quality can be viewed in the results to the ROICC Survey conducted by the author and as exhibited in Appendix D. In this case the ROICC's were queried as consumers of the product (particularly plans and specifications) put out by the Acquisition Departments. The most interesting point surfaced by the survey was the fact that in both SOUTHDIV's and WESTDIV's case, their ROICC's held the quality of plans and specifications in relatively low esteem. As in the case of the Market Survey, all those questioned were U. S. Navy Civil Engineer Corps Officers (most LCDR and above). SOUTHDIV's overall rating as an Acquisition Department was slightly higher than WESTDIV's.

X. OBSERVATIONS

A. OVERALL RESULTS OF COMPARISON

As expected when this thesis was begun, comparing the two Acquisition Departments turned out to be a most difficult task. Absence of solid data in some areas precludes the making of a clear cut and supportable judgment on the two entities. However, based on the foregoing discussions about the two organizations, it would appear that WESTDIV has been generally less efficient in terms of WIP/man year during the period under consideration. This observation is based upon productivity during the period of comparison (FY 1975 and 1976).

However, these differences in efficiencies were not as great as initially indicated in Chapter I where staffing and WIP differences for the two Acquisition Departments were displayed and discussed. Probably the best way to consider the two organizations is to think of them as operating at two different points on a spectrum of efficiencies with SOUTHDIV near the higher end and WESTDIV near the lower end. From the standpoint of effectiveness, it is postulated that the two Acquisition Departments are about equal.

In terms of achieving desired results, the Goal Progress Report for FY 1976 shows that both entities are generally meeting their

assigned goals and therefore successfully accomplishing their assigned tasks.[1]

Finally, the close comparability of Construction Divisions and ROICC's might be correlated with NAVFAC's apparent keen interest in managing this aspect of an EFD's output. That is, the Construction Program (IV) of the CMP is much more production oriented in the output goals while the Engineering Program (III) is not as output oriented even though it has more goals in its portion of the CMP. Some claim that the production of project plans and specifications should be moved from Program IV to Program III and design output managed like construction work in place is presently handled.

B. APPLICATION OF FINDINGS AT THE NAVFAC LEVEL

Apart from the attempt to determine what the difference between these two Acquisition Departments is, it became apparent that there is a basic need to develop some practical measures of output in this area. During the research phase, it was most difficult to find data on such simple measures of activity as those described in Chapter V for each division within an Acquisition Department. To measure output seems most basic to management for purposes of comparing activity for various periods, converting future workload to staffing required or as justification in the budgeting arena.

---

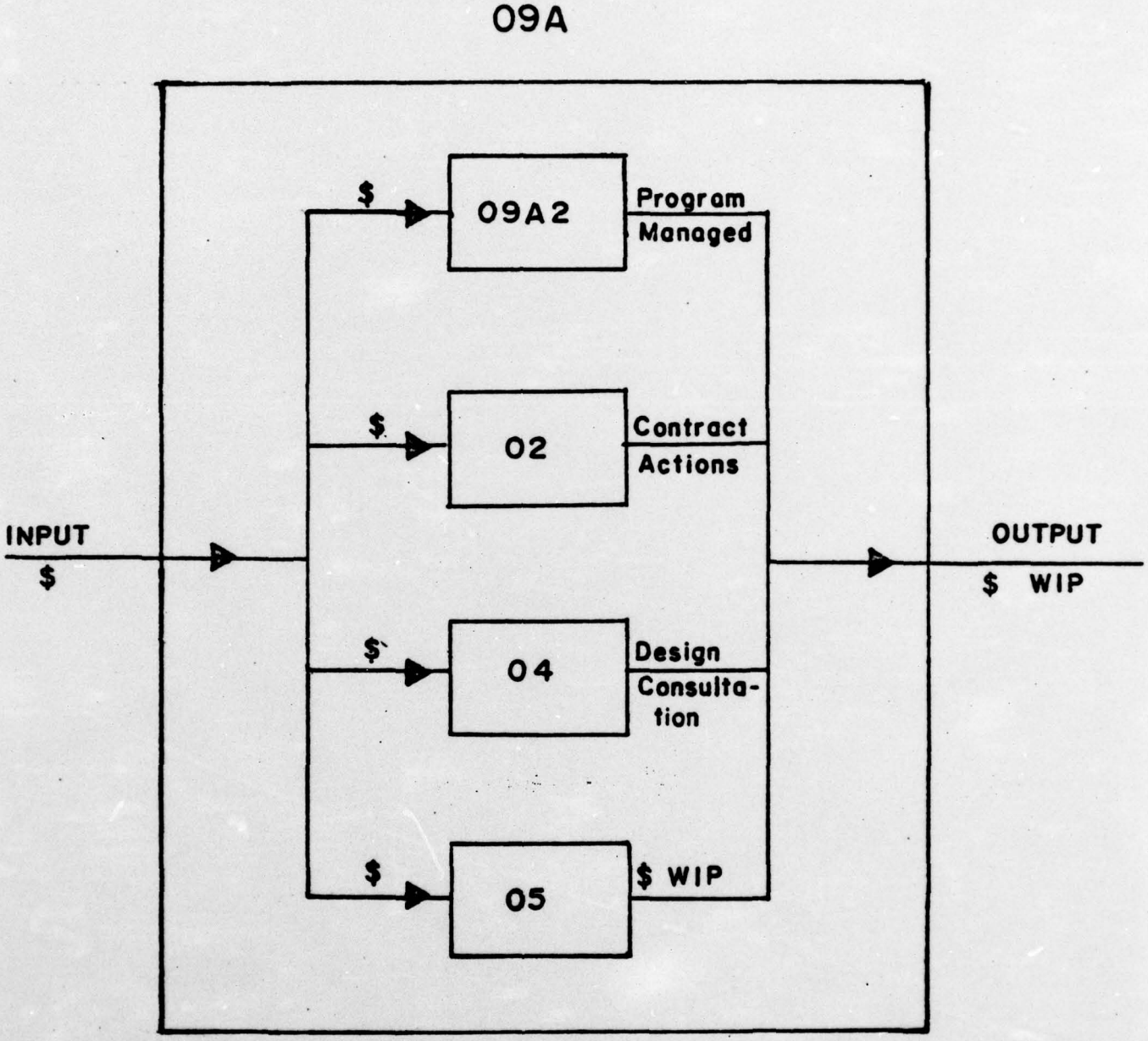
[1] NAVFAC Goal Progress Report FY 1976.

