NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

THE PEARL HARBOR NAVAL SHIPYARD AND INTERMEDIATE MAINTENANCE FACILITY CONSOLIDATION: A REVIEW OF PERFORMANCE MEASURES

by

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June 1998

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	June 1998	Master's Thesis

4. TITLE AND SUBTITLE
THE PEARL HARBOR NAVAL SHIPYARD AND INTERMEDIATE MAINTENANCE FACILITY CONSOLIDATION: A REVIEW OF PERFORMANCE MEASURES

5. FUNDING NUMBERS

6. AUTHOR(S)
White, James R.

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Naval Postgraduate School
Monterey, CA 93943-5000

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES
The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT *(maximum 200 words)*

An important step in the Navy's Regional Maintenance Program is the consolidation of Pearl Harbor Naval Shipyard and the Naval Intermediate Maintenance Facility to improve maintenance operations. Final approval to continue operation as a consolidated organization is scheduled for FY 2000. To gain approval, the Navy must demonstrate to the Office of the Secretary of Defense (OSD) and the Congress that the consolidation has been successful in improving maintenance operations. This thesis evaluated five metrics proposed by the Naval Sea Systems Command (NAVSEA) and the Naval Audit Service (NAS) to measure performance of the consolidation. The process of developing a strategic plan and a performance measurement system (PMS) was explained. The "Balanced Scorecard" framework was used to present the five metrics in a comprehensive PMS. The five proposed metrics, "cost per unit of output", "quality", "production efficiency and resource utilization", "CSMP backlog", and "schedule adherence", were evaluated as useful measures of performance. Ten additional metrics were developed that provide managers further evaluation tools to measure improvements in maintenance operations. Of the ten, only "total asset turnover", the "days worked ratio", and "revenue/cost per employee", are recommended for inclusion with the original five metrics for OSD and Congressional review.

14. SUBJECT TERMS
Performance Measurement, Regional Maintenance, Consolidation, Strategic Planning

15. NUMBER OF PAGES
170

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFI- CATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	UL

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 39-18

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Submitted in partial fulfillment of the
Requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
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An important step in the Navy's Regional Maintenance Program is the consolidation of Pearl Harbor Naval Shipyard and the Naval Intermediate Maintenance Facility to improve maintenance operations. Final approval to continue operation as a consolidated organization is scheduled for FY 2000. To gain approval, the Navy must demonstrate to the Office of the Secretary of Defense (OSD) and the Congress that the consolidation has been successful in improving maintenance operations. This thesis evaluated five metrics proposed by the Naval Sea Systems Command (NAVSEA) and the Naval Audit Service (NAS) to measure performance of the consolidation. The process of developing a strategic plan and a performance measurement system (PMS) was explained. The "Balanced Scorecard" framework was used to present the five metrics in a comprehensive PMS. The five proposed metrics, "cost per unit of output", "quality", "production efficiency and resource utilization", "CSMP backlog", and "schedule adherence", were evaluated as useful measures of performance. Ten additional metrics were developed that provide managers further evaluation tools to measure improvements in maintenance operations. Of the ten, only "total asset turnover", the "days worked ratio", and "revenue/cost per employee", are recommended for inclusion with the original five metrics for OSD and Congressional review.

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I. INTRODUCTION

A. DISCUSSION

1. Maintenance and the National Defense

"The world remains a dangerous and highly uncertain place, and the United States likely will face a number of significant challenges to its security between now and 2015." This quote from the 1997 Quadrennial Defense Review (QDR) states very clearly the reason we must maintain a strong national defense. To keep the defense infrastructure in the state of readiness required by the world situation it must be properly maintained. Proper maintenance is vital to the operation of military hardware and systems that are increasingly complex. These systems, and the people who operate them, are the cornerstone of the defense of our country.

A key piece of the maintenance puzzle is DOD Depot maintenance. This massive system employs about 76,000 DOD civilian personnel, controls facilities and equipment valued at over $50 billion, and is charged with maintaining 52,000 combat vehicles, 514,000 wheeled vehicles, 17,300 aircraft of over 100 different models, and 347 ships [Ref. 1]. This maintenance, however, comes with a big price tag. In FY98 nearly $14 billion will be spent on depot maintenance of DOD hardware and systems. Of that the Navy will spend nearly $5.3 billion. The Ship Depot Maintenance (SDM) portion of that money amounts to $4.6 billion [Ref. 2]. The majority of these funds will be spent in the four remaining naval shipyards (NSY): Pearl Harbor, Puget Sound, Norfolk, and Portsmouth NSY.

A recent report by the General Accounting Office (GAO) concluded that: [Ref. 3]

- "The inefficient operation of depot maintenance activities results in a reduction in the military services purchasing power through its Operations and Maintenance funds."
- For FY98, Naval shipyards could expect an end-of-year Navy Working Capital Fund (NWCF) accumulated operating result (AOR) of between -$25 and -$100 million. This would continue a long-standing trend of losses in this most important of the Navy's business sectors.

Clearly the time has come for strategically re-thinking the Navy's ship depot maintenance system to improve the operating results.

It is imperative that defense managers ensure the limited funds for defense be invested as effectively as possible. In today's downsizing environment that imperative takes on even more importance. In the area of naval ship maintenance, value adding and non-value adding activities must be identified with the objective of enhancing the value received on the defense dollar. The result should be a leaner, more productive and cost-effective maintenance organization. Savings in dollars are then available to upgrade the capabilities of our fighting forces.

2. Performance Measurement

This decade has witnessed an increasing focus both in private industry and the government to improve the quality of goods and services and to increase customer satisfaction. Inherent in this has been a drive to develop organizational goals, objectives, and performance metrics by which to measure success of these efforts. Two important pieces of legislation have been enacted which seek to inculcate these ideas of quality improvement into the day-to-day operations of the federal government. They are the Chief Financial Officer's Act of 1990, and the Government Performance and Results Act of 1993.

a. Chief Financial Officer's Act

By the end of the 1980s there was a general belief that the financial management functions of the Federal Government required improvement. Topical issues included waste, fraud and abuse, and inadequate financial disclosure of federal programs. In 1990, Congress enacted the Chief Financial Officer's (CFO) Act. The purposes of the Act were to: [Ref. 4 & 5]

- Bring more effective general and financial management practices to the Federal Government.
- Provide for improvement in systems of accounting, financial management, and internal controls.
- Provide for the production of complete, reliable, timely, and consistent financial information for use by the Executive branch and Congress in the financing, management, and evaluation of Federal programs.

b. Government Performance and Results Act

In 1993, President Clinton announced a government-wide initiative headed by Vice-President Gore to reinvent government. The initiative was called the National Performance Review. In support of that effort, Congress passed and the President signed into law the Government Performance and Results Act (GPRA) of 1993. GPRA requires that federal agencies develop strategic plans for how they will deliver high quality products and services to the American people [Ref. 4]. A few of the stated purposes of the Act were to [Ref. 5]:

- Improve the confidence of the American people in the capability of the Federal Government.
- Initiate program reform by requiring managers to set goals, measure performance against those goals, and then report publicly on their results.
- Promote a new focus on results, service quality, and customer satisfaction.
- Improve internal management of the Federal Government.

GPRA requires that each agency of the Federal Government submit to Congress a strategic plan for program activities. These plans are to include a mission statement, goals and objectives, a description of how they are to be achieved, and a description of the measures to be used to evaluate program performance. Additionally, by the year 2000 each agency will be required to report on program performance for the previous fiscal year. [Ref. 5]

c. DOD and the National Performance Review

The CFO Act and GPRA highlight an intensive effort by the Federal Government to significantly improve internal financial and program management. By improving the efficiency and effectiveness of government, higher quality work could be accomplished with fewer personnel. Reducing labor also provides for reduction in infrastructure. In combination these two outcomes, reduced labor and infrastructure cost, have allowed for smaller budgets and have led to the first balanced budget in twenty-five years. This has also required the DOD to "do more with less".

To support the President's NPR, DOD listed several actions the services would take. [Ref. 6]

- Create a clear sense of mission.
- Replace regulations with incentives.
- Expose federal operations to competition.
- Search for market, not administrative solutions.
- Measure our success by customer satisfaction.

d. The Navy's Plan

The fall of the Berlin Wall, increased emphasis in stewardship of public funds, and the drive for a balanced budget have all resulted in steadily shrinking defense

budgets. From 1990 to 1998 there has been a 36.4% decrease in Navy outlays (constant FY98 dollars). This has required the Navy (as well as the other services) to dramatically reduce personnel, equipment and infrastructure. All of this has occurred while maintaining national defense, and supporting missions in the Mideast, Somalia, Bosnia, and Asia.

In support of this "rightsizing" of the Navy, the Chief of Naval Operations (CNO) established several working groups tasked with implementing CFO/GPRA. The goal was to implement the four "national metrics": cost effectiveness, overhead reduction, customer satisfaction, and infrastructure reduction within the Navy. One of the results has been the Regional Naval Maintenance Plan. The objectives as set forth by the CNO in 1994 are to: [Ref. 7]

- Emphasize process improvement while maintaining customer responsiveness and fleet readiness.
- Eliminate excess infrastructure capacity and capability.
- Better integrate supply support and maintenance requirements.
- Provide management visibility of all maintenance-related costs.
- Provide compatible ADP management across all levels of maintenance.
- Preserve the requirement for positive technical control.
- Reflect DOD and Navy "core competencies" policy.

Out of this effort, the Pearl Harbor Fleet Maintenance Pilot was initiated.

3. The Navy Maintenance Concept

The Navy employs a three tiered maintenance concept as follows:

- Organizational – Maintenance work accomplished by the individual unit.
- Intermediate – Repair work beyond the capability of the individual units accomplished by Navy (and some civilian) personnel at various shore and tender based Intermediate Maintenance Activities (IMAs).
- Depot – Major repair work and improvements accomplished at public and private shipyards.

a. Organizational Maintenance

This level covers all of the maintenance that is performed by the crew of the ship and is typified by the lowest level of technical difficulty. Both corrective and preventive maintenance is performed. A ship's ability to "fix itself" is a vital component of material readiness. A ship's crew must be able to identify and correct system/equipment problems as they occur. While at-sea emergent repairs do not happen too often, the crew must be able to rapidly correct material problems in order to stay at sea to support operational tasking. To foster the ability to carry out this tasking, ship crews attempt to fix as much broken equipment as possible. By doing this, personnel get training in many different areas of maintenance. This on-the-job training and experience improves the quality of the work they perform, and instills in them a "fix-it-yourself" attitude. Unit morale and readiness are improved. Some maintenance or repair problems are beyond the ship's capability to fix. In these instances the work is passed to the Intermediate-level.

b. Intermediate Maintenance

Intermediate Maintenance Facilities provide the next level of maintenance support. In general this maintenance is more technically demanding than the organizational maintenance. The work is completed by naval personnel assigned to the maintenance facility for a shore tour. Some I-level activities also use civilian personnel. Intermediate Maintenance is budgeted for $240.3 million for FY 1998 [Ref. 2]. However, this is misleading because it includes only the cost of the operation of the facilities and civilian personnel pay. It excludes the pay for Navy personnel who also work at the IMAs. More complete cost visibility in this area would facilitate a better understanding of where potential savings might be realized during a re-engineering effort.

c. Depot Maintenance

Depot-level work is the most technically demanding and is usually completed during CNO Scheduled Availabilities. These are generally significant long-term repairs and ship/system improvements that are beyond the capability of the other two levels. Depot maintenance activities will also perform maintenance at the organizational and intermediate level when tasked by Fleet Commanders. This is usually done to ensure a ship meets an operational schedule. Depot maintenance is performed in one of the four Naval Shipyards (NSYs) or one of the many private shipyards around the country. The workforce is composed of experienced civilian personnel.

4. The Pearl Harbor Fleet Maintenance Pilot

In Pearl Harbor there is a Naval Shipyard (PHNSY) one hundred yards across the harbor from the Naval Intermediate Maintenance Facility (NIMF). As each of the organizations is tasked with planning and executing ship maintenance, there is some amount of redundancy. If these activities can be consolidated, there exists the potential to reduce resource consumption and the fixed costs of operations. For a Working Capital Funded (WCF) organization (PHNSY), this would tend to reduce the unit cost goal and, therefore, the price customers pay for services. For a mission-funded organization (NIMF) the lower operating costs would result in lower budgetary requirements. In both cases, resources not used for ship maintenance could be shifted to support the Navy's war fighting capabilities.

The Commander in Chief, Pacific Fleet (CPF) and Commander, Naval Sea Systems Command (NAVSEA) initiated the Pearl Harbor Fleet Maintenance Pilot (FMP) program to consolidate PHNSY and the NIMF. The new organization, named "Pearl Harbor Naval

Shipyard & Intermediate Maintenance Facility" (PHNSY & IMFAC) officially "stood-up" in April 1998. The FMP is an initiative to strategically rethink the way ship maintenance is managed. A portion of the vision statement reads: [Ref. 8]

> ...Increase the quantity of ship work accomplished in the region through integration of I and D level resources in such a manner that reduces overhead infrastructure while creating increased shipboard productive capacity.

The Office of the Undersecretary of Defense (OUSD) is concerned about how the Navy will measure "increased shipboard productive capacity". Program Budget Decision 404, approved by OUSD in December 1997 and issued to the Navy, states, "...the end-state of the pilot is not defined in terms of what will be the measurements for success...". In Hawaii, the FMP Transition Team has proposed several performance metrics they believe will be useful in measuring the status of the pilot program. The question is, do these metrics measure the areas of performance which work toward achieving the Pearl Harbor NSY & IMF strategic vision?

5. The Business Community and Performance Measures

There is a large body of literature available, which looks specifically at business performance measurements. Many corporations, to strategically rethink the way they do business and measure success, are using Robert S. Kaplan's and David P. Norton's concept of the "Balanced Scorecard" [Ref. 26]. Can this same concept provide clues to improving operations and performance measurement in a Navy maintenance facility? This is the issue that is addressed in this thesis.

B. OBJECTIVES

This research examines the issues surrounding the consolidation of the Naval Shipyard and the Intermediate Maintenance Facility in Pearl Harbor. In particular, performance metrics which have been proposed as part of the Congressionally required test plan are evaluated. Additionally, the maintenance processes of the consolidated organization are evaluated for other metrics that are useful in measuring the performance output of the organization.

The primary research goal is to determine what performance metrics can be used to measure the success of the consolidation of Depot and Intermediate Ship Maintenance in Pearl Harbor.