The basis of the following ideas is that a common system of conversion factors to convert future workload to required staffing should be developed to permit an improved system of allocation of resources among EFD's (at least in the Program III and Program IV areas). First, workload to staffing conversion factors could be most helpful to the CAB as a predictive device for the allocation of resources among the EFD's. Second, a realistic system of conversion factors could aid the EFD's in allocation of their resources among the divisions. Next, the factors could be used as a measure of comparative performance among the EFD's over a given period. Finally, and most important, these conversion factors could be used to construct the budget base for NAVFAC to be used in the obtaining of resources from higher authorities. This aspect may become more important with the advent of Zero Base Budgeting.

The first concept to consider is how the Acquisition Department functions as a system. Figure 10.1 illustrates that the total input to the Acquisition Department is dollars of cost and the total output is dollars of WIP. However, the true efficiency of the organization is not correctly measured in total output over total input because some of the input dollars produce output in a different time frame. For example, dollars worth of cost this year are reflected in outputs from the Acquisition Project Management Office that may affect WIP output for several different years. Therefore, one must look at the inputs and outputs of

FIGURE 10.1

COMPARATIVE VIEW OF A TYPICAL ACQUISITION MANAGEMENT DEPARTMENT



NOTE: Some outputs (e.g. 09A2) are not for same Fiscal Years as other outputs (e.g. 05).

each entity within an Acquisition Department in order to develop effective conversion factors. More important than measuring efficiency, this approach gives the ability of converting future workload to staffing required in each entity. With the staffing and cost derived for each entity based on that division's workload, then the entire Acquisition Department's staffing and cost is merely a summation problem. This system should not be considered as a means of taking away an EFD's prerogative to allocate its resources, but rather its merit lies in more equitably dividing the total resources among the EFD's.

No attempt was made in this thesis to derive conversion factors because it was felt that historical information on all EFD's, not just the two in question, would be required to properly calculate the factors. Use of in-house capability or an engineering study to determine these factors is suggested.

1. Preliminary considerations in deriving input/output conversion factors.

(a) Effects of inflation

One concern in developing output measures is that almost any parameter selected will be subject to inflation. This would mean that the factors based on dollars worth of WIP or dollars worth of design would require revision every year to relate to the actual effort required. The inability to predict inflation with any certainty would certainly limit the predictive powers of any factors using parameters

affected by inflation. Another approach is to use an expense rate which would be the cost or input divided by the output or measurement parameter in dollars. This concept is already in limited use by NAVFAC. The assumption one must make when using an expense rate is that inflation will affect the input cost at the same rate it affects the output parameter. This is not always true, as seen when one compares the rise in the input cost (basically the Federal Pay Scale) compared to the output cost which is basically the cost of construction over the last few years. Even with this problem, the expense rate approach is considered sound to use.

(b) Multiple factors versus single factor

A second aspect to consider when attempting to derive these figures is whether to look for one conversion factor based on one output indicator or to look towards multiple linear regression where several output factors are applied to different parts of the product and summed for total input required. A single factor, though easiest to use, will provide very rough numbers and fairly inaccurate estimations of input requirements. The multiple factor approach, if kept within reason, provides a much better approximation of the requirement. The multiple factor concept is employed by NAVFAC presently in converting design workload into staffing requirements. Different man year conversion factors are used for varying types of work (e.g., final plans and specifications, 30% plans and specifications or post-

award consultation). These factors are tied to dollars worth of design (estimated construction cost), so that they are susceptible to inflation and must be changed every few years.

2. Expense rate approach to conversion factors[2]

(a) Acquisition Project Management Office Factors

The Acquisition Project Management Office's workload can be divided between Military Construction projects and other reimbursable projects which may relate to a series of Fiscal Years, and the Operations and Maintenance (OMN) funded projects and other projects that expire in the one fiscal year.

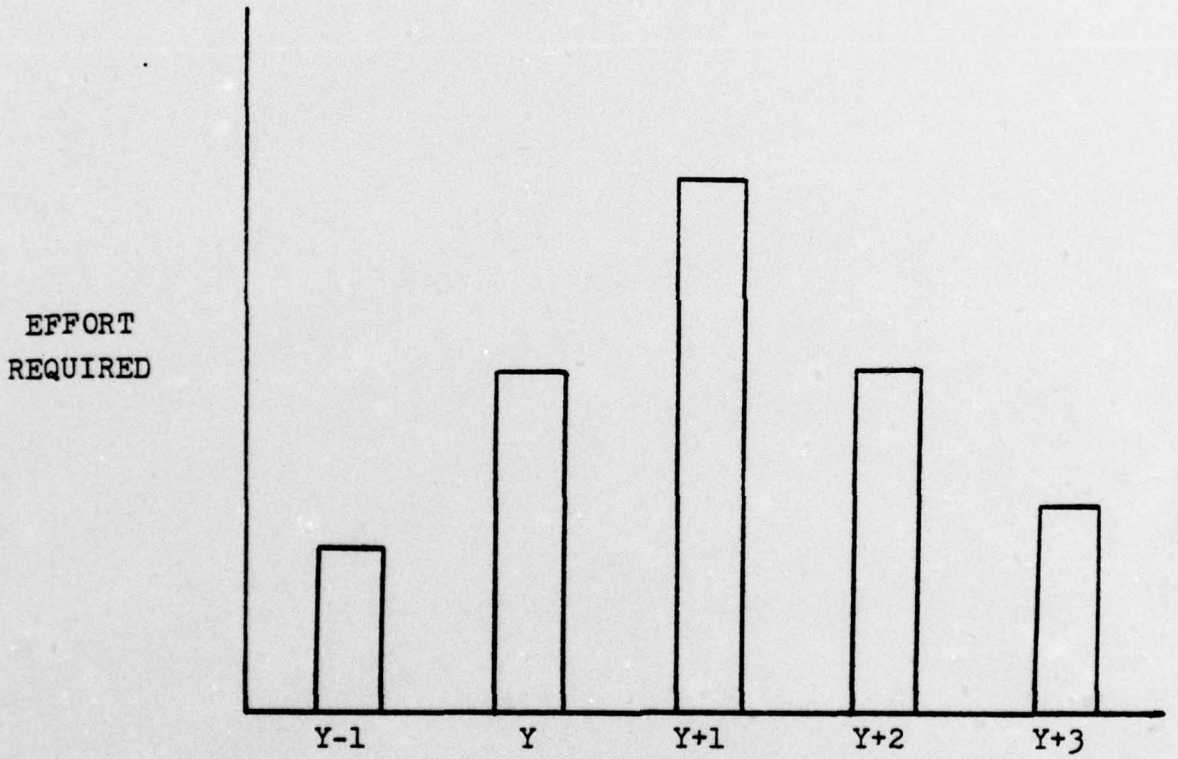
It appears that the work or effort required on each of the Fiscal Year's programs under the first category varies. That is, more work in the Acquisition Project Management Office might be required on the program that is two fiscal years distant than the projects for this fiscal year. Figure 10.2 illustrates the concept envisioned. Whether the relationship of amount of work to year, shown in Figure 10.2, is exactly correct is unimportant. Rather, it is intended to convey the message that different year's programs require different amounts of effort. It is suggested that different expense rates could be applied to each Fiscal Year's program based on where it is in relation to today. By summing these various costs, a total cost could be generated to manage those programs.