C. SCOPE

The purpose of this thesis was to provide an outside evaluation of the performance metrics proposed by NAVSEA and the Naval Audit Service (NAS). This was accomplished by:

- Evaluating the performance metrics established by NAVSEA and the NAS.
- Examining the financial and operations data from PHNSY and NIMF looking for possible alternative performance measures.
- Estimating expected performance improvements resulting from the consolidation.
- Utilizing data from the PHNSY and NIMF financial statements and the expected performance improvements to estimate potential savings from consolidation.

D. METHODOLOGY

The methodology used in this thesis research consisted of the following steps:

- Conducting a literature review in the area of budgeting within the Federal Government and the Department of Defense. The review targeted the Ship Depot Maintenance and Intermediate Maintenance issues.
- Conducting a literature review of current initiatives to institute strategic planning and performance measures in the private sector.
- Performing an analysis of the costs, production performance, and infrastructure of PHNSY and NIMF. This included a detailed examination of the following:
  - Trail Balance Reports (NC 2199)
  - Expense Element Reports (NC 2171)
  - Status of Funds Authorized Reports (NC 2025)
  - Financial and Operating Statements
  - CPF's Regional Maintenance Initiatives
  - Pertinent manning documents
  - NAVSEA guidance regarding the operation of Naval Shipyards
- Analyzing productivity metrics developed by CPF, NAVSEA, PHNSY, and NIMF to evaluate maintenance performance.
- Conducting a search for private shipyard data in order to build a composite "industry" financial picture against which PHNSY could be compared.

E. ORGANIZATION

The thesis is organized as follows:

- Chapter I is the Introduction.
- Chapter II provides an overview of Naval Ship Maintenance Program.
- Chapter III examines the history and background of the Pearl Harbor Fleet Maintenance Pilot and presents the performance metrics proposed by NAVSEA and the NAS.
- Chapter IV introduces the concept of strategic planning and performance measurement systems and describes the "Balanced Scorecard."
- Chapter V discusses measures of performance as they can apply to the consolidated organization, PHNSY & IMFAC.
- Chapter VI discusses findings, conclusions and recommendations for further research.

II. THE NAVY MAINTENANCE SYSTEM

A. BACKGROUND

OPNAVINST 4700.7J (Maintenance Policy for Naval Ships), states the Chief of Naval Operation's (CNO) guiding policy for the maintenance of naval ships:

> Ships shall be maintained in a safe material condition, adequate to allow accomplishment of assigned missions.

The program designated to accomplish this policy is the Naval Ship Maintenance Program (NSMP). The NSMP is designed to keep naval ships in the highest possible state of readiness. (Another program, the Fleet Modernization Program (FMP) is designed to maintain ship configuration as system changes are authorized. The FMP will be addressed as required; however, it is not the focus of the thesis.)

1. The Naval Ship Maintenance Program (NSMP)

Before any discussion of the NSMP can begin, we must define maintenance. Ship maintenance can be divided into two major categories, preventive and corrective. Preventive maintenance is that work which seeks to ensure the continued proper operation of equipment and systems. Inspections, greasing, changing oil and filters, calibration, and component replacement are performed on properly operating equipment in an effort to prevent their untimely failure. This maintenance is controlled by the Planned Maintenance System (PMS). Preventive maintenance is scheduled and performed on equipment/systems at periodicities ranging from four hours to one or more years. If the maintenance is not performed at the required periodicity, it is considered "deferred". Some preventive maintenance is very easy, some very difficult. The Maintenance and Material Management (3M) program developed the PMS in an effort to keep

equipment/systems operating within engineering specifications for as long as possible. This reduces the likelihood and occurrence of failures. The other type of maintenance, corrective, is work performed on equipment that has failed or is not operating at design capacity/efficiency.

a. Documentation

To function properly the NSMP and 3M program require a documentation system to keep track of maintenance. The Maintenance Data System (MDS) is the central database of maintenance information. The ship's maintenance personnel enter information into the database via OPNAV Form 2K/CK. Many reports can be generated from MDS. The most important of these is the Consolidated Ship's Maintenance Project (CSMP). The CSMP is the central collection point for all information regarding the maintenance history of a ship. It is maintained by the ship and contains all corrective, deferred corrective, deferred preventive maintenance, and alteration actions. After a maintenance item is entered onto a 2K/CK, it is up-line reported to the MDS. The MDS central database is reviewed frequently by higher authorities. One of these, NAVSEA, keeps track of equipment/system problems and trends. As the Navy's engineering authority it is tasked with providing guidance, alterations, and improvements to all ships in the Navy to keep their equipment/systems operating properly. It is, therefore, imperative that the CSMP be correct and current. [Ref. 9]

Form 2Ks are generated on the ship by the work center responsible for the particular equipment/system involved. On this form the workers describe the problem and provide technical and supply information about the equipment/system. Two important items to record are priority (PRI) and type availability (T/A).

- ***Priority***

PRI codes describe the importance of the maintenance. The codes are: [Ref. 9]

Code	Description
1	Mandatory
2	Essential
3	Highly Desirable
4	Desirable

This code is the ship's first cut of the importance of the job. This job prioritization is reported to the ship's Immediate Superior in Command (ISIC) and the local maintenance activity and plays an integral part in planning maintenance. This code is subject to approval from the ISIC and the maintenance activity. Since the highest effort is put into the PRI 2 jobs (PRI 1 is rarely assigned), they are scrutinized very closely.

- ***Type availability***

Type availability (T/A) codes describe who is best capable of performing the maintenance. The codes are: [Ref. 9]

Code	Description
1	Depot maintenance
2	Intermediate maintenance
3	Other technical assistance
4	Ship's force

This code determines which organization actually performs the work. As the ship's work package flows from the ship to the ISIC to the maintenance activity, each organization

gets a "cut" on the acceptability of this code. The ship may think that a particular job is within its capability (T/A 4). However the ISIC may feel, based on previous experience with other ships, that the work should be performed by an intermediate maintenance activity (T/A 2). This code can be very useful in breaking down the CSMP into component sections based on which organization is tasked with which repair. This will be important later.

2. NSMP Structure

To support the NSMP, the Navy employs a three level maintenance echelon. Each of these is discussed below.

B. ORGANIZATIONAL MAINTENANCE

Personnel assigned to the ship normally perform this level of maintenance. O-level maintenance usually consists of preventive maintenance and simple corrective maintenance. The majority of the jobs listed in the CSMP are worked at the organizational level. The organizational level allows for the training of Navy personnel in many different types of maintenance techniques. This on-the-job training and experience improves the quality of the work they perform and instills in them a "fix-it-yourself" attitude. Unit morale and readiness are improved. Work beyond the unit's ability to fix is passed to the Intermediate-level.

Typical O-level maintenance actions include: [Ref. 10]

- Facilities maintenance, such as cleaning and preservation.
- Routine systems and component preventive maintenance, such as inspections, systems operability tests and diagnostics, lubrication, calibration, and cleaning.

- Corrective maintenance, such as hull, mechanical, electrical, and electronic troubleshooting down to the lowest replaceable unit level, miniature and microminiature (2M) electronic repair, and minor repairs to components to restore operation.
- Assistance to higher-level maintenance activities.
- Verification and quality assurance of maintenance accomplished by other activities.
- Documentation of all deferred and completed maintenance actions, whether accomplished by ship's force of by other activities.

Each ship is equipped with an automated system called the Shipboard Non-tactical Automation Program (SNAP). This system is the central point for descriptions of maintenance problems and tracking of supply parts ordered to fix the problems. Newer versions of the system also include all of the ship's technical drawings and manuals. A worker can log into the system and research the drawings/manuals for sources of the problem or for troubleshooting guides. He then calls up a "Form 2-Kilo" (2K), describes the problem, and orders the parts necessary to fix the problem. Additionally, he can write a work package to fix and retest the problem. The database of all of the 2Ks generated is CSMP. The CSMP is the ship's formal listing of all known material issues. The ship distributes the CSMP to its ISIC and to the local IMA.

C. INTERMEDIATE MAINTENANCE

Intermediate Maintenance Activities (IMAs) are chartered with providing intermediate-level maintenance and related support work to assigned ships. They also provide maintenance training to the assigned Navy personnel. As with the Organizational-level, this training improves worker level of knowledge and unit readiness. Additionally,

the IMA provides an adequate sea/shore rotation to support the professional and personal growth of the individual. This improves quality of life and retention.

I-level maintenance includes: [Ref. 10]

- Preventive maintenance.
- Corrective maintenance.
- Tests and inspections.
- Provision of services such as electrical power, water, gas and air replenishment, and tool issue.
- Installation of alterations.
- Work on electronic 2M printed circuit boards, components, modules, subassemblies, and other equipment coded for I-level repair.
- Calibration and repair services for electrical and electronic test and monitoring equipment; pressure; vacuum, and temperature measuring devices; and mechanical measuring instruments.
- Technical assistance to ship's force in diagnosing system or equipment problems and assistance in repairs, as necessary.
- Assistance in the emergency repair and manufacture of unavailable replacement parts or assemblies.

IMAs are located at many sites around the country and overseas. They come in two basic varieties, ship based and shore based. Afloat IMAs are on tenders and repair ships. Their mobility provides Fleet Commanders with a rapidly deployable repair facility that can repair battle damaged ships closer to the action. The Navy currently has four submarine tenders, four destroyer tenders, and two repair ships. The typical afloat IMA has approximately 1200 personnel assigned, of which about 700 are assigned to the Repair Department. The second type, Ashore IMAs come in several varieties. These are Shore Intermediate Maintenance Activities (SIMA), Intermediate Maintenance Facilities (IMF), Trident Refit Facilities (TRF), and Naval Submarine Support Facilities (NSSF).

1. IMA Structure

Intermediate maintenance activities utilize the typical Navy hierarchy of CO/XO, departments, divisions, and work centers. Figure 2.1 below is a graphical representation of the typical shore-based IMA structure.

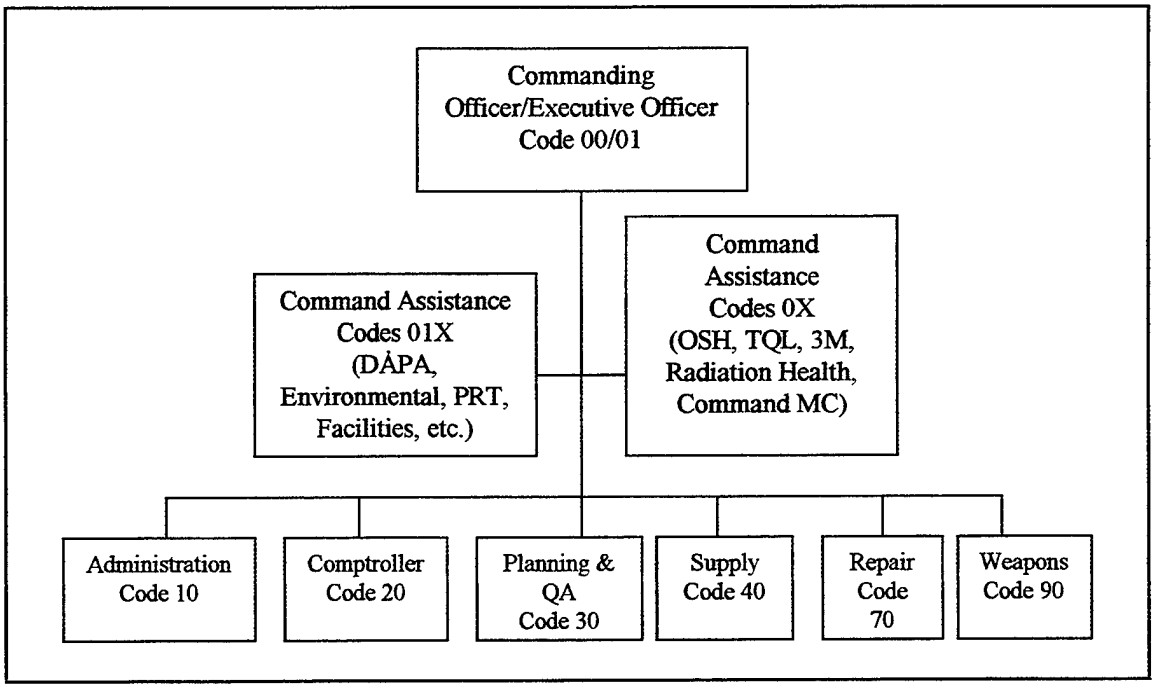

Figure 2.1. The typical IMA organizational chart.

2. The Process

Ships undergo maintenance availabilities three to four times a year. The availabilities last from three to five weeks depending upon the type of ship. There are three distinct phases to the upkeep cycle. Phase One is the ship's early identification of material issues. This consists of ship's personnel conducting rigorous material inspections, performing planned preventive maintenance, and closely observing the ship's day-to-day operations. From this, a detailed listing of actual and potential problems is generated and the upkeep is planned. As discussed above, problems are entered into SNAP and a 2K for

each material issue is generated. The 2K is assigned a unique number called a Job Control Number (JCN). Each 2K is reviewed through the ship's chain of command and ultimately agreed to by the Commanding Officer. SNAP computer data tapes are made every few days (while in port) and given to the ISIC, where they are "screened" for validity. In this step, the ISIC reviews the 2K the ship has coded for Intermediate or Depot accomplishment (T/A 2 or 1 respectively) to determine if the work required to fix the problem is really beyond the ship's capability. If he concurs, the 2K is accepted, and the work is assigned to the local IMA for the next upkeep (if T/A 2), or deferred until the next depot availability (if T/A 1). If the ISIC disagrees with the ship's assessment of the degree of difficulty of the work, he returns the 2K to ship with his justification. (As a side note, 2Ks are not often returned to the ship for this reason).

Thirty-five days prior to the start of the availability, the ISIC formally delivers the work package to the IMA. Five days later, the ISIC, IMA and ship hold a Work Definition Conference (WDC). At the WDC, all parties discuss the ship's CSMP (the 2K database) and agree which jobs will be worked and by whom. Once agreement is reached (this is usually a short meeting), Phase Two of the process begins. At the IMA the 2Ks are read by central processing and assigned a Lead Shop. The Lead Shop reviews the 2Ks for content and completeness. Depending on the nature of the problem, the Lead Shop may go to the ship for a 'ship check'. 'Ship checks' are the standard method IMAs use to ensure that the problem described in the 2K is the actual problem the ship is trying to fix. If the 2K matches the problem, the Lead Shop sends it to the Planning Department. Planning researches technical drawings and manuals, orders repair parts, and writes the work package. The Lead Shop holds the work package until the start of the upkeep.

From the WDC to the beginning of the upkeep, the ship continues to submit 2Ks as new problems arise.

Phase Three begins with the start of the upkeep. Three days after the start of the upkeep an Arrival Conference (AC) is held. This is a formal meeting attended by the ship's Commanding Officer, the ISIC Commander, the IMA Commanding Officer, and the ship's and IMA's top management. Each job (2K) to be worked by the IMA is discussed. The big jobs are discussed in more detail. Important pieces of information are status of the work package, status of repair parts, and status of the plant conditions required to start repairs.

During the upkeep, many meetings are held to track work progress. Daily Production and Night Work meetings are held by the IMA's Repair Officer (RO) (an Engineering Duty Officer Commander). The ISIC Material Officer (Lieutenant Commander), the ship's Engineer (Lieutenant Commander), the Ship Superintendent (IMA liaison to the ship - a senior, experienced enlisted person), and the Lead Shop supervisors attend these meetings. Every week the IMA Commanding Officer holds the Management meeting with the ship's Commanding Officer and the ISIC Commander. At this meeting, the RO briefs the status of all IMA work. The intent of this very important, high profile, face-to-face meeting is to provide upper management with a formal feedback mechanism that lets them keep track of the status of the upkeep. Informally, the ship's Engineer and the IMA's Ship Superintendent brief the ship's Commanding Officer daily. On the IMA side, the RO briefs the IMA Commanding Officer daily. These meetings should keep the number of surprises to a minimum.

Two days prior to the end of the upkeep, the IMA Commanding Officer holds his final meeting. The flow of the upkeep is discussed, as well as lessons learned. A very important part of the meeting is the discussion of which work was not started. This deferred work is formally assigned to the next upkeep. Phase One begins again when the ship gets underway for post upkeep sea trials.

The success of an upkeep depends on the close working relationship between the ship and the IMA. Numerous sensors are in place in the form of the many meetings that detail the progress of the upkeep. Some of these same meetings afford the opportunity for both formal and informal feedback to the process. The Lead Shops also track upkeep progress. They use production charts, scheduling programs, and computer printouts to keep the status of their jobs. Figure 2.2 presents a simplified flowchart of the IMA process.

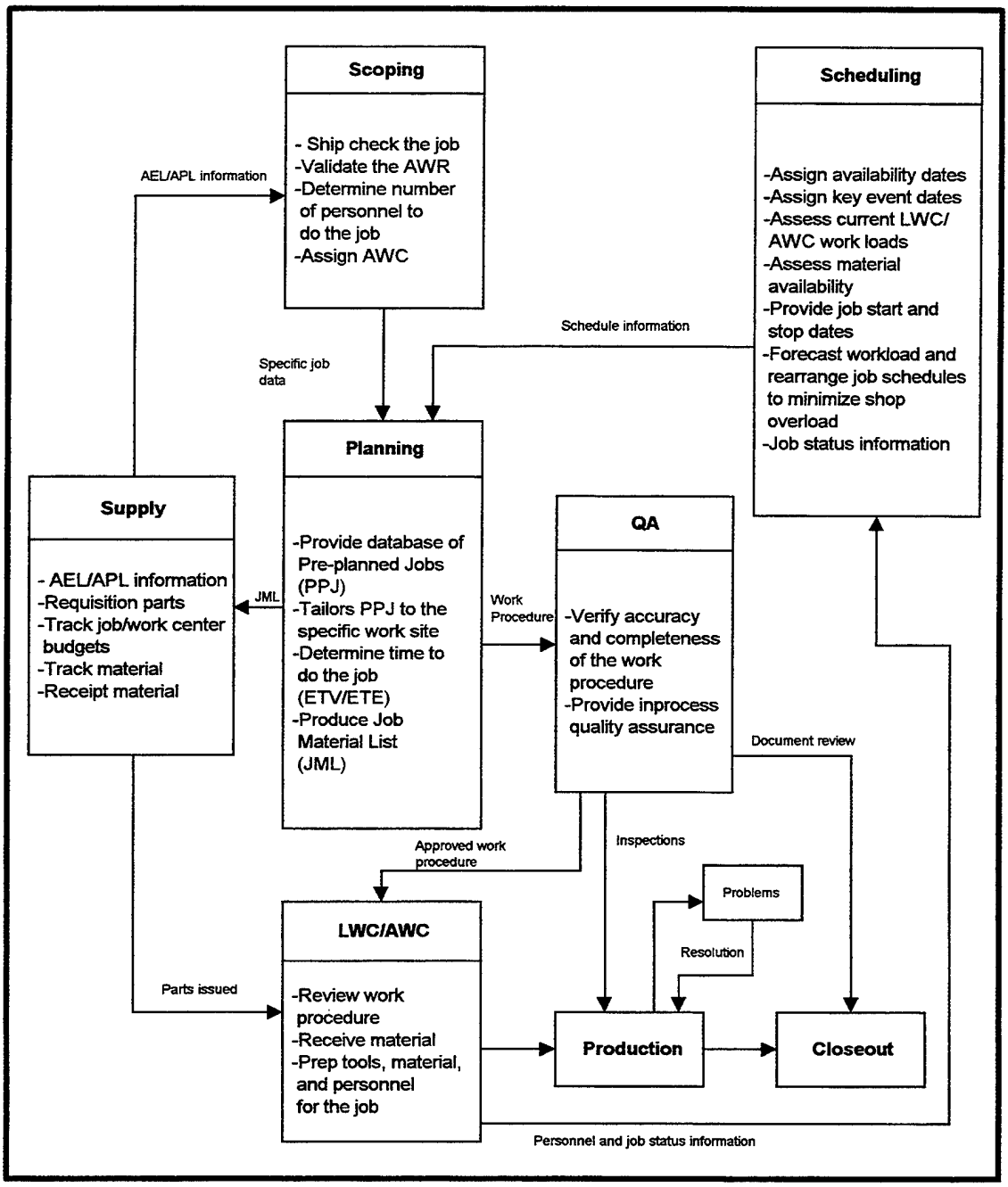

Figure 2.2. A simplified flowchart of the IMA process.

Upkeep is difficult for both the ship and the IMA. Many thousands of man-hours and as much as several hundred thousand dollars are spent to get a ship out on time in good material condition. Both organizations are filled with "good people working hard"

to get the job done safely and correctly. Each ship undergoes this process three or four times a year. The Navy currently has 347 ships [Ref. 11]. That is a lot of time and energy being spent on the management and execution of ship maintenance.

3. Financial Management

All I-level maintenance is mission-funded. This means that the funds are appropriated annually as part of the Operations and Maintenance - Navy (OMN) budget line. The funding is provided by Fleet Commanders through the Type Commanders (TYCOMs). Funding is for material, facilities, and some civilian salaries. For FY 1998, I-level maintenance is budgeted for $240.3 million [Ref. 2]. This number, however, is misleading as it includes only the cost of the operation of the facilities and civilian personnel pay. It excludes Navy personnel who also work at the I-level facilities but are funded from the Military Personnel budget line.

This system utilizes the Standard Accounting and Reporting System - Fleet Level (STARS-FL) system for reporting. The two most frequently used reports are the Trial Balance Report (NavCompt form 2199) and the Expense Element Report (NavCompt form 2171). Examples of the NIMF's NavCompt forms 2199 and 2171 can be found in Appendix A.

A quick glance at these two reports does not tell the reader very much. The reports are not user friendly. The accounts are not very well laid out and their names do not lend themselves to immediate understanding. Those who use the reports on a daily basis understand the way the material is presented. To be fair to the two reports, they are designed to keep the comptroller informed of the status of his/her budget. A mission-funded organization must not overspend its budget. To that end, the NavCompt forms

2199 and 2171 are very useful. However, other personnel, including Commanding Officers of mission-funded activities, who are charged with overall fiduciary responsibility, are not able to easily understand them. One of the goals of the CFO Act of 1990 is to make such reports more useful to a wider audience. There are new versions of these reports, which look more like the traditional balance sheets and income statements, but they have not yet been approved for general use. Anything which can be done to improve the way in which these important reports tell the financial story of mission-funded activities will be greatly appreciated by those who do not use these reports on a daily basis.

Mission-funded activities are not supposed to go "over budget". By tracking obligation rates, the activity can determine its expenditure pattern versus its budget. It can then tighten the belt if it looks as though it will run out of money prior to the end of the year. It can ask for more money via a supplemental request. This is an arduous process for the activity. The supplemental request provides a complete description of the events leading up to the need for more money. In some cases it may be due to emergent expenditures that were required as a part of the activity's mission. In other cases it may be due to poor budget estimates. In either event, the activity must ask its boss for more money. If it does not get the funds, activities cease until the issue is resolved.

4. Maintenance Reporting Management System

The Maintenance Reporting Management System (MRMS) is a software application package in use at both ashore and afloat IMAs. It supports a variety of maintenance-related functions for work brokers and repair activities. MRMS is designed to meet the following objectives: [Ref. 12]

- Schedule jobs that are within a repair activity's capability and capacity.
- Procure the correct materials to do the job.
- Complete the job within the required time frame.
- Complete the highest priority jobs first.
- Ensure the jobs are properly documented.

MRMS is a Management Information System (MIS) which inputs the ship's CSMP then tracks each entry through the chain of events leading to completion of the job. This chain starts with the work broker, the ISIC. Jobs beyond the ship's capability or capacity are "screened" to a regional repair activity. Most work is sent to the I-level. The IMA accesses the ship's file in MRMS, accepts (or rejects) each job, and then submits them throughout the activity in the form of an Automated Work Request (AWR). At each stage of the process data is entered into the AWR. In this way management can track the progress of each job. MRMS tracks material which was ordered for the job and the time spent working on the job. Each shop has a "time keeper" who is responsible for entering his/her shop's expended time into the AWR. This data is used not only to track progress but also to track performance statistics of each shop and the total activity. To explain this we must first look at some definitions. [Ref. 12]

a. Definitions

- Repair Labor. All personnel who are permanently or temporarily assigned to IMA standard productive work centers and accomplish work directly identifiable to JCNs.
- Productive Labor. That labor directly spent in the repair, manufacture, or maintenance of any equipment or component. Only personnel routinely spending 51% or more of their time doing this type of work are considered productive.
- Productive Support Labor. Labor spent in the supervision of productive labor personnel or in support of productive effort. Again the 51% rule applies.

- Gross Productive Support Man-hours. Calculated by multiplying the number of Productive Support Labor personnel by eight hours (the tended day).
- Total Man-hours Assigned. Calculated by multiplying the total number of personnel assigned (sum of Productive Labor and Productive Support Labor) by eight hours. The lunch hour is not part of the eight hours.
- Gross Productive Man-hours (Gross PAM) is calculated by subtracting Gross Productive Support Man-hours from Total Man-hours Assigned.
- Earned Man-hours. The number of *planned* man-hours to complete a job.
- Expended Man-hours. The *actual* number of man-hours a job took to complete. This includes Lost Time.
- Lost Time Man-hours. Time lost due to unplanned job delays. This includes such things as job scope changes, wrong material, accessibility to the job site, etc.
- Man-hours Unassigned to JCNs. Man-hours available for work but not assigned due to a lack of JCNs. Workers physically present but not working.
- Man-hour Deductions. Man-hours not available due to schools or training, medical or dental appointments, administrative or legal appointments, military duties, special liberty, etc. This is further subdivided into Production and Production Support categories.
- Net Productive Available Man-hours (Net PAM). Gross PAM minus Man-hour Deductions. There is also a Support component called Net Support Available Man-hours.
- Unaccounted Time. The difference between Net PAM and the sum of Earned Man-hours, Lost Time Man-hours, and Man-hours Unassigned to JCNs.

These terms are in daily use throughout the IMA. They are used to track progress and measure performance. In addition to the man-hour numbers, a series of ratios using the numbers have been developed as Measures of Effectiveness (MOEs). The MOEs are tracked by the IMA, at Fleet Headquarters, and at NAVSEA. Appendix B shows NIMF's "numbers" for FY 1997. The MOEs are divided into four areas. These are performance, utilization, productivity, and process management. The performance and utilization MOEs for NIMF in FY 1997 are:

- Performance is calculated by dividing Earned m/hrs by Net Productive Man-hours. The ratio measures the planned maintenance m/hrs by the net number of production personnel m/hrs available to do the work. For FY 1997 NIMF's performance ratio was .913. This means that each net available m/hr resulted in .913 m/hrs of planned work.
- Utilization is calculated by dividing Net PAM by Gross PAM. The ratio is a measure of the amount of m/hrs available for productive work after the "deduction time" is taken. For FY 1997 the ratio was .681. This means that NIMF lost 31.9% (1-.681) of their net available m/hrs to deductions (see above for definition). As we will see in Chapter V, there is Navy guidance that states that the deduction percentage should be about 16.6%. In FY 1997, NIMF was nearly double that percentage.

D. DEPOT MAINTENANCE

Depot-level work is generally limited to significant long term repairs, and ship/system improvements that are beyond the capability of the other two levels. This maintenance is performed in CNO Scheduled Availabilities. Depot maintenance activities also perform Intermediate-level maintenance when tasked by Fleet Commanders to support ship schedules. Experienced, civilian personnel perform depot-level maintenance in one of the four NSYs or one of the many private shipyards around the country.

To minimize conflicts in the work that is performed in the NSYs and to aid the maintenance planning process, OPNAVINST 4700.7J [Ref. 10] prescribes the following priorities (listed in descending order):

- Work associated with the Trident program.
- Voyage repairs.
- Work on ships being prepared for deployment.
- CNO-scheduled depot maintenance availabilities.
- Restricted Availability/Technical Availability (RAV/TAV)
- Other U.S. Navy ship availabilities, except for inactivation or disposal.
- Refurbishment of repairables.

- Work on other U.S. Government ships.
- Inactivation or disposal availabilities.
- Work on foreign ships.

1. Types of CNO Scheduled Availabilities

Depot maintenance is performed in many types of availabilities. The list includes: [Ref. 33]

- Overhaul
- Depot Modernization Period (DMP)
- Selected Restricted Availability (SRA)
- Phased Maintenance Availability (PMA)
- RAV/TAV
- Voyage Repair (VR) Availability
- Fitting-Out Availability (FOA)
- Post Shakedown Availability (PSA)
- Inactivation Availability
- Activation Availability

2. Locations

NSYs are located in Pearl Harbor, Hawaii, Puget Sound (Bremerton), Washington, Norfolk, Virginia, and Portsmouth, New Hampshire. In addition to the NSYs, naval depot maintenance is carried out in many private shipyards throughout the country. The six largest ones are Newport News Shipbuilding, Ingalls Shipbuilding, Bath Iron Works, Electric Boat, National Steel and Shipbuilding Company, and Avondale Industries. NSYs perform only ship repair and improvement work. Private shipyards perform this work as well as all new construction work.