---

[2] For sample method of using expense rates to determine cost, see Appendix E.

FIGURE 10.2

RELATIVE EFFORT REQUIRED IN 09A2 FOR VARIOUS FISCAL YEAR'S PROGRAMS



Y = THIS FISCAL YEAR

Conceptually, the projects that are funded out of expiring funds would be easier to handle. An expense rate could be multiplied by the amount of the total expected funding to get a cost for administering this type of project. This number could then be summed with the MILCON figure for a total Acquisition Project Management Office cost. Given this cost, the staffing and material support (usually minimal compared to labor) could be derived.

The expense rates used in the above calculations could be derived from past cost experience contained in the IPMS. When one is applying these expense rates, permissible bands should be established to account for inter-EFD differences in number of projects comprising the program or other unique factors that prevent the EFD from hitting the expense factor exactly.

In summary, program size could be converted by the expense rates into allowable costs which would permit calculation of the total required Acquisition Project Management Office staffing. These factors would take into account all the miscellaneous functions like collateral equipment procurement that are lodged in this Office.

(b) Contracts Division (02)

The Contracts Division is one of the easiest entities to derive the factors to be used because its output, contractural actions, is independent of inflation. The staffing rate, (in lieu of expense rate) derived for this entity could be simply multiplied by the estimated

contractural actions for the coming year, giving staffing required. A contractural action could be defined in many ways, but as a starting point the following is suggested:

a. Contracts awarded (A/E and Construction)

b. Change orders processed

c. Claims handled

To assure equity in comparison, a weighting factor could be used for each of the above which would reflect the average amount of effort required to do the task.

Using the above scheme, a staffing figure could be calculated and that figure converted to total cost. These rates could be derived from historic data as in the case of the Acquisition Project Management Office.

(c) Design Division (04) Factors

The basis already exists for the factors in the Design Division area as a result of NAVFAC's work in developing the staffing requirements model previously discussed. In this model, various conversion factors in terms of amount of workload that can be handled in one man year have been derived. Presently, these conversion factors are divided into the amount of anticipated workload to derive the number of man years required to accomplish the tasking. It would be relatively uncomplicated to convert these man year factors into expense rate conversion factors. The improvement realized by

converting to an expense rate system would be the elimination of the need to modify the factors periodically to accommodate inflation in the cost of construction.

The factors presently used include factors for design, consultation and support. Therefore, all the facets in input costs for the Design Division are treated as are the important measures discussed in Chapter VII. Therefore, the desired output could be converted into the total inputs (cost plus man years) required.

(d) Construction Division (05)/ROICC Factors

The Construction Division and the ROICC's are probably the easiest group to relate input to output. In fact, the expense rate is already being monitored in SOUTHDIV and WESTDIV as a means of keeping track of how the ROICC's and Construction Division are doing independently and jointly. It would be a simple matter to use the expense rate as a predictive tool to relate future workload to staff. To be equitable, the entire workload (income-bearing and non income-bearing) should be included. One factor (income-bearing and non income-bearing) or two separate factors could be used to convert workload into cost. The two factor cost would be more representative and would treat the problem of the extra load created by the OMN type contracts. As in the case of the other divisions, acceptable bands would have to be derived to accommodate the varying number of contracts that are to generate the projected WIP. As in the case of

the other entities, once the cost had been derived, it would be relatively simple to forecast the man years and the material support required.

3. Direct workload to staffing factor - an alternate approach

If the expense rate approach proves to be unwieldy or yields unreliable responses, a second approach would be to develop conversion factors that would convert workload to staffing directly. If this approach is used, the figures would require periodic adjustment to account for inflation in construction costs. The principles of application would be similar to the expense rate except man years would be converted into cost. Either method should produce equally accurate results.

The approaches outlined in this section on Conversion Factors would not stipulate how many of a given grade level employee is needed nor would an exact figure on input cost be derivable. Rather the numbers generated would have to have an accompanying allowable zone to account for unique variances among EFD's. But the system would help ensure an equitable distribution of resources based on a quantifiable and supportable basis - a premise strived for by all good managers.

C. SUGGESTED FUTURE THESIS TOPICS

One topic that would logically follow would be the generation of the expense rates for each division within the Acquisition Departments. This effort would probably involve extensive review of historical data

and the generation of some "first cut" rates that could be tested.

A second topic that would logically follow this thesis is the construction of a computer-based model that would predict staffing and cost requirements of an Acquisition Department based on anticipated workload and the use of the previously devised expense rates (or man year conversions). This model would be much like the Design Division model used now but of course would be much larger.

Another area that could be of interest to study would be the NAVFAC Management System and particularly the successes and failings of the Management by Objectives as practiced in NAVFAC. This study might provide some independent thinking about how we might improve the system.

An area that is tangential to this thesis but is recognized as an area of concern is the role that automated data processing and the computer are playing in the NAVFAC Management system. Most all the managers interviewed in the field appeared to consider the EFD MIS as more of a requirement to input data than as the management tool it should be.

Another tangential subject would be to search for means to evaluate the quality of design and construction. It would require the uncovering of some surrogate for quality that was a reliable indicator.

APPENDIX A

ACQUISITION PROJECT MANAGEMENT OFFICE QUESTIONNAIRE WITH RESPONSES

(Asterisk indicates information was obtained as a result of interviews with Division Directors. Remainder of responses taken from written replies to questionnaires.)

1. What is the split of the Project Manager's time among the following work tasks?

   a. Design Coordinator between Customer and Designer

      WESTDIV - 25%

      SOUTHDIV - 5%

   b. A/E Contract Administration

      WESTDIV - 10%

      SOUTHDIV - 40%

   c. Funding Matters

      WESTDIV - 20%

      SOUTHDIV - 5%

   d. ADMIN MATTERS including updating reports

      WESTDIV - 5%

      SOUTHDIV - 10%

   e. Construction coordination for change orders and final inspections

      WESTDIV - 20%

      SOUTHDIV - 25%

f. Attending Design review conferences

WESTDIV - 10%

SOUTHDIV - 10%

g. Other (please list)

WESTDIV - 10%

- Advertise and award Construction Contract

- Future Projects Planning

- PED preparation

- Briefing

SOUTHDIV - 5%

- AD HOC committees, etc.

2. What system is used for assigning work to Project Managers?

WESTDIV - (a) Activity location, (b) Type of Projects (Medical, AF, Civil, etc.) workload.