3. Structure

NSYs report to their respective Fleet Commanders. A second link is to NAVSEA, which provides the governing guidance concerning NSY operations and management. Figure 2.3 shows the organization chart of a typical NSY.

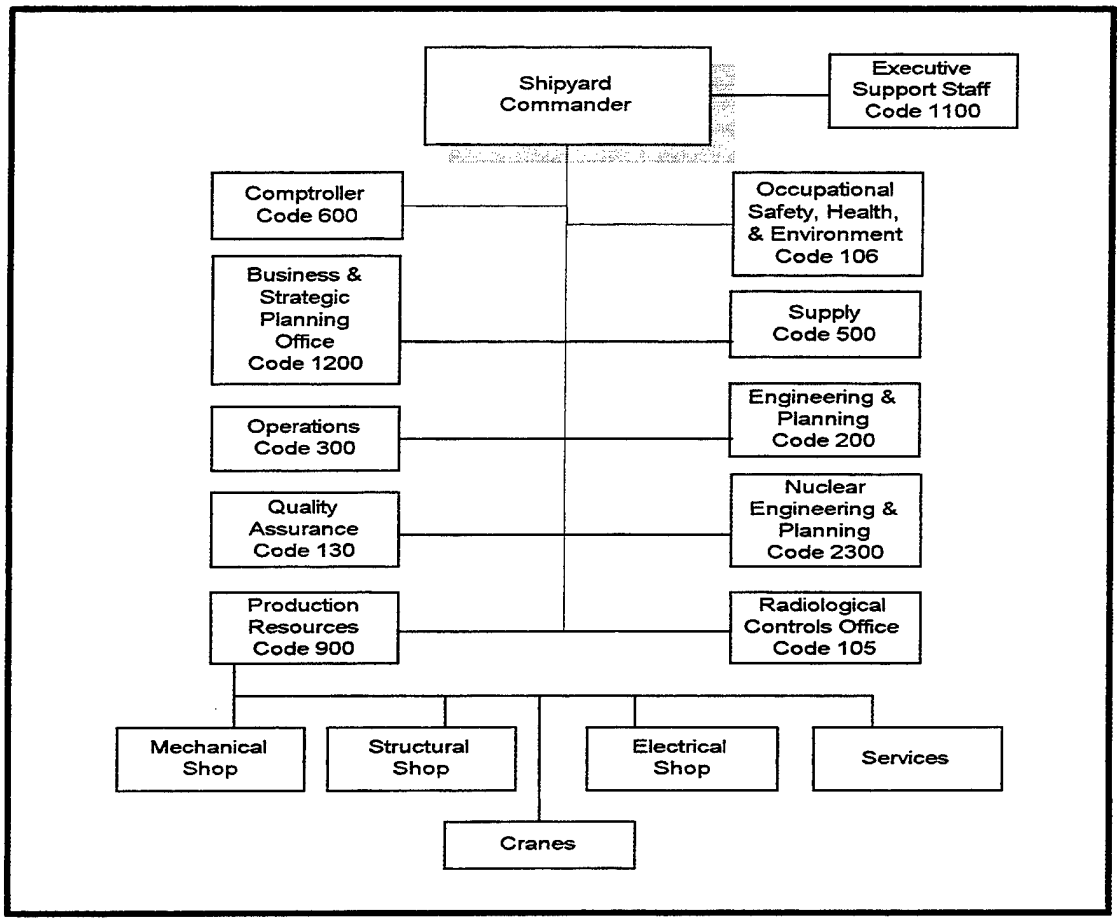

Figure 2.3. The typical Naval Shipyard organizational structure.

4. The Process

The process of assigning work to a depot maintenance facility is much the same as in the I-level case. Some differences occur in the way jobs are input to the cycle. The CSMP itself does not go to the NSY. It is routed through the ship's ISIC, TYCOM, the

Fleet and then into the Baseline Advanced Industrial Management (BAIM). Rather than JCNs, NSYs deal in Job Order Numbers (JONs). Depot availabilities are very large in scope and they mainly work at the system level instead of the component level. Normally, several JCNs are rolled into one JON. JONs are grouped into categories based on the system they involve. While IMAs work with JCNs tied directly to the CSMP, NSYs work with JONs tied to the work package.

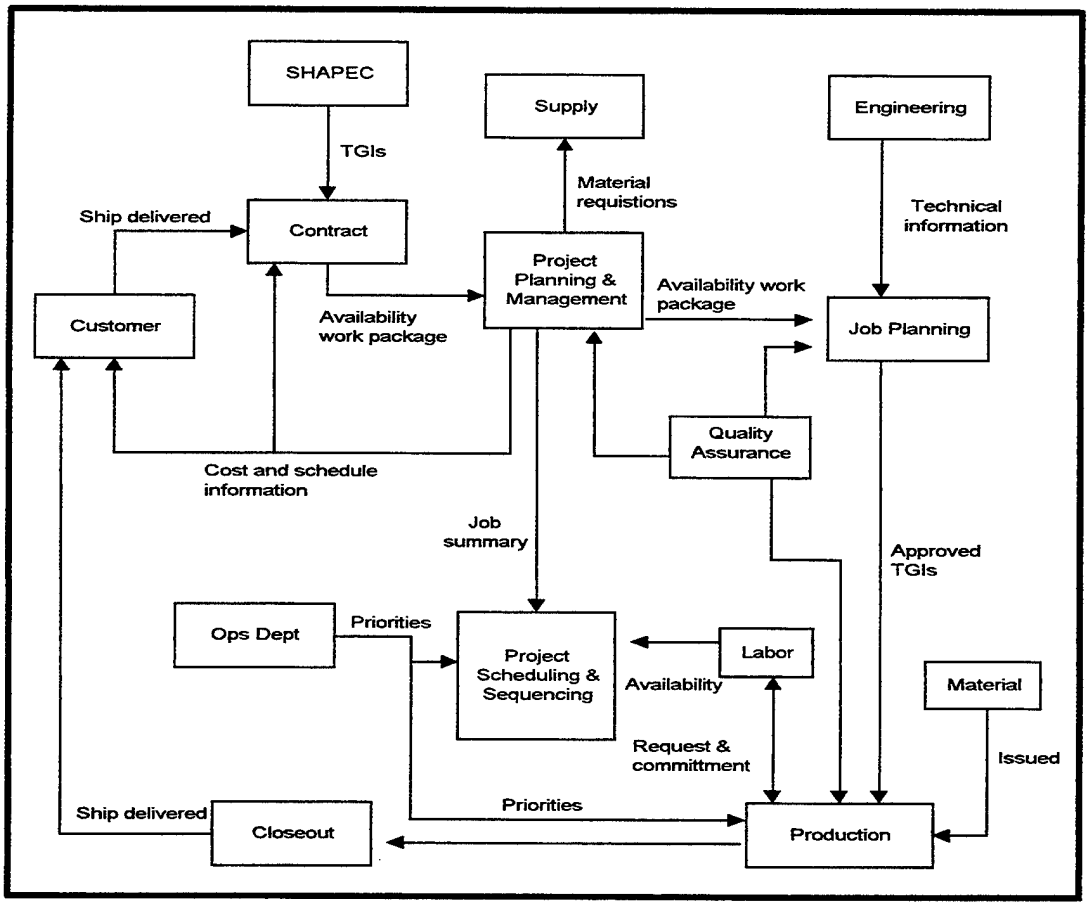

Figure 2.4. A simplified view of the Depot process. [Refs. 13 & 33]

The internal process of a NSY is similar to an IMA, only on a grander scale. Figure 2.4 provides a simplified view of the depot process. The scope of work performed

by NSYs is bigger than that accomplished at the I-level. As a result, planning for work and procurement of materials usually has a longer lead-time. NSYs use a process called Project Management. In this process, one individual is assigned the responsibility of overseeing the planning and execution of each "project" (ship) assigned to the NSY.

5. Financial Management

NSYs are funded from the depot maintenance Navy Working Capital Fund.

a. Background

The Defense Business Operations Fund (DBOF) was established in 1991 for the purpose of transforming selected defense operations into more business-like management processes. It was felt that, by increasing cost visibility at all levels of management, goods and services could be offered at lower costs. This would occur because management would remove or reduce non-value added processes and thereby improve efficiency and effectiveness. Quality of goods and services provided to customers would also improve. The result would be satisfied customers and lower levels of resource consumption. The areas selected for inclusion in the DBOF were depot maintenance, transportation, supply management, and finance and accounting. [Ref. 31]

In FY96, the fund was divided into four separate funds: one each for the Navy, Army, Air Force, and DOD components. The new funds were renamed Working Capital Funds (WCF). This reorganization was directed by the Under Secretary of Defense (Comptroller) (USD(C)) to give each service total responsibility over its own business operations. [Ref. 31]

The idea of the WCFs is that a particular business area's revenue covers all costs of operation. This is accomplished by setting unit costs for goods and services (the

price the customer pays) at a rate such that costs incurred per unit equal revenue received per unit. This should result in a net operating result (NOR) of zero. [Ref. 31]

The WCF system allows an activity to borrow against the future. This means that, if execution will go over budget, the negative NOR is carried into the next year. The year-to-year accumulation of NOR is called the Accumulated Operating Result (AOR). WCF rules state that AOR must be passed on to the customer. If AOR is positive, the customer's rates are reduced. If AOR is negative, the customer's rate is increased through the use of a "surcharge" which is added to the following year's unit cost. [Ref. 3]

In order to provide price stability for the customer throughout the fiscal year, the unit cost for any particular good/service is set during the previous fiscal year. This facilitates customer budgetary planning but requires the business operation to estimate many future transactions. A few of the significant estimates include the number of units to be sold, labor costs, material costs, and facilities costs. Several Catch-22 issues arise with this system. The primary one is that the customer may be unable to say precisely how many units are needed until the unit cost is known. The unit cost cannot be known until it is known how many units the customer wants. The result is that the unit cost charged may not recover all of the costs of operation. [Ref. 31]

The key to the effective operation of DOD WCFs is cash. The WCF operates in a very similar fashion to a household checkbook. Revenue from customers is an increase in cash balance, and disbursement (wages/salaries, material, etc.) is a decrease in cash balance. Since 1993, the funds have operated with a cash shortage. In that year business operations began advance billing their customers to cover cash shortages. This

helped with the cash flow problem, but did not improve the process of setting prices to cover costs. The FY 1996 reorganization of the fund into four separate, service-controlled funds did improve the process, as each component is now accountable and responsible for its balance, and cash shortages have steadily decreased. However, the GAO estimated that at the end of FY97 the AOR of all of the funds combined would be a loss of about $1.7 billion. Additionally, they estimated the end-of-year AOR for NSYs to be a loss of between $25 and $100 million. Since the idea of WCFs is to break even over time, past losses must be recovered. To accomplish this, future unit costs must increase. [Ref. 3]

b. Budget

The Navy's depot maintenance budget for FY 1997 was $3,282.9 million. This included $3,051.2 million from OMN and $231.7 million from the Shipbuilding and Conversion, Navy (SCN) budget. The SCN portion funded aircraft carrier refueling complex overhauls at Newport News Shipbuilding. Included in the OMN portion was $348.1 million of Congressionally directed Navy WCF surcharges. The surcharges were levied to "pay off" the negative cash balance from previous year's operations. PHNSY's portion of the Navy's depot maintenance budget for FY 1997 was $353.6 million. Removing the surcharge from the OMN portion of the budget shows that PHNSY received about 13.1% of the Navy's depot maintenance budget. [Ref. 2]

c. Cost visibility

The accounting systems associated with the WCF provide a very detailed examination of NSY cost structures. The Navy Industrial Fund Reporting System (NIFRS) is the system into which all cost, production, and budget information is entered

for the NSYs. From this are generated the Financial and Operating (F&O) Statements for the NSYs. NIFRS also enables the Assistant Secretary of the Navy for Financial Management and Comptroller (ASN (FM&C)) to monitor budget execution throughout the fiscal year. Cost visibility is enhanced due to the nature of the reports in the F&O Statement. Balance sheets, income statements, and statements of cash flows are produced and look remarkably like those found in the private sector. Appendix C contains portions of the 1997 PHNSY F&O Statement. All costs are accounted for and are, where possible, assigned to a particular project. Even military personnel costs are included. This system contrasts markedly from I-level accounting. For example, IMA material costs are allocated to the job but labor costs are not. An IMA will know how much it cost to operate for the year; however, it will not be able to produce total costs figures for a particular upkeep. The NSY can provide that level of visibility. [Ref. 34]

6. Management Information Systems

NSYs use a variety of systems to provide detailed personnel and material cost information, job planning and scheduling information, material ordering and tracking information, and resource management information. These Automated Information Systems (AIS) contain two components.

a. Baseline Advanced Industrial Management (BAIM)

BAIM is both a concept and a system. As a concept it "follows a systems engineering approach to re-engineer the planning and management process for the industrial operations of naval shipyards." [Ref. 22] The concept is designed to improve performance by: [Ref. 22]

- Providing simplified, complete work procedures to the workers.

- Improving data management and integration.
- Providing work planning, estimating, and scheduling functions.
- Reshaping and downsizing the organizational structure to take advantage of improved processes.

As a system, BAIM consists of four main modules. These are:

- SUPDESK is the time and attendance module that tracks employees through the use of direct and overhead JONs.
- PMC is the performance, monitoring, and control module that provides detailed information regarding each project's (ship) jobs, budget, and schedule. Within the PMC module are two mini-modules, PCWLF and RSC. PCWLF is a workload forecasting application that takes progress information from PMC and schedule information from the Shipyard Management Information System (SYMIS) and projects upcoming manday requirements. RSC is a resource loading application that takes personnel input from PMC and workload forecast information from PCWLF and allocates resources to projects/jobs to obtain the most efficient mix.
- PSS is the project scheduling and sequencing application which integrates job costing information from SYMIS with planning information from BAIM to schedule job accomplishment.
- MR is the material requirement application which orders and tracks all material requested via work documents.