SOUTHDIV - By activities, major claimants and number of projects.

3. What system is used to monitor workload of P. M.?

WESTDIV - Number of active projects

Complexity of projects

Problem projects

Sensitive Projects

SOUTHDIV - Number of active jobs weighted to reflect complexity and effort required by P.M.

4. What are the best measures to gauge workload and output of the Program Management Office?

WESTDIV - Number of PED (Projects Programmed)

Number of MCON Projects under Design

Number of MCON Projects under Construction

Number of Urgent Minor Projects

Number of Special Projects

Number of ESR's

Number of Engineering Investigations

Complexity of all the above projects

Size ($ Value) of each project

Collateral Equipment Workload

Number of A/E Contract(s) Award

Number of C/O to A/E Contracts

Number of C/O to Construction Contracts

Number of visits to activities, NAVFACENGCOM, etc.

SOUTHDIV - Annual work in place divided by number of personnel.

5. What is your percentage of clerical and other support per Project Manager?

WESTDIV - 50%

SOUTHDIV - 9 support for 14 P. M.'s including supervision (4).

6. What are the major phases of program management work at your EFD during both design and construction?

WESTDIV - Preaward Stage (A/E Selection and Negotiation)

Problem Resolution during design

Design review stages

Advertise and Award of Construction contract

Problem resolution during construction

Acceptance of facility

Post Occupancy problems

SOUTHDIV - Design Phase - Slate, selection and fee negotiation

Construction Phase - Coordination of 04, 05, 02 on large change orders.

7. How many major and minor (define major and minor) projects does a P.M. handle at a time? What has been the staff level and average load for a P.M. over the last three years?

WESTDIV - Major: MCON, U. M., and Large/special projects

Minor: Special Project, ESR, Engineering Investigations.

It varies with the complexity and size of projects.

Average 15-20 major

15-25 minor

SOUTHDIV - Not answered.

8. What is the relationship between the P.M. and the EIC in your Division (EFD)? Does the P.M. serve as head of the project team?

WESTDIV - P.M. is responsible for overall coordination.

EIC is responsible for design/technical coordination.

Generally P.M.'s start on a project earlier (during planning stages) and finish later (during facility operation).

SOUTHDIV - The P.M. is C.O. for his projects. The EIC is responsible for all technical development. P.M. is head of the project team.

9. Who handles the administration connected with A/E contracts? Does P.M. write scopes for A/E contracts, if so, how many scopes does a P.M. have to write per year on the average?

WESTDIV - P.M. handles administration (scope, negotiation scheduling, award and change orders.

EIC point of contact with A/E on technical matters.

EIC processes invoices to pay the A/E.

60 to 70 scopes per year.

SOUTHDIV - EIC handles administration of A/E contract.

EIC writes scope. P.M. reviews and approves.

10. Does P.M. sit on A/E Slate, Selection or Contract Negotiation Boards? If yes, how many of these boards per year?

WESTDIV - Yes, $\pm$ 50.

SOUTHDIV - P.M. is Recorder (non voting) on Slate but is Recorder and Voting Member on Selection and Fee Negotiation Boards.

11. Does P.M. attend Pre-Design Conferences, 30% reviews, 60% reviews (if held) 90% reviews and finals? If so, how many reviews are held for each project and what is the average time required for each review?

WESTDIV - Number of conferences varies with projects. Number of conferences per project 0 - 10. Number of days per conference 1 - 5.

SOUTHDIV - P.M. attends 90% of Pre-Design conferences, 50% of 30% reviews and 50% of 100% reviews depending on complexity and possible scope problems.

12. What is the major problem in Program Management at this EFD?

WESTDIV - Too much responsibility and not enough authority

SOUTHDIV - Amount of clerical work required of P.M. but this is being solved by additional clerical personnel.

13. Do you have enough people to handle the tasks assigned this Division?

WESTDIV - Have sufficient ceiling but have not been at full strength for over two years due to vacancies which have caused problems.

SOUTHDIV - Yes.

14. Are ADP (NAVFAC and local) reports used in daily 09A2 matters? How many man years are used in updating and massaging ADP reports?

WESTDIV - Yes, ADP reports are used. It is difficult to isolate "updating" and "massaging" since everyone does other tasks also. Say, 3-4 man years.

SOUTHDIV - Yes, about 3 man years.

15. Are there any factors that make this Project Management Division unique from other EFD's?

WESTDIV - Yes, A/E Professional Office is in 09A2.

Medical Projects are handled by Medical Branch of 09A2 - very heavy emphasis of medical work here.

Heavier total workload for EFD.

*SOUTHDIV - Three Team Concept for dividing Project Managers.

Upper management lets 09A2 do his job and provides adequate support.

Good internal (Code 09A) communications.

16. Who makes the decision as to whether design will be in-house or A/E contract? What is the criteria used to make this decision?

WESTDIV - Joint 09A2/04 Design

Criteria - workload, urgency of project, complexity of project.

SOUTHDIV - 04 with advice and consent of 09A2.

17. What portion of Goals in the Command Management Plan belong to 09A2? How has actual accomplishment been as compared to planned over the last three years?

WESTDIV - 09A2 is involved with the following goals:

Product Goals - Collateral Equipment

Service Goals - Project Management

Construction Administration

Support Goals - Program Management

Training

Improvement Goals - CMS Reporting

Performance Goals - Collateral Equipment Obligation Rate

CMS Reporting has significance as some measurement that workload data input is being reported.

Collateral Equipment Obligation Rate has significance in assuring that funds are obligated in a timely manner.

The remaining goals are budgetary in nature and indicate little as to quality or quantity of effort in the 09A2 functions.

*SOUTHDIV - Goals are the same cited above. No reply as to progress over last three years as in WESTDIV's case. This oversight is not important because statistics are available from Code 01 at NAVFAC.

18. How is progress towards goals (Division or CMP) monitored and who is responsible for collecting and analyzing data?

WESTDIV - Each Division monitors those goals under their cognizance. 09A2 monitors construction starts in addition to CMS Reporting and Collateral Equipment Obligation Rate.

*SOUTHDIV - Work Input Control Center (newly established) will collect and analyze data. Code 09A2 Division Director monitors goal progress also.

19. What is the average turnover rate of 09A2 staff?

WESTDIV - 1970-72 7-10 people per year

1972-76 3-5 people per year

*SOUTHDIV - Even though only two employees have been in the Division more than five years, turnover of professional staff is very low, clerical staff turnover is high.

20. How many man years are spent in travel by 09A2 personnel?

WESTDIV - 1 - 2 man years

*SOUTHDIV - Normally three trips per large project. Distances to sites are not considered a problem.