An important portion of BAIM is the work package application. All work packages and documents are generated within BAIM. These documents are called Task Group Instructions (TGIs). To understand how TGIs work, we will first look at how the NSY work package is organized. Each ship is broken down into systems. The systems are further subdivided into component units. Each component unit has several work items which can be accomplished. An example would be as follows: 688-class submarine (project), engineering (department), air systems (system), high pressure air compressors (component), repair (work item). The component could have several work items, such as

clean and inspect, repair, replace, overhaul, or combinations of these. Each work item is covered by a TGI. Since much of the work performed on a ship is of a repetitive nature, TGIs can and should be reused as much as possible to minimize "reinventing the wheel." There is a central database of the commonly used TGIs. It is located at the Ship Availability Planning and Engineering Center (SHAPEC) in Portsmouth NSY. All four NSYs access SHAPEC to receive the TGIs necessary to plan work on ships in their respective yards. [Ref. 8, 13, & 14]

b. Ship Yard Management Information System (SYMIS)

SYMIS is a consolidated grouping of software applications that form the heart of the NSY's AIS. It is the shell that contains the applications that track the budget, cost accounting information, personnel information, and material. SYMIS is made up of: [Ref. 14]

- SABRS tracks budget execution and overhead cost accounting data.
- PC creates a variety of reports in user specified formats.
- COST is the overall financial tracking application.
- MAT is the material ordering and tracking application. During the job planning phase material is identified as being required and it is automatically ordered by MAT.
- PAYROLL contains the personnel database as well as the pay schedules.

Many performance measures are employed in NSYs. As will be described in Chapter V, many of the measures required by NAVSEA are variance measures [Ref. 21]. These include budget to actual variances for the areas of cost and schedule. PMC and COST are two key modules that provide much of the reported variance information.

E. SUMMARY

The process of maintaining ships is complex and resource consuming. Outside of the individual ship, two systems are in place to provide expert technical support in maintaining Navy ships. IMAs and NSYs are staffed with personnel and equipment that enable them to perform any type of repair that may be required on a ship. In addition, there are numerous indicators in place to help management evaluate the financial and operational performance of their organizations. In an era of downward budgetary pressures, the senior leadership at both IMAs and NSYs are required to "do more with less." This means more maintenance per dollar. This requires that work processes and MIS are carefully examined to ensure that each step in the development and execution of a ship's maintenance package is carried out with the ultimate goal in mind. That goal is to return a well-maintained warship to the Fleet Commander on time and within budget. Steps in the process that do not add value to the ultimate goal must be removed. This will increase productivity and reduce cost. This concept will be expanded in Chapter IV.

III. THE PEARL HARBOR FLEET MAINTENANCE PILOT

A. IMPROVE EFFECTIVENESS AND EFFICIENCY AND SAVE MONEY

The CFO Act and GPRA combined with across-the-board cuts in the defense budget forced the DOD and the Navy to recognize the need to "re-structure" many programs in an effort to improve the efficient and effective use of funds. In 1994, the CNO released the results of the Maintenance Support Quality Management Board's (QMB) plan to reshape Navy maintenance for the 21st century. The QMB developed a Regional Maintenance Plan (RMP) that features a single maintenance management process. The objectives of the RMP are: [Ref. 7]

- Emphasize process improvement while maintaining customer responsiveness and fleet readiness.
- Eliminate excess infrastructure capacity and capability.
- Better integrate supply support and maintenance requirements.
- Provide management visibility of all maintenance-related costs.
- Provide compatible ADP management across all levels of maintenance.
- Preserve the requirement for positive technical control.
- Reflect DOD and Navy Core Competencies Policy.

The CNO planned the maintenance restructuring in three phases.

- Phase One - Optimize I-level interoperability by minimizing redundant capacity and capability. The integration in Pearl Harbor in 1996 of the Submarine Base IMA (SUBASE IMA) and the Pearl Harbor Shore IMA (PH SIMA) into the NIMF accomplished phase one.
- Phase Two - Integrate I and D level activities. This phase is in progress with the consolidation of PHNSY and NIMF.
- Phase Three - Perform fleet maintenance with a single maintenance process supported by common business and production practices. This phase will be implemented during fiscal years 1997-1999.

To quote the CNO: [Ref. 7]

> The Regional naval maintenance approach provides an excellent opportunity to preserve force levels through restructured maintenance support for our future naval forces without sacrificing responsiveness. Many of the concepts are significantly different from those currently in practice; support and innovation will be required from all in the chain of command...

1. Hawaii Regional Maintenance

Due the close proximity of the many maintenance sites in Hawaii, Pearl Harbor was a logical choice to start the process of regionalization. Although other naval regions also began the process, none were as geographically fortunate as Hawaii. PHNSY, SUBASE IMA, and PH SIMA are all located within two miles of one another.

a. I level consolidation

In August 1995, the PH SIMA and the SUBASE IMA officially consolidated into one organization. The new organization was called the Naval Intermediate Maintenance Facility (NIMF). It was the first command in the Navy to combine both submarine and surface ship maintenance into one organization. About two thirds of the personnel and nearly 250 pieces of industrial plant equipment were moved from various locations to a new building to house the NIMF. Additionally, the two MRMS data management computer systems were merged. Since the new building was originally designed to house only SUBASE personnel, many of the previous buildings were kept open to support production work. As a result of the consolidation, a work force reduction was also accomplished. In this a very unique action was taken. Six hundred and ninety-eight military personnel were replaced with 504 experienced civilian technicians. Most of these civilian workers came from PHNSY after their previous

Reduction-In-Force (RIF) actions. By bringing in these civilian workers, sailors were able to return to sea to fill critical billets. Additionally, and more importantly, the action dramatically increased the maintenance experience of the average worker at the NIMF. [Ref. 16]

The NIMF now supports all of the ships stationed in Pearl Harbor (about 35), as well as visiting US and foreign Navy ships.

b. I&D level consolidation

In April of 1997, COMNAVSEASYSCOM (NAVSEA) issued a memorandum outlining the specific plan to consolidate PHNSY and the NIMF. In May of 1997, CPF established the Pearl Harbor Regional Maintenance Pilot Executive Steering Committee (ESC). This committee was made up of representatives of PHNSY, NIMF, Commander Submarine Forces Pacific Fleet (CSP), CPF, and Commander Naval Surface Group Mid-Pacific (MIDPAC). They were tasked with managing the consolidation of the two organizations. Their goal was to formally stand-up "PHNSY & IMFAC" in April 1998.

B. I&D LEVEL CONSOLIDATION

1. Tasking (CPF/NAVSEA)

Following the May 1997 formation of the ESC a series of meetings were held to discuss the feasibility of consolidating Hawaii's fleet maintenance activities. CPF began work on a pilot study report detailing the concept of operations (CONOPS) of the integrated organization. The CONOPS final report was completed in August 1997. It provides the framework for much of the information presented in this chapter. In

November 1997 a Memorandum-of-Agreement (MOA) was signed by CPF and NAVSEA providing the details of how the consolidation was to be accomplished.

a. Working groups

In addition to the CONOPS, eight working groups were formed to work out the details of the consolidation. The groups were headed by senior military or civilian personnel and were comprised of functional area experts from PHNSY, NIMF, CPF, CSP, and MIDPAC. The functional areas included:

- Resources
- Budget/Comptroller
- Engineering and Planning
- Personnel and Administration
- Facilities/Safety/Health/Environmental
- Supply/Transportation
- Weapons
- Customer-Interface

b. Timeline

The timeline established by the CONOPS was very ambitious. Table 3.1 below lists the major milestones and the dates.

Key Event	Completed
CNO tasking to regionalize maintenance	March 1994
I level consolidated	May 1996
I&D level consolidation tasked by CPF/NAVSEA	April 1997
CPF/NAVSEA Memorandum of Understanding regarding the consolidation	September 1997
Integrated Local Area Network operational	September 1997

Integrated personnel administration organization established	October 1997
Trade skills/Job qualification cross-index completed	October 1997
Integrated resource allocation program in place and tested	November 1997
Non-nuclear supply functions outsourced to the Fleet Industrial Supply Center, Pearl Harbor (FISC)	November 1997
Integrated planning and estimating process established	December 1997
Integrated Quality Assurance program established	December 1997
Integrated comptroller established	December 1997
Integrated Business Department established	January 1998
PHNSY & IMFAC stood-up	April 1998

Table 3.1. PHNSY & IMFACAC consolidation milestones. [Ref. 8]

C. IMPLEMENTATION

1. Organization Chart

Figure 3.1 shows the organization chart for the consolidated PHNSY & IMFAC. The shaded items indicate new codes/functions developed as a result of the consolidation.

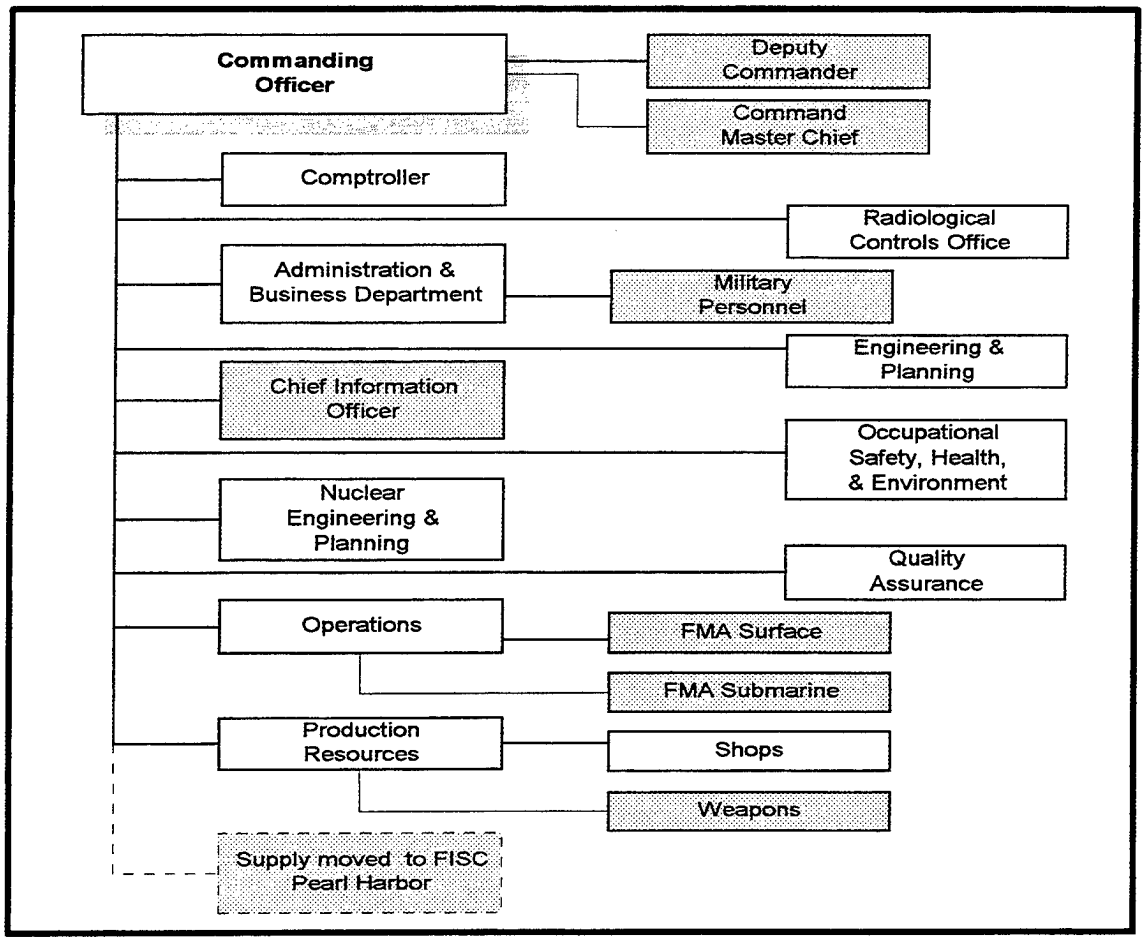

Figure 3.1. PHNSY & IMFACAC organization chart. [Ref. 8]

There are three notes regarding the new organization chart. The CPF/NAVSEA MOU stated that the organization of PHNSY & IMFACAC would be along "normal" NSY lines as spelled out in the NSY Standard Organization and Regulations Manual. This required a lot of work to cross-reference the NSY codes/shops with the NIMF codes/shops.

The second note regards the formation of two new groups within the Operations Department. These are the Fleet Maintenance Activity (FMA) - Submarines and the FMA - Surface. The FMAs are almost a throwback to the old days when SUBASE IMA and

PH SIMA were separate entities serving the two different communities. It is expected that expertise in a particular area of maintenance, combined with the ability to quickly bring in more help as workload demands, and with the single infrastructure of PHNSY & IMFAC, will improve production efficiencies in non-CNO scheduled availabilities. While this appears to contradict consolidation, the improved customer service aspects of "working with people we know," coupled with the infrastructure reduction efficiencies, should improve production performance in these areas.

Finally, PHNSY and the Fleet Industrial Supply Center (FISC) Pearl Harbor signed a memorandum of agreement to consolidate the supply function into the existing structure of the FISC. This was done to reduce inventory held by the shipyard and to send the supply function to an organization where that function is a core competency. PHNSY is not a supply center. FISC is a supply center. In addition to the transfer of material, there will be a transfer of personnel as well. FISC will operate what amounts to a small supply detachment within the shipyard to handle the supply function.

2. Infrastructure

The infrastructure consolidation is not yet complete. Current planning is to turn over 16 buildings to Naval Station Pearl Harbor. Additionally, the Controlled Industrial Area (CIA), the security area encompassing the shipyard, will be reduced in size. This will provide more pier space for the Naval Station and provide greater ship access for ship crews without the need for special identification badges. [Ref. 8 & 18]

3. Personnel

In September 1997 a Congressional Conference Committee report regarding the consolidation stated, "...the conferees direct that the Navy shall not make any changes to

the workforce in terms of total numbers of employees..." This edict is required to be followed until such time as Congress approves permanent changes to the SDM process. This will not happen before fiscal year 2000. With this in mind, the PHNSY & IMFAC consolidation will proceed with no RIFs. In the period prior to the CPF/NAVSEA MOA regarding the consolidation (dated November 26, 1997), PHNSY had a total of 2846 civilian and military personnel on the payroll. The NIMF had a total of 1564 personnel. Most of the NIMF personnel are military (956 or 61.1%). The NIMF "onboard" personnel numbers are larger than the "authorized" numbers due to the I-level consolidation that occurred in 1996. Rather than cut billets and short-cycle sailors from shore duty back to sea duty, a decision was made to let the military manning levels reduce themselves via normal rotation attrition. For FY 1998, the NIMF's Authorized Manning Document (AMD) lists a military authorization of 710 personnel.