21. Who are your ten major customers and where are they located?

WESTDIV - (a) Major Claimants

CINC U. S. Pacific Fleet — Oahu, Hi.

Chief, Bureau of Medicine and Surgery, Wash., D.C.

Chief of Naval Personnel — Wash., D.C.

Chief, Naval Material Command — Wash., D.C.

Chief of Naval Reserve — New Orleans, La.

Commandant of the Marine Corps — Wash., D.C.

COMNAVTELCOM — Wash., D.C.

Commander, Naval Security Group Command — Wash., D.C.

Chief of Naval Education and Training, Pensacola, Fla.

(b) Activities

MARCORB, Camp Pendleton

NAS Miramar, San Diego

NAS, North Island

NAVREGMEDCEN, San Diego

NAVSHIPYD, Long Beach

NAVSTA, San Diego

NAVSHIPYD, Mare Island

NAVSHIPYD, Bremerton, (Wash.)

NAS Whidbey Island, (Wash.)

NAVSTA, Adak

SOUTHDIV - NAS Jacksonville, Fla.

NAS Pensacola, Fla.

All U. S. Navy facilities in New Orleans, La.

All U. S. Navy facilities in Charleston, S.C.

22. What is the general nature of tasks assigned to the program analyst in your Division?

WESTDIV - There are several program analysts in 09A2.

(1) Medical Programs Branch - maintains and tracks progress of medical facilities construction projects by network analysis.

(2) Support Branch

a. Support Branch Supervisor administers 09A Department Budget Execution plans for Program III and IV in addition to providing support to 09A2 and personnel matters. Also supervises functions of CMS, Special Projects, and Collateral Equipment.

b. Special Projects and Collateral Equipment Section Supervisor, a working supervisor responsible for overseeing the two functions and administering a portion of the special projects major claimants O&MN funded execution plans.

c. Collateral Equipment Program is administered by a program analyst.

d. The Management Analysis Section is headed by a program analyst who is responsible for project status reporting and briefings and quality control for the Construction Management System.

SOUTHDIV - Program Analysts handle Collateral Equipment Program*

23. What was the total cost of design done by A/E's and what was the total cost of design done in-house for last Fiscal Year?

WESTDIV - (MCON & MCNR) FY 1976

A/E - $7,189,805

In-house support - $1,220,724

Total: $8,410,533

SOUTHDIV (Total) FY 1976

*A/E - $4,384,899

In-house support of A/E Contracts - $574,434

In-house design cost - $790,192 (with overhead and profit)

Total Cost - $5,696,947

SOURCE: SOUTHDIV Design Summary Sheets

24. What is the average yearly time spent on coordination of Shore Electronics projects?

WESTDIV - 1,760 hours or one P.M.

SOUTHDIV - about 10% of one man year.

25. How many yearly man hours are spent on obtaining security clearances for contractors?

WESTDIV - 10 hours - negligible

SOUTHDIV - negligible.

26. How many man years are spent in handling ESR's?

WESTDIV - 09A2 office work generated by ESR's $\pm$ 2 man years

SOUTHDIV - Does not significantly impact on workload of Code 09A2 personnel. *

APPENDIX B

QUESTIONNAIRE AND RESPONSES FROM DESIGN DIVISION

(All of SOUTHDIV's responses were recorded by the author during interview with Division Director. WESTDIV's responses marked with an asterisk were taken from personal interviews. Remainder of WESTDIV's responses were taken from written replies to questionnaire.)

1. What is the split of the 04 Professional staff's time among the following areas? (percentage, please)

   a. Slate, selection and contract negotiation boards

      WESTDIV - 5%

      SOUTHDIV - 1%

   b. In-house design

      WESTDIV - 30%

      SOUTHDIV - 18%

   c. A/E Contract Administration (paperwork)

      WESTDIV - 15%

      SOUTHDIV - 5 to 10%

   d. Predesign conferences in the field

      WESTDIV - 1%

      SOUTHDIV - 5%

   e. Design Reviews (30%, 60% (if held), 90% and finals)

      WESTDIV -- in-house - 5%

      SOUTHDIV -- 34% (combined with h below)

f. Training and professional conferences

WESTDIV - 2%

SOUTHDIV - 1%

g. Updating manuals, updating cost data and reviewing new materials

WESTDIV - 3%

SOUTHDIV - 5%

h. Reviewing designs by A/E's

WESTDIV - 18%

SOUTHDIV - combined with e above

i. Reviewing designs by PWC's and PWD's

WESTDIV - 1%

SOUTHDIV - 2%

j. Managing NAVFAC's Engineering Investigation Program

WESTDIV - 1%

SOUTHDIV - 4%

k. Administering Value Engineering Program

WESTDIV - 1%

SOUTHDIV - 5% (historically 1%)

l. Preconstruction Conferences

WESTDIV - 1%

SOUTHDIV - 15 to 20% (includes all post construction contract award consultation)

m. Administrative tasks

WESTDIV - 1%

SOUTHDIV - 1%

n. Other (please list major categories not shown above)

WESTDIV - Consultation, technical - 8%

Turnkey - 2%

SOUTHDIV - none

2. What system is used in assigning projects to various engineers?

WESTDIV - Code 04 selects lead discipline (branch) having most related work. Branch selects EIC.

SOUTHDIV - Scheduling branch (04A1) looks at type of project and availability of EIC's. 09A1 assigns an EIC directly and simultaneously advises the EIC's branch manager.

3. How is the decision made as to whether a design project will be done in-house or by A/E?

WESTDIV - Many factors involved. Usually joint Code 04 and Branch Head decision. Factors might be 25% creditable I-H goal, time constraints, expiring funds, size of project may be uneconomical to design by A/E, etc.

SOUTHDIV - Decision made by committee of Branch Managers, Code 04 and Code 04A. Review future workload for candidates and select best based on type and location of project, applicability of 25% goal, size of project, etc.

4. Does 04 do functional reviews only or are A/E's plans and specs reviewed from a technical standpoint? Functional review is defined as a check for completeness and compliance with DD 1391 while technical refers to review of technical adequacy (e.g., steel size) of design.

WESTDIV - Functional for adherence to scope, $, criteria is our normal review. Technical only when cursory review reveals major problems or deficiencies.

SOUTHDIV - Primarily do functional reviews. Technical review done when preliminary look indicates serious design deficiencies.

5. For in-house design, do engineers do their own drafting?

WESTDIV - yes

SOUTHDIV - yes

6. Does the physical nature of the building(s) that house 04 cause any particular difficulties in getting the job done?

WESTDIV - yes

SOUTHDIV - no

7. How many man years are spent in travel by 04 personnel?

WESTDIV - 15.5 Engineer

4.0 Management

SOUTHDIV - information not available.

8. What is the average turnover in office staff each year?

WESTDIV - Engineer and Technical - 20 people

Management - 2 people

Clerical and Admin - 8 people

SOUTHDIV - Engineer and Technical - 5%

Management - 1%

Clerical and Admin - 15 to 20%

9. What is the single best measure of workload for the Design Division. What level has your tasking been in this measure over the last three years?

WESTDIV - No single best measure available. There are many factors involved here. Perhaps we should discuss (this) sometime.

SOUTHDIV - No single best measure. Some good measures are dollar value of design completed, number of projects completed and number of ESR's done.

10. What system is used to monitor the workload for each engineer?

WESTDIV - DMIS EIC report

SOUTHDIV - DMIS reports and DYL 260 report developed at SOUTHDIV. Director, Design Division relies on Exception Report.

11. What has the total staff been for your organization at the end of the last three years?

WESTDIV -	Professional	185	194	205
	Admin and Clerical	31	36	36
SOUTHDIV -	Professional	87	94	94
	Admin and Clerical	16	16	16

12. Do you have enough people to accomplish your assigned tasks?

WESTDIV - yes

SOUTHDIV - yes

13. What staffing factors are used to convert anticipated workload to man year requirements? How are these requirements distributed among the various engineering disciplines?

WESTDIV - HQ (NAVFAC) staffing factors, historical distribution vs. workload and type of discipline required.

SOUTHDIV - Use NAVFAC production rates of million dollars of design per man year to convert workload to staffing. Distribution done by analyzing workload and applying judgment to decide mix of discipline. Rule of thumb - Engineer's time required to do one in-house design is equal to the engineering time required to coordinate six projects designed by A/E.

14. Is the training of and assistance to A/E's who have not previously worked for the Navy, a problem? If so, how many man years do you estimate are consumed in this task?

WESTDIV - No

SOUTHDIV - Has a self imposed quota of 25% of A/E's used during the year must be new firms (not used in two years). However, this turnover does not present a problem for Design Division.

15. Who sets design milestones and how are they monitored? What action is taken if design falls behind proposed milestones?

WESTDIV - Set at fee negotiation (with A/E). Scope of work contains time frames.

We miss dates or curtail review times or administrative release time.

SOUTHDIV - 04A1 sets milestones and they are monitored by everyone. Code 04 holds Branch Managers responsible for meeting milestones.

16. What is the system for setting, monitoring the progress towards goals (Command Management Plan or 04)? What has been the results at the end of each of the last three Fiscal Years?

WESTDIV - Setting by CMP. Monitor progress through DMIS, IPMS. Achieved most goals.

SOUTHDIV - Set by CMP. Monitor by using goal progress completion report for Programs III and IV.

17. Is there anything that makes the 04 in this EFD unique?

WESTDIV - No

SOUTHDIV - Low personnel turnover

This 04 only major consumer of engineering talent in Charleston area.

All engineers graduate from three colleges in area.

18. How many man years of engineering do you estimate it takes to do 25% of design in-house?

*WESTDIV - 42 man years (17.4% of total man years)

SOUTHDIV - 18 man years (16.4% of total man years) if use NAVFAC yardstick 29 man years if count all in-house.

19. How much of your design were you doing in-house in FY 1971 when the 25% goal was announced?

WESTDIV - 21%

SOUTHDIV - 22%

20. What is the major problem in 04?

*WESTDIV - Problem areas where 04 is concentrating.

(a) Stabilization of performance in meeting in-house design goal

(b) Reduction of cost of design

(c) Improvement in cost effectiveness of design

(d) Improvement in design quality

(e) Elimination of change orders due to design deficiencies.

SOUTHDIV - None.

21. What is a good measure of design quality and how has this 04 done as measured by this parameter?

WESTDIV - Design awards, lack of change orders relating to design deficiency and bid spread.

SOUTHDIV - Not able to say.

22. How many man years are spent in data processing, input preparation and massaging data-based processing systems, (e.g., computerized specifications)?

WESTDIV - 4.2 man years

SOUTHDIV - DMIS one man year, Computer assisted design - .3 man year, computer assisted specifications - 1.2 man year.

23. Does the preparation of special studies, formal reports and progress reports present a significant workload? If so, how many man years are consumed on the average?

WESTDIV - No

SOUTHDIV - No

24. Does 04 maintain its own design status reporting system? If so, how many man years are devoted to this?

WESTDIV - Yes, 1 man year

SOUTHDIV - No

25. Does 04 use the central NAVFAC DMIS? If not, what system is used?

WESTDIV - Yes

SOUTHDIV - Yes.

APPENDIX C

CONSTRUCTION DIVISION QUESTIONNAIRE AND RESPONSES

(SOUTHDIV's responses were recorded by the author during an interview with the Construction Division Director. WESTDIV's responses were taken from written reply to questionnaire.)

1. What is the split of the 05 professional staff's time among the following areas?

a. Preconstruction Conferences

WESTDIV - 2%

SOUTHDIV - 0% (special contracts have 05 participation)

b. Change Order negotiations

WESTDIV - 5%

SOUTHDIV - 1%

c. Final Inspections

WESTDIV - 5%

SOUTHDIV - 0% (special contracts)

d. Construction Management consultation to field

WESTDIV - 40%

SOUTHDIV - 80%

e. Reviewing contractor submissions (via ROICC)

WESTDIV - 5%

SOUTHDIV - 0% special contracts)

f. Monitoring and expediting progress on various construction projects

WESTDIV - 5%

SOUTHDIV - 2%

g. Collecting data and updating reports

WESTDIV - 2%

SOUTHDIV - 1%

h. Labor relations matters

WESTDIV - 0% (special area for 05A)

SOUTHDIV - 8% (two man years)

i. Safety

WESTDIV - 2% (special area for 05B)

SOUTHDIV - 4% (one man year)

j. Clerical duties (making copies, etc.)

WESTDIV - 2%

SOUTHDIV - 1%

k. Other (please list)

WESTDIV - Bid inquiries - 10%

Claim review - 15%

Misc. - 7%

SOUTHDIV - Claim review - 15%

Misc. - 5%

2. What is the best indicator of 05's workload? In terms of this indicator what has been your workload over the last three years?

WESTDIV - Number of EFD contracts and number of AROICC/ Engineer contracts

SOUTHDIV - Dollars of WIP, number of contracts, location.

3. How many 05 man years are spent in travel?

WESTDIV - 3 man years

SOUTHDIV - 4 to 5 man years

4. What is the system used for converting anticipated workload into 05 staffing requirements?

WESTDIV - volume of work and ceiling constraints

SOUTHDIV - total workload fairly constant. Workload shifts among branches. Code 05 measures workload by WIP and number of projects. Balancing of workload done by 05 and Branch Manager committee.