As of April 30, 1998, PHNSY & IMFAC had a total of 4061 personnel. The break down of personnel is:

- 728 military (17.9%)
- 1005 civilian General Schedule (GS) (24.8%)
- 2328 civilian Wage Grade Supervisor (WS) and Workers (WN, WL, WG, WD, and WT) (57.3%)

The difference in personnel counts between 1997 and 1998 (349 people) is due to normal civilian attrition and unfilled planned rotations of military personnel. Additionally, there is a difference between last year and today in the mix of workers and supervisors. As part of the consolidation, production shop makeup was changed. This involved reducing the numbers of supervisors by reassigning many of them to "production worker"

positions. There was a considerable effort by management to keep personnel in the same job title, series, and grade, and in most case that occurred. However, some reassignments were made. One of the stated goals of the consolidation was to improve productivity without increasing cost. One of the ways that will be accomplished is by increasing the number of production workers relative to the number of supervisors. In this way management hopes to improve productivity (more workers) while maintaining the same cost structure. Of course there are many human resource issues to deal with regarding the "downgrading" of personal stature that occurs when a supervisor becomes a worker. First, the union had to approve the plan. This was no easy task. Second is the issue of motivating the reassigned workers. The conversion plan keeps the converted personnel in the same job description, same pay, and same seniority. They do, however, go from being "white hats" (supervisors) to workers. How each individual will handle the loss of stature associated with the conversion remains to be seen. While increasing the number of workers may improve productivity, making them unhappy (because of reassignment) may lead to a decrease in productivity. Only the passage of time will reveal the true result.

4. Work process

At the beginning of the transition process, senior managers from CPF, NAVSEA, CSP, MIDPAC, PHNSY, and NIMF met to develop a work process transition strategy. They reviewed the ship availability process (a combined I and D level look) and identified nine major processes which will comprise an availability in the consolidated organization. These include Work Package Development, Work Acceptance, Work Induction, ADP Systems, Planning, Work Packaging, Execution Management, QA Processes, and Work Certification. It is clear that the basic process for CNO Scheduled availabilities will

remain essentially the same. Portions of the I-level process will change due to the introduction of the Miscellaneous Industrial Management System (MIMS). However, that basic process will also remain largely the same.

Where some differences and difficulties may occur is in the area of the "pace of work." Planning for a regular overhaul (D-level) begins about eighteen months prior to the availability. An overhaul can last for up to two years. It is a slow, steady process. IMA upkeep on the other hand, is fast-paced and hectic. As described in Chapter II, planning for the 200-300 jobs (this does not include the ship force work) that are routinely completed in an upkeep starts about thirty days prior to the upkeep. Thirty-five days later the ship goes to sea. It will be interesting to see how well each group adapts to the other's pace of work.

With the introduction of MIMS, the I-level component will receive access to the Ship Availability Planning and Engineering Center (SHAPEC) and its database of TGIs. While similar to MRMS' Pre-Planned Job (PPJ) database, SHAPEC's is much more extensive. With access to this larger database of work documents, the time required to plan an I-level job should decrease.

One of the major differences between the two work processes (I and D level) is in the area of Quality Assurance (QA). The NIMF operates the QA program in accordance with the guidance issued in the Joint Fleet Maintenance Manual (JFMM). Depot level maintenance activities use the guidance issued in Task Group Instructions (TGIs). In both cases the desired result is the same: to ensure the right parts are properly assembled within the equipment/system and to ensure the equipment/system is properly tested. Where the two differ is in the requirements for documentation and in-process control. The end state

goal is to have common, standardized processes and paperwork. To that end, a new QA manual, the Quality Program (QP) manual was developed. The new QP manual invokes all higher authority source documents and instructions required in the performance of maintenance on surface ships and submarines. It is approved for local use in Hawaii as part of the pilot program. Additionally, the SHAPEC database of TGIs has included the QP manual standard forms in their products. [Ref. 8]

5. Financial Management

One of the crucial questions regarding the consolidation was the funding issue. NIMF is mission funded and PHNSY is working capital funded. An early concern was how the two systems would work together in the consolidated organization. With a mandate to consolidate maintenance functions, differences in the two financial systems, with two major budget claimants, would impede progress. In order for consolidation to work as planned, workers and material must be able to be moved around the organization to various jobs without regard as to how the financial system would account for it.

a. Mission funding versus WCF

It was soon realized that a financial arrangement using both funding systems would not work. One system would have to be chosen. CPF wanted to use mission funding. That would allow CPF to directly fund management and base support costs, as well as all ship maintenance work. PHNSY & IMFAC would continue to provide depot services on a reimbursable basis when the funding source was other than CPF. OSD, however, was concerned that the reduced cost visibility of mission funding would not lend itself to an extensive maintenance organization such as a shipyard. [Ref. 8, 17, & 19]

b. CPF buyout

The question was answered in December 1997 when the OUSD (C) signed Program Budget Decision (PBD) 404 approving the use of mission funding for the consolidated organization. PHNSY & IMFAC would be direct-funded through CPF using the appropriation accounting system known as Standard Reporting and Accounting System - Fleet Level (STARS-FL). Under mission funding, PHNSY & IMFAC would receive an operating budget funding the entire fiscal year without identification of the specific work to be accomplished. [Ref. 19]

6. Management Information Services

The consolidation will require the merger of two very different information systems. The NIMF uses MRMS P-6 for managing maintenance information and STARS-FL for accounting. PHNSY uses a variety of systems that provide detailed personnel and material cost information, job planning and scheduling information, material ordering and tracking information, and resource management information. One of the keys to the success of the consolidation will be how well these different systems communicate with one another. PHNSY's Automated Information System (AIS) is composed of two components, BAIM and SYMIS. A third component, the Miscellaneous Industrial Management System (MIMS) has been added to merge MRMS P-6 and PHNSY's AIS. MIMS is the "junior" version of BAIM. It has some but not all of the features of BAIM. It is used to track JOs, to perform job planning, and to order material via its own version of MR. In the consolidated organization BAIM will be utilized for all CNO scheduled availabilities planned for greater than 10,000 mandays, and MIMS will be used for I-level

availabilities and CNO scheduled availabilities planned to take less that 10,000 mandays. [Ref. 8]

The two key links for the consolidation are to integrate the MRMS P-6 system of the NIMF into MIMS, and to allow SYMIS to feed cost information into STARS-FL. PBD 404 directs that depot level maintenance maintain the same cost visibility it had while it was in the NWCF. To do this, full SYMIS capability must be maintained. However, since the consolidated organization will be mission funded and all financial reporting will be via STARS-FL, a link between SYMIS and STARS-FL is needed to prevent the need for duplicate financial data entry. That link, called the "green box", has been developed and is in testing. Figure 3.2 is a simplified diagram of the proposed integration of the I and D level MIS. [Ref. 8 & 14]

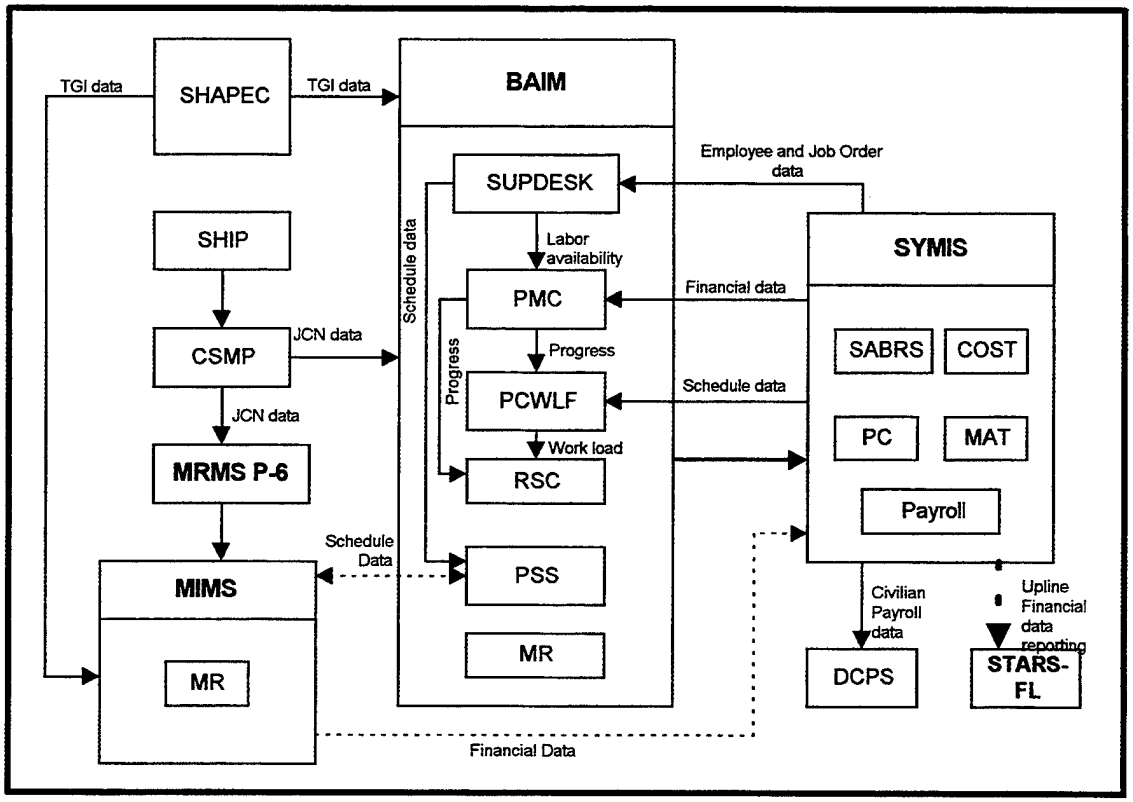

Figure 3.2. The integrated PHNSY & IMFAC MIS. [Ref. 8 & 14]

7. Observations

The consolidation of PHNSY and NIMF is one of the more ambitious maintenance consolidations yet taken in the DOD. The consolidation involves over 4000 people in two different organizations with a total budget of nearly $420 million. In FY 1997, the two separate organizations worked a total of over 640,000 mandays on over forty ships.

There are many roadblocks ahead for the consolidation. Some of these, systems integration, personnel integration, work process integration, and financial integration, have been briefly discussed. Other roadblocks, unseen at this time, lay ahead for the managers and workers at PHNSY & IMFAC. If PHNSY & IMFAC is to continue life as a consolidated maintenance facility beyond FY 1999, the Navy must convince the Congress that the effort has been successful. In order to do that, PHNSY & IMFAC will require a set of metrics that measure how well they have performed the maintenance mission. The metrics they have chosen to do this are the focus of the next section.

D. THE PEARL HARBOR TEST PLAN PERFORMANCE MEASURES

In PBD 404, the OUSD (C) expressed concern about two issues regarding the PHNSY and the NIMF consolidation. They were, the financial cost base line, and how success would be measured. In April 1998, the Naval Audit Service (NAS) completed work on the financial cost baseline for FY 1997. The results of this baseline assessment will be compared to baseline metrics in FY 1999 and subsequent years. This will be done to evaluate whether any savings have been realized from the consolidation. It must be remembered, however, that saving money was not the primary reason for the consolidation. The focus of the CPF/NAVSEA effort is to get more maintenance

performed per dollar. They will do this by improving process/infrastructure efficiencies such that the material condition of CPF ships improves at a faster rate than the money spent.

The second issue gets to the heart of this thesis. How will the success of the consolidation be measured? How will we know if it worked? Can the idea be applied to other activities? To answer these questions, the Pilot Transition Team (PTT) Metrics Subgroup highlighted several areas that could be used as performance measures. They proposed five categories for metrics: The first four of the categories are CNO national metric areas. The fifth is a miscellaneous category. The five categories are,

- Cost effectiveness.
- Overhead reduction.
- Customer satisfaction.
- Infrastructure reduction.
- Miscellaneous measures to track.

These proposed areas were provided to NAVSEA and the NAS for review. In April 1998, NAVSEA issued the completed Financial Cost Baseline and the Pearl Harbor Pilot Test Plan. The test plan describes five "assessment metrics." They are:

- Cost per unit output.
- Production efficiency and resource utilization.
- Material readiness.
- Customer satisfaction.
- Quality.

Each of the metrics will be described and, where possible, calculations performed to show their values. PHNSY financial data from 1996 and 1997 will be used to make the

calculations. Two years were chosen to highlight trends and to show the variances between years. Additionally, 1997 end-of-year CSMP data was used to evaluate the material readiness metric.

1. Cost per unit output

The metric chosen was "cost per unit output ensuring total cost visibility." This will be calculated by dividing the total activity costs (minus certain items) by the production shop direct man-hours delivered. The items that will be excluded from the total activity costs are included in the top third of Table 3.2 [Ref. 35].

	1996	1997
Costs of goods/services	375,161,478	298,088,687
- NWCF surcharges	0	0
- Dir Reimb Mat	29,357,309	29,255,327
- Dir Reimb Contract	34,589,056	31,341,480
- Depreciation	12,188,393	10,546,275
- MILCON Exp	0	0
- Centrally managed	0	0
= A. Total costs	299,026,720	226,945,605
Productive manhours	1,774,342	1,532,484
Other Productive manhours	834,490	782,655
B. Total production manhours	2,608,832	2,315,139
Total cost per Prod manhr (=A/B)	$114.62	$98.03
x 8 hrs/day	x 8 hrs/day	x 8 hrs/day
= Total cost per Prod manday	**$916.97**	**$784.21**
C. Total labor hrs charged	6,913,385	5,279,300
Productive manhours	1,774,342	1,532,484
Other productive manhours	834,490	782,655
D. Total production manhours	2,608,832	2,315,139
Production efficiency ratio (=C/D)	**2.65**	**2.28**

Table 3.2. Cost per unit and production efficiency ratios. [Ref. 29 & 35]

Table 3.2 shows the results of the cost per unit calculations for FY 1996 ($916.97/manday) and FY 1997 ($784.21/manday) for PHNSY (the NIMF numbers have not been included). In calculating a unit cost there are many issues which must be discussed and understood. The numbers presented above were calculated using one method. There are many other methods that could have been used. In determining the financial cost baseline for FY 1997, the NAS will calculate its own rate using slightly different cost and labor components than were used here. In any event, the metric will still indicate the total cost per unit of production. Since the intent of the consolidation is to improve both the maintenance process as well as worker productivity, the total cost per unit should decrease.