5. What is the system used for converting workload into inspector, clerical admin, and procurement support for ROICC offices?

WESTDIV - inspectors - number of contracts

clerical - supportive to professional (staff)

admin - not applicable

procurement - contract type and volume

SOUTHDIV - Total staffing based on $80,000 to $90,000 WIP per person MCON and $40,000 to $50,000 WIP per person OMN. Three or four Inspector/Engineers to one clerical. Number and type of contracts are considered as well as location.

6. How are local goals set for 05 and how is progress monitored?

WESTDIV - (a) AGC - Command relationships

(b) ROICC - 05 relationships

(c) CMP performance

SOUTHDIV - There are none except quality construction in a timely manner as well as NAVFAC goals.

7. What goals in the Command Management Plan fall under the auspices of 05? How had actual performance vs. planned turned out over the last three years?

WESTDIV - (1) WIP (2) Change Order negotiation (3) Contract Admin. All found in Program IV.

SOUTHDIV - (1) WIP (2) SIOH (3) Change Order rates (4) BOD's.

8. Is there something about 05 in this EFD that makes it unique from other 05's in the EFD's?

WESTDIV - Personal viewpoint and travel

Collective Bargaining Agreement - (15% involvement)

SOUTHDIV - The past record. Also, good lateral communications among Divisions.

9. What is the average yearly turnover of your staff and the ROICC's civilian staff?

WESTDIV - (a) 05 - 5%

(b) ROICC - 10%

SOUTHDIV - (a) 05 and ROICC's stable

10. Does the physical layout of the EFD offices increase the work required for proper coordination?

WESTDIV - No

SOUTHDIV - No

11. What size and where have your largest ROICC offices been over the last three years?

WESTDIV - Site	Number of People
San Diego, Calif.	± 54
Long Beach, Calif.	± 20
Camp Pendleton, Calif.	± 20
San Francisco Area	± 15
Bremerton, Wash.	± 20
North Bay Area	± 25
SOUTHDIV	
Jacksonville, Fla.	± 30
New Orleans, La.	± 10
Gulfport, Miss.	± 17
Charleston, S.C.	± 24
Orlando, Fla.	± 10
Pensacola, Fla.	± 16

APPENDIX D

ROICC Telephone Questionnaire

1. Methodology

Six ROICC's were randomly selected from each EFD's area. The six represented 30% of SOUTHDIV's ROICC and 27% of WESTDIV's ROICC's. The sample of six for each EFD turned out to contain 66% large ROICC offices and 33% medium or small offices. (Large, medium and small are discussed in Chapter VIII.) A number rating of one for poor to 10 for excellent was requested as a response to each of the six areas in the questionnaire. The questions were framed to cover each of the areas where the ROICC is a "consumer" of an 09A's services. (See Chapter III for further discussion of questions.) Finally, the survey was conducted with the permission of each of the 09A's or his authorized representative.

2. Questionnaire

1. What is your rating of the quality of plans and specifications produced for the construction contracts you are assigned?

2. Does the EFD provide adequate resources to the field (e. g. funds, staff and material support.)?

3. How responsive is the EFD to your requests for assistance (e.g., consultation, advice, etc.)?

4. How well does the EFD support decisions made in the field?

5. How responsive is the EFD to requests for additional project funds, additional design or authorization to make contract change orders?

6. What is your overall rating of the Acquisition Department?

The first question basically involves the services provided by the 04 and to a lesser extent 02. The second question refers to 05 only. Number three question speaks to the services of 02, 04, and 05. The next question addresses 02 and 05 support. Finally, the fifth and sixth questions refer to the entire 09A organization. The interviewees were asked to make their ratings based on their total experience in the Navy.

3. Results

	ROICC's						
Question Number	1	2	3	4	5	6	Average
SOUTHDIV							
1	4	0*	7	8	5	8	5.3
2	10	6	N/A**	9.5	10	6	8.3
3	10	8	10	7.8***	9	9	9
4	9.9	8	7.5	10	9	6	8.4
5	9.5	7	8	10	9	9	8.8
6	9.6	7	10	9	10	7	8.8
WESTDIV							
1	9	6	7	5	6	6	6.5
2	9	8	8	8	4	8.5	7.6
3	8.5	8	7	7	7	8.5	7.7
4	8.5	9	9.5	8	8	9	8.7
5	8	8	8.5	7	6	9	7.8
6	8.5	7	8	8	5	7.5	7.3

*ROICC asked that 0 be used in lieu of 1 as lowest rating.
**Service not provided to ROICC
***ROICC wanted to award 6.5 for design advice and 9 for construction advice. To allow for computation, two figures averaged to 7.8.

The average along the right side of the table of results represents the average for the question.

APPENDIX E

Sample Calculation Using Expense Rate

09A2

Total projected Cost for a given 09A2 = (A x a) + (B x b) +

(C x c) + (D x d) + (E x e).

SYMBOLS

Last Fiscal Years Program Amounts	A
This Fiscal Year Program Amount	B
Next Years Program Amount	C
Year after next's Program Amount	D
Estimated Projects funded out of expiring funds	E

a = expense rate derived for Fiscal Year Y - 1

b = expense rate derived for Fiscal Year Y

c = expense rate derived for Fiscal Year Y + 1

d = expense rate derived for Fiscal Year Y + 2

e = expense rate derived for Single Year funded projects

LIST OF INDIVIDUALS INTERVIEWED

NAVFAC

RADM N. W. Clements, Deputy Commander for Planning

CAPT F. M. Newcomb, Acting Assistant Commander for Construction

CDR F. G. Kelley, Executive Assistant (Past 09A at SOUTHDIV)

Mr. R. H. Field, 09FA1, Assistant Policy Planning Division

Mr. W. R. Grupe, 012A, Deputy Director Programs Division

Mr. T. Rutherford, 04C, Program Coordinator

Mr. R. J. Chalfort, 05C1, Program Execution and Reports Branch

Mr. M. P. Galgano, 05C1C, CMC Coordination and Program Manager

Mr. A. F. Malloy, 05C2, Resource Management Branch

Mr. C. Bittenbring, 051A, Deputy Director, Operational Facilities Construction Division