2. Production efficiency and resource utilization

Central to determining the efficacy of the consolidation is a determination of whether there has been an increase in productivity. Productivity is the ratio of outputs to inputs. Unfortunately, shipyards do not provide a stable output that can be measured with precision. Shipyards do not make widgets on an assembly line. They repair ships and each ship is different. If the process does not result in a stable output product, how can productivity be measured?

The metric developed to measure this is production efficiency and resource utilization. It will be calculated by dividing the total activity "labor man-hours charged" (direct and indirect) by the total production shop "direct man-hours delivered." Table 3.2 shows the calculations for FY 1996 (2.65) and FY 1997 (2.28) for PHNSY (the NIMF numbers have not been included). As some supervisors are transitioned to production positions, the total number of indirect man-hours should decrease. However, that

decrease should be offset by an increase in direct man-hours. The numerator should then remain nearly constant. The denominator, as mentioned, will increase since production shop direct man-hours will increase. The net result of efforts to increase shipyard productivity will decrease the value of this metric.

3. Material Readiness

The metric chosen was "CSMP backlog". As previously discussed, the CSMP is the database of the material problems of a ship. Under ideal conditions one can say that the fewer the number of CSMP entries (i.e., equipment/system problems), the better the material condition of the ship. This leads directly to increased readiness and, therefore, improved war-fighting capability. Commanding Officers, TYCOMs, and Fleet Commanders routinely gauge the condition of their ships based on the quantity and quality of content in their CSMPs. From the ship's point of view (the customer), reducing the number of CSMP entries is the only purpose of IMAs and depot maintenance facilities. To meet the goal of keeping the CSMP as small as possible, ship crews are continually performing maintenance. Whether in a depot or intermediate availability, voyage repair period, or simply a ship's force upkeep, corrective and preventive maintenance is always being performed.

Backlogs occur for a number of reasons. Most commonly, there are more material problems on the ship than there are maintenance activities to fix them. Backlog is inevitable. Ships undergo three to five week I-level availabilities three to four times a year. They undergo SRAs (depot maintenance) about every one and a half to three years (depending upon the ship class). Regular overhauls occur at the eight to ten year points. Even with all of this maintenance time, ships continue to find and report material

problems. Material problems screened to depot maintenance periods will probably be listed in the CSMP for anywhere from one to three years. That creates backlog. Additionally, even *during* I-level or ship's force upkeep periods, crews find and report material problems to be corrected at the *next* maintenance period.

The Metrics Subgroup proposes to count the gross number of CSMP entries as reported by each ship. This will be done monthly. One of the goals of the consolidation is to "level load" the workload. This means that, when the CNO Scheduled Availability workload is greater than depot capacity, I-level technicians can fill the gaps. Conversely, when depot capacity is greater than Intermediate scheduled work, depot technicians can work at the I-level reducing the CSMP backlog. One measure of the success of the consolidation would be a reduction in the number of backlogged CSMP entries.

As of December 31, 1997, Pearl Harbor based surface ships had an average backlog of 530 jobs per ship, while the submarines had an average backlog of 390 jobs per ship. [Ref. 20]

4. Customer Satisfaction

This metric category is focused on the customer's perspective. From the ship's point of view, it wants a maintenance activity (I or D level) to provide work that is (1) of high quality and (2) on schedule. As one moves up the chain of command a third element is added: (3) low cost. NAVSEA states that these elements, quality, schedule, and cost are the "cornerstone" of its business policy. The customer satisfaction metric should, therefore, seek to address at least one of the customer's wants.

This metric area will be composed of a schedule adherence measure. The measure will track how early or late a ship is coming out of an I or D level availability. This is not a new metric. Both PHNSY and NIMF track this metric.

5. Quality

The quality metric will be measured by customer surveys. To quote the Pilot Test Plan [Ref. 35]:

> Naval shipyards have a proven record of quality output in both nuclear and non-nuclear work. This is the result of stringent technical control, extensive technical documentation for all work, work process requirements and exhaustive equipment testing. The most comprehensive measure of overall quality is product reliability and operability, which is best gauged by the customer through formal customer feedback.

6. Observations

The consolidation makes sense only if it improves the material condition and therefore the war-fighting capability of the fleet while maintaining or reducing the price tag. One question may be; how can we measure the capacity of the organization to perform more maintenance? Or, more importantly, will the capacity added through consolidation actually result in more maintenance performed? This question forces us to look not only at the internal "busy-ness" measures but also at metrics that measure outputs and outcomes. The "busy-ness" areas are important. The public demands that resources are used efficiently and input/inter-activity metrics can be useful in measuring this. However, they must be used in concert with metrics that measure the result we really want: more maintenance output per dollar spent. The old adage, "you get what you measure," is as true at a NSY as it is anywhere else.

Reviewing the proposed metrics reveals that they can be segregated into two categories: customer satisfaction measures and "surrogate" productivity measures. As mentioned earlier, productivity is the ratio of outputs to inputs. Since the output of a NSY is difficult to define and measure, so to will be the productivity metrics. The productivity metrics proposed then, are surrogates for true productivity measures. Additionally, material readiness is really a customer satisfaction measure. If the ship is not ready for war due to a material problem the entire chain of command is not happy (satisfied). In the customer satisfaction category belong CSMP backlog, schedule adherence and quality. In the (surrogate) productivity category belong cost per unit and production efficiency and resource utilization. The five proposed metrics are excellent performance measures. That said, there are two concerns:

- In order for the CSMP backlog to be a useful measure, both the ship and its ISIC must work vigorously to ensure the CSMP is as accurate as possible.
- In order for the quality metric to be useful, a system must be in place to actually "do" something with the surveys. The customer must believe that the comments will be acted upon and not just acknowledged and filed away.

The next chapter will examine various other measures within a framework that is used in some very successful private businesses.

IV. PERFORMANCE MEASURES AND THE BALANCED SCORECARD

A. WHY MEASURE PERFORMANCE?

We measure performance for a variety of reasons. The most important of these should be to determine if the organization's goals and objectives are being met. This requires that the organization have a set of goals and objectives. Business literature is replete with case studies and information regarding the importance of developing and implementing strategic plans to guide the organization. These ideas are finding their way into the public sector as well. The GPRA requires that federal agencies submit, by FY 1999, strategic plans that answer these basic questions: What is our mission? What are our goals and how will we achieve them? How can we measure our performance? How will we use that information to make improvements? [Ref. 23] The strategic plan is at the heart of what the organization is all about. Once the plan is in place, a performance measurement system (PMS) [Ref. 24] is developed to track adherence to the plan. The typical PMS seeks to answer three questions:

- Are we implementing our strategic plan?
- Are we meeting our goals and objectives?
- Are we improving?

To help federal managers through the process of developing and implementing a strategic management plan, the GAO has provided guidance containing key steps and critical practices that can be used to formulate a strategic plan. Figure 4.1 briefly describes the process espoused by the GAO. The three steps are; define the mission, measure performance, and use the performance information.

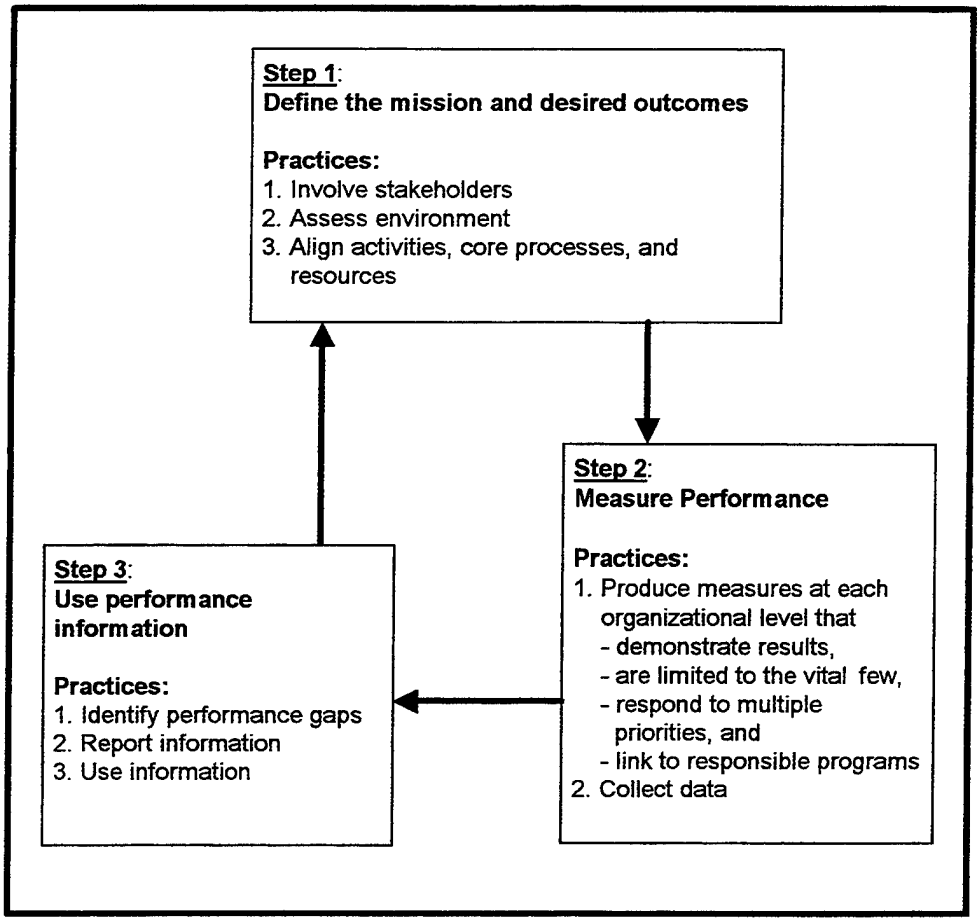

Figure 4.1. GPRA Key Steps and Critical Practices [Ref. 23]

B. DEFINING THE MISSION AND DESIRED OUTCOMES

The strategic plan is at the heart of the PMS. The PMS tracks adherence to the strategic plan. With no strategic plan there is little value in a PMS. The strategic plan involves not only the organization's mission statement but also its goals. It describes what the organization does, why it is in business, and who the customer is. It should also contain a road map for implementing the plan. The strategic plan is not a static document kept on the CEO's shelf, but rather a dynamic action plan which is continually reviewed and updated as conditions, both internal and external, warrant.

The process of developing a strategic plan, if done correctly, is not easy. A key factor in the strategic plan is input from stakeholders. Stakeholders are people, either internal or external to the organization, who have an interest in what the organization does. In the public sector this can potentially involve groups as diverse as the Congress, the Executive, various federal agencies as well as many "regular" citizens. Indeed, the public sector organization in particular has a very difficult task ahead in the formulation of agency direction in light of the many inputs that can be brought to the floor. Nevertheless, all organizations need a well-formulated statement of mission, or purpose, and a clear plan to achieve that purpose. The strategic plan fulfills that need.

In addition to the organization's purpose, the strategic plan must provide goals that define the desired outcomes. These goals should be achievable and measurable. Most importantly, they must support the mission of the organization and directly impact the output product or service. The question is, do the stated goals take into account what the customer (stakeholder) really wants? If the organization's goals and ideas of output are not in congruence with the stakeholders' ideas, the door is open for one or the other of the parties to be sorely disappointed by the outcome.

The next step requires that a framework, or road map, be presented to explain how the organization will achieve the goals of the strategic plan. This road map does not provide the exact course to be laid out, but instead provides guidance regarding how the organization intends to satisfy the goals and objectives.

C. MEASURING PERFORMANCE

The process of developing a strategic plan is difficult and time consuming. The most difficult part of the process may well be that of determining what performance metrics best capture the essence of the goals and desired outcomes. The old adage in management literature is "you get what you measure, so you had better measure what you want". Too often outcome A is desired, but managers and employees are rewarded for outcome B. Not surprisingly, outcome B is the result. Additionally, for many federal agencies, the output of the process is not clear. For example, what is the DOD's output? What metrics can be used to measure the performance of the DOD? Or the U.S. Forest Service, or Health, Education, and Welfare? Achieving common agreement on the goals of these agencies will be difficult enough; never mind the process of developing performance measures. GPRA requires that agencies provide for maximum stakeholder involvement in the development of their strategic plans. In the political environment that public agencies operate this is a very tall order indeed. Further, GPRA states that the Congress will be the final arbiter of agency disagreements regarding missions, goals, and outcomes. Again, in the public arena achieving "goal congruence" among the many stakeholders (i.e., the public) involved will be a long and arduous process. However, this must be done.

1. Definitions

Two types of measures must be defined. These are "outcome measures" and "driver measures". Outcome measures include areas such as customer satisfaction, profitability (budget adherence in the public sector), and employee skills. Outcome measures are *lag* indicators. This means that the process is complete by the time the

organization knows the results of the measure. Driver measures are *lead* indicators in that they provide measurement feedback during the process. These measures include areas such as defect rates, rework rates, and cycle time. Outcome or driver measures by themselves do not tell the whole story. A PMS must have a balance between these two types of measures to be effective. [Ref. 26]

Additionally, measures may be objective or subjective. In general, most managers and employees prefer objective measures. With these measures the goal is clear. Determining whether or not the goal was attained is also clear. Objective measures are usually easier to develop. Subjective measures on the other hand are more difficult to develop and use. Rather than a definitive yes or no, these measures are of the "gut feel" variety. Subjective measures lend themselves to questions regarding their viability, accuracy, and importance. Sometimes, however, a subjective gut feel is the only way to measure certain aspects of a process.

2. Key Attributes

In his book, *Levers of Control*, Robert Simmons describes four "control systems" that are evident in organizations. One of these, the diagnostic control system, is a feedback system that Simmons describes as "the backbone of traditional management control...designed to ensure predictable goal achievement". The concept is that for an organization to succeed it must be able to measure the output of its process, compare its output to industry standards, and then correct deviations from those standards [Ref. 25]. Most business organizations do this in the form of business plans, goals/objective systems, and budgets. Because of the GPRA, public sector organizations are now required to work though this process as well.

Managers must look very hard at the metrics they are developing to measure performance. For the measures to be effective in satisfying the strategic plan they must be "complete", be within the manager's ability to change, and must provide incentives for both the managers and the employees. A "complete measure" is one that accurately captures the essence of the desired goal or outcome. [Ref. 25]

For example, if the goal of an organization is to provide well maintained, modernized ships to protect the country, should the organization measure its cost structure or the readiness of the ships or both? One could argue that, by selecting incomplete measures, measures that do not fully capture the essence of the organization's goal, dysfunctional behavior within the organization might occur. The measures should be within the manager's ability to control. The manager must control the process that the metric measures. If he or she does not control the process but is held accountable for the measurement results, frustration and poor performance can occur. Tied to this are incentives.