WESTDIV

CAPT R. W. Auerbach, 09A

CAPT J. I. Dick-Peddie, 09A

Mr. J. R. Collins, 09A2

Mr. N. S. Lee, 09A2X, Electronics Coordinator

Mr. J. F. Benson, 09A2.50, Head Support Branch

Ms. L. M. Moore, 09A2.54, Head Management Analysis Section

Mr. R. Wolf, 04

Mr. H. R. Marquardt, 04D, Deputy Design Division Director

Mr. F. J. Gaggioli, 04A, Assistant Design Management

Mr. H. Beade, 04A1

Mr. J. B. Watson, 405 Head, Civil Branch

Mr. E. L. Hughes, 05

Mr. G. C. Tucker, 051 Head, North Branch

Ms. M. J. Null, 05P, Program Analyst

SOUTHDIV

CAPT W. H. Bannister, Commanding Officer

CDR J. R. Dunn, Executive Officer

CDR T. H. Oswald, 09A

LCDR J. R. Cottingham 09A1

Mr. H. M. McCracken, 09A2

Mr. C. E. McCrorey, 09A21, Team Leader 1

Mr. R. B. Roessle, Jr., 09A214, Project Manager

Mr. E. G. Malone, 04

Mr. E. L. Dodson, 04A1, Scheduler

Mr. T. Marbert, Program Analyst in 04A

Mr. K. M. Robertson, 405, Civil Engineering Branch Head

Mr. R. B. Foster, 403, Mechanical Engineering Branch Head

Mr. L. J. Kruger, Engineer in Structural Branch

Mr. N. W. Shepard, 05

Mr. J. G. O'Hearn, 051, Western Branch Head

Mr. H. W. Yeager, 05C, Quality Assurance Branch

LIST OF REFERENCES

1. Department of Commerce, Business Statistics 1975, 1976.

2. Department of Commerce, Bureau of Census, Statistical Abstract of U.S., 1975, 1976.

3. Department of Commerce, Survey of Business Statistics, August, 1976, 1976.

4. Department of Labor, Bureau of Labor Statistics, Employment and Earnings, October 1976.

5. Hurwicz, L., The Design of Mechanisms for Resource Allocation, American Economic Association V. 63, pp. 1-30, May 1973.

6. Johnson, R. C., A Study of Executive Information Requirements within a Navy Construction Contracting Organization, Master Thesis, unpublished, Naval Postgraduate School, Monterey, California, 1974.

7. Levinson, H., Organizational Diagnosis, Harvard University Press, 1972.

8. McCullagh, P. W. and Van Royen, W. S., Analysis of Workload Planning and Allocation of Resources to Support Field Administration and Inspection of Naval Facilities Engineering Command Contracts, Master Thesis, unpublished, Naval Postgraduate School, Monterey, California, June 1974.

9. Naval Facilities Engineering Command, Command Advisory Board (CAB), NAVFAC INST. 5420.15C, October 1973.

10. Naval Facilities Engineering Command, memo, Subject, Command Management Concept and Related Code 01 Reorganization, 22 December 1970.

11. Naval Facilities Engineering Command, Construction Program Goal Progress Report, FY 1976, September 1976.

12. Naval Facilities Engineering Command, EFD Fact Book, unpublished, pp. 8-13, February 1970.

13. Naval Facilities Engineering Command, Engineering Program Goal Progress Report, FY 1976, September 1976.

14. Naval Facilities Engineering Command, FY 1974 Command Management Plan, NAVFAC P-441, July 1973.

15. Naval Facilities Engineering Command, FY 1975 Command Management Plan, NAVFAC P-441, June 1974.

16. Naval Facilities Engineering Command, FY 1977 Command Management Plan, NAVFAC P-441, July 1976.

17. Naval Facilities Engineering Command, Integrated Program Management System, NAVFACINST 7300.7K, 9 June 1975.

18. Naval Facilities Engineering Command, Manpower Listings, OPNAV form 5320/3, unpublished, (for SOUTHDIV and WESTDIV), 1970-1975.

19. Naval Facilities Engineering Command, Zero Base Study; The Phase Two Report of Civil Engineer Corps Career Development, Education, and Training, 1971.

20. O'Neill, L. F., "A Program Management System for BUDOCKS Field Engineering Offices," The Navy Civil Engineer, June 1964.

21. Parker, G. A., An Evaluation of the U. S. Navy's Facilities Acquisition Process, Masters Thesis, unpublished, Massachusetts Institute of Technology, Boston 1976.

22. Price, J. L., Organizational Effectiveness, Richard D. Irwin, 1968.

23. Rand McNally Commercial Atlas and Marketing Guide, Ninety-Ninth edition, p. 31, Rand McNally and Company, 1968.

24. Southern Division, Naval Facilities Engineering Command, Organization and Functions of the Southern Division, Naval Facilities Engineering Command, SOUTHNAVFACENGCOMINST. 5450.1A, October 1975.

25. Southern Division, Naval Facilities Engineering Command, Progress Report Fiscal Year 1973, November 1973.

26. Southern Division, Naval Facilities Engineering Command, Progress Report Fiscal Year 1974, October 1974.

27. Southern Division, Naval Facilities Engineering Command, Progress Report Fiscal Year 1975, October 1975.

28. Southern Division, Naval Facilities Engineering Command, letter Code 0132 to NAVFAC, Subject; Tentative Op-Plan, FY - 77, comments on, 14 May 1976.

29. Washington Operations Research Council, Cost Effectiveness Analysis, Frederick A. Praeger, 1967.

30. Western Division Facilities Engineering Command, Command History, OPNAV reports 5750-1 for 8 June 1970.

31. Western Division, Naval Facilities Engineering Command, letter 013:SPD: kw Serial 013/555 to NAVFAC, Subject; Comments and Reclama to Tentative FY - 77 OP-Plan, 14 May 1976.

32. Western Division, Naval Facilities Engineering Command, Organization and Function Manual, WESTNAVFACENG-COMINST. 5450.1A, 3 January 1973.

33. Wymore, A. W., Systems Engineering Methodology for Interdisciplinary Teams, John Wiley and Sons, 1976.

INITIAL DISTRIBUTION LIST

		No. Copies
1.	Defense Documentation Center Cameron Station Alexandria, Virginia 22314	2
2.	Library, Code 0212 Naval Postgraduate School Monterey, California 93940	2
3.	Department Chairman, Code 54 Department of Administrative Sciences Naval Postgraduate School Monterey, California 93940	2
4.	Commander J. C. Tibbitts, Code 54Ti Department of Administrative Sciences Naval Postgraduate School Monterey, California 93940	1
5.	Lieutenant Commander J. D. Buttinger, Code 54B Department of Administrative Sciences Naval Postgraduate School Monterey, California 93940	1
6.	Commander Naval Facilities Engineering Command Alexandria, Virginia 22332	2
7.	Commanding Officer, Western Division Naval Facilities Engineering Command P. O. Box 727 San Bruno, California 94065	1
8.	Commanding Officer, Southern Division Naval Facilities Engineering Command 2144 Melbourne Street P. O. Box 10068 Charleston, South Carolina 29411	1
9.	Lieutenant Commander David J. Nash, CEC, USN NMCB 1 FPO New York 09501	1