One could argue that managers and employees perform the tasks that keep them out of trouble with their bosses or that are tied to their performance evaluation systems (and therefore to their financial well-being). In the private sector, incentives are usually financial. In the public sector they are a little more difficult to define. Certainly, by giving a manager/employee an outstanding performance evaluation there exists the potential for financial compensation via advancement or promotion. However, most of the incentives are in the form of time-off, citations/awards (in some case these can be financial), or a "pat on the back". Whatever form they take, incentives are a key area that must be examined during the process of developing performance measures.

3. Financial and non-financial measures

Until recently, most businesses relied on financial information to measure performance. Accounting data is easy to archive, retrieve, and measure. Within the last ten years, however, there has been a push to include non-financial information as a source for measurement. This has come about due to an increased awareness of the needs of the customer. Customer satisfaction measures came to prominence after American businesses were caught flat-footed by Japanese business' focus on manufacturing high quality products for American markets. From the mid-1970s to the mid-1980s, Japanese industry secured a firm foothold in American market share. Nowhere was this more evident than in the auto industry. Japanese automobiles went from being cheap, low-tech, low-quality commodities to expensive, high-tech, high-quality status symbols. This occurred over about fifteen years. The miraculous turnaround came as a result of Japanese industry listening to their customers. As automobile prices increased and as technology improved, customers began to take issue with the quality problems of their cars. Japanese industry instituted "total quality" process improvement and, using non-financial measures in conjunction with financial measures, charted a strategic course that nearly devastated the American automobile industry. Today Japanese automobile manufacturers are as dominant as our own.

4. Application

No single measure or category of measures will suffice. There must be a mix of driver/outcome measures, objective/subjective measures, and financial/non-financial measures to tell the complete story of the organization's success in realizing the strategic plan. Within this framework, the non-financial metric has become more important as a

measure of organizational success. So the question is, how can we meld financial and non-financial metrics into a PMS that is focused on achieving the strategic plan? There are many strategic measuring systems discussed in business management textbooks. This thesis will examine one of them, the Balanced Scorecard, which is discussed below.

D. THE BALANCED SCORECARD

The Balanced Scorecard (BSC) is a management system that incorporates a strategic plan and a robust PMS [Ref. 26]. The idea is to design performance measures that work toward the goals and objectives of the strategic plan. Translating the plan into workable measures is difficult. It requires that managers have an intimate understanding of their customers, their processes, and their outputs so they can choose the most effective measures of the processes' performance. As its name implies, the Balanced Score Card seeks to achieve a balance between the different categories of measures: outcome and driver measures, objective and subjective measures, and financial and non-financial measures.

The BSC seeks measures that are in congruence with the desired goals and objectives of the strategic plan. The goals must set targets that are high enough to be challenging yet also be achievable. There must also be short, intermediate, and long-term targets. Each successive level of management has a different time horizon. Senior management (e.g., a Shipyard Commander) usually has a very long time horizon of interest. The group leader of a small project in one division (e.g., a production shop supervisor) of a large company, will probable have a very short time horizon of interest. The PMS must capture the different qualities of the time horizon component. The

measures senior management reviews will probably not be the same measures that a shop foreman reviews. However, all of the measures must work toward achieving the goals and objectives of the strategic plan.

The goals must have a standard against which they can be measured. This standard is called a "benchmark". We measure performance to determine how well we are doing. Most businesses are interested in increasing shareholder value. To do that they must improve "the bottom line" of their income statements, their earnings per share (EPS). That is accomplished by changing the cost structure of the company and by increasing market share. Changing the cost structure requires a focus on financial information as well as the internal business process. Increasing market share requires a focus on the customer's needs and the company's ability to innovate and learn new processes. Effective performance measures capture all four of these focus areas. Once the measures are chosen and implemented, the next step is to compare them against the benchmark measures.

The most effective benchmarks are those of the leaders in the particular market. For instance, Microsoft may be an excellent source of benchmarks for a firm in the software business, GE for a widely diversified set of businesses. Performance measures alone do not tell managers how well the company's strategic plan is achieving their goals. While they can provide information regarding areas requiring improvement, to be truly effective in increasing shareholder value, they must be referenced to benchmarks of excellent performance.

The BSC defines four "perspectives" that are used to achieve the balance required of strategically effective performance measures. These are, the financial, the customer, the

internal business, and the innovation and learning perspectives. Figure 4.2 outlines the system described by Norton and Kaplan. Each of the perspectives will be discussed in its generic form and then applied to the specific case of PHNSY & IMFAC.

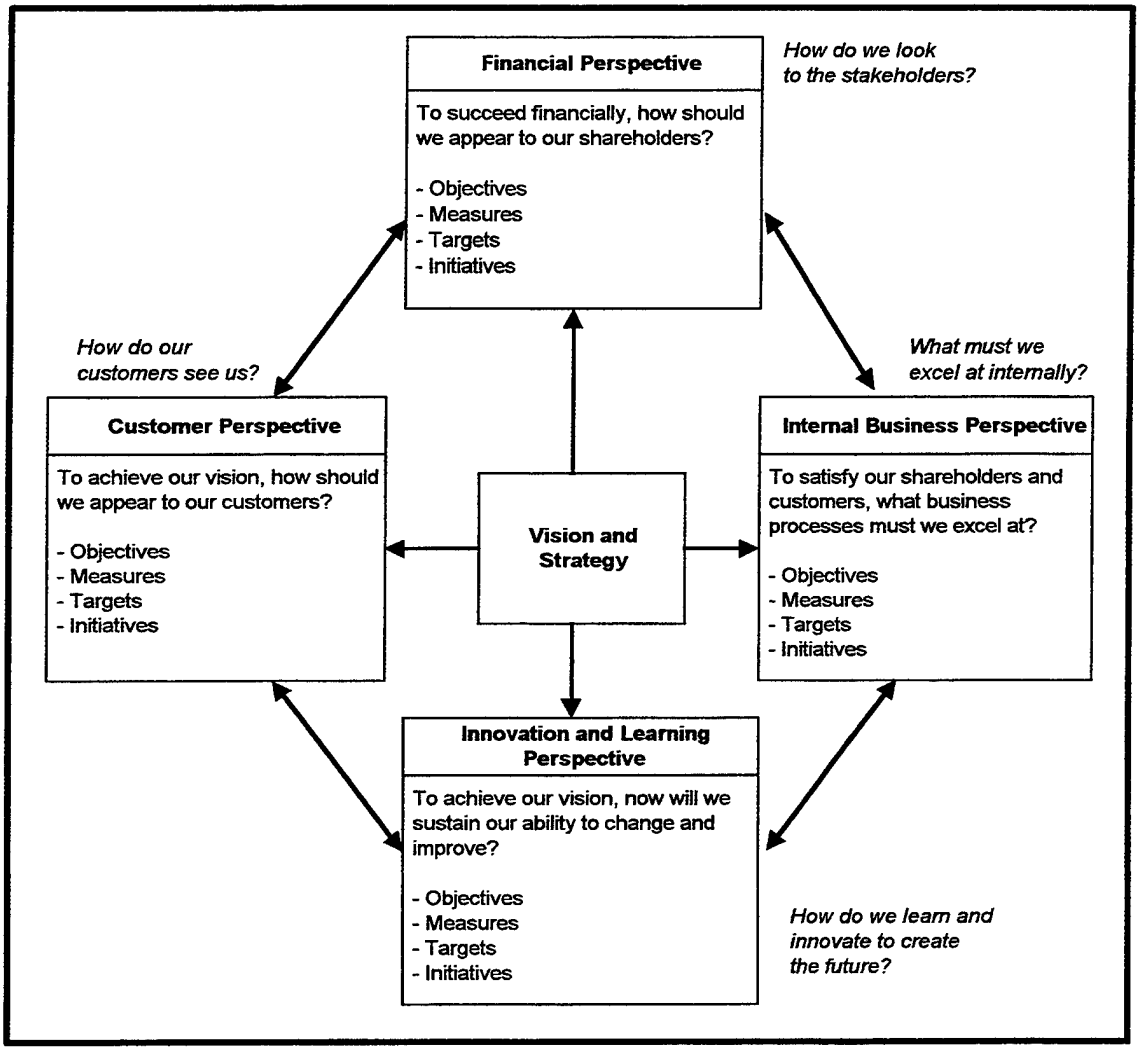

Figure 4.2. The Balanced Scorecard [Ref. 26]

1. The Financial Perspective

The financial perspective encompasses the traditional metrics used to measure performance. Included in these measures are the profitability ratios, liquidity ratios, asset

management ratios, debt management ratios, and market value ratios [Ref. 27]. Two additional concepts are "market value added," and "economic value added." The ratios and concepts are targeted at answering the fundamental financial question every business has: is our strategic plan improving our bottom line and therefore our shareholder value?

a. Liquidity Ratios

Liquidity Ratios examine the company's ability to pay short-term obligations. The two ratios used are the current ratio (current assets divided by current liabilities) and the Quick, or acid test, ratio (current assets minus inventories divided by current liabilities).

b. Asset Management Ratios

Asset Management Ratios measure how effectively the firm is managing its assets. The ratios used are inventory turnover (cost of sales divided by inventories), days sales outstanding (receivables divided by average sales per day), fixed asset turnover (sales divided by net fixed assets), and total assets turnover (sales divided by total assets).

c. Debt Management Ratios

Debt Management Ratios measure the extent to which the firm uses debt (vice equity, i.e., stocks) to finance assets and operations. These ratios include the debt ratio (total debt divided by total assets), the times-interest-earned ratio (earnings before interest and taxes (EBIT) divided by interest charges), and the fixed charge coverage ratio (EBIT plus lease payments divided by the sum of interest charges, lease payments, and sinking fund payments adjusted for taxes).

d. Profitability Ratios

Profitability Ratios show the combined effects of liquidity, asset management, and debt management on operating results. Ratios include profit margin on sales (net income available to common stockholders divided by sales), basic earning power (EBIT divided by total assets), return on total assets (net income available to common stockholders divided by total assets), and return on common equity (net income available to common stockholders divided by common equity).

e. Market Value Ratios

Market Value Ratios relate the firm's stock price to its earnings and book value. Ratios include price to earnings (price per share divided by earnings per share), market to book (price per share divided by book value per share - where book value is common equity (including retained earnings) divided by shares outstanding).

f. Market Value Added

Market Value Added (MVA) is an attempt to measure the firm's value added to the stakeholder. It is the market value of equity (shares outstanding times price per share) minus the total equity capital supplied by stakeholders. This is a long-term measure of value added for the shareholder, starting from the firm's first public equity offering. The greater the difference, the more value the firm has added to the stakeholder's investment.

g. Economic Value Added

Economic Value Added (EVA) seeks to evaluate management's effectiveness in a given year. It is calculated by subtracting the cost of all capital (total capital supplied times the weighted average cost of capital) from operating profits after

taxes (sales minus operating costs minus taxes). Again, the higher the EVA the more effective were the managers in operating the firm for the stakeholders.

In practice these ratios are more complex to apply than their definitions imply. Accounting issues such as inventory valuation methods, depreciation and amortization, and lease financing can create numerical differences in the ratios of firms where no practical difference exists [Ref. 27].

2. The Customer Perspective

As its name implies, the focus of this perspective is on customer related issues. In the private sector, financial performance is the dominant driver. To achieve the desired level of financial performance (i.e., increase shareholder value) the business must attract, satisfy, and retain customers. The customer perspective is an external focus on the core competencies that the business must improve to attract and retain customers. In the last ten years there has been increasing emphasis on the wants and needs of customers.

The public sector is budget driven rather than profit driven. With a few exceptions, public agencies are usually the sole issuer of the goods or services they provide. This has engendered, in some agencies, a monopolistic attitude. As a result there has been less attention paid to the wants and needs of the customer. The GPRA attempts to get public agencies to focus on their customers' needs. Customer acquisition and retention may not be issues for many public sector organizations, since they are monopolies. However, customer satisfaction and customer profitability (via reduced cost operations) are.

Regardless of the sector of operation, the organization must develop metrics that effectively measure core competencies that affect the customer's needs. Examples of the customer focus areas include: [Ref. 26]

a. Market Share

While market share is a major indicator for private sector firms, little attention has been paid to it by public agencies. As previously noted, in many instances the public agency has a virtual monopoly on the particular good or service it provides. However, in some areas, such as government communications, some public agencies are in competition to provide services. Certain measures provide excellent information regarding the success or failure of the agency's initiatives to increase market share. Market share measures require intimate understanding of not only the customer but also the competition. While data for these measures are not necessarily easy to obtain, the payoff is the knowledge of how well a business is faring against the competition.

b. Customer Retention

This measure can be as simple as identifying who the customers are and tracking their patronage from period to period. Another method is to measure growth of the business resulting from returning customers.

c. Customer Acquisition

Measures the numbers of new customers or the percentage of total sales attributable to new customers.

d. Customer Satisfaction

This area cannot be emphasized too much. There is a wealth of data that demonstrates how much customer satisfaction affects the customer's decision to continue

doing business with an organization. A customer survey is an excellent method to measure customer satisfaction. Indeed, it is the most common method. The process of generating, issuing, and evaluating customer satisfaction surveys is difficult and time consuming and is beyond the scope of this thesis. Generally, private sector organizations outsource this function to service companies that specialize in this area.

e. Customer Profitability

Not all customers are equally profitable. Businesses must determine which customers provide the greatest profit, and re-think the plan for the rest of the customers. It may be in the business' best interest to drop high cost customers. Obviously, in the public sector this is usually not an option. However, measures that provide management with a picture of the profitability of each customer are very useful, if only for knowing on whom to spend the most time. Activity-based-costing is an excellent example of an accounting process that can provide a wealth of information on customer profitability.

Data for these areas are not always easy to obtain. However once the decision is made to use measures such as these, the data gathering systems can be put in place. The payoff comes later when managers find that they have more information with which to make decisions regarding organization issues.

In addition to the five areas discussed above, it must be remembered that a good image/reputation, a strong customer relationship, and good product/service functionality are key measures of the customer perspective. To that end, there are several measures of core competencies that can be utilized to evaluate how well the organization is satisfying the customer's needs. [Ref. 26]

f. Time

The customer values on-time delivery and lead time very highly. Metrics that describe the essence of these two areas are excellent performance measures. The measures work at many different levels within the organization. Product/service throughput timing metrics, as well as end result timing metrics, can be utilized throughout the organization. Each shop, division, and department can use timing measures.

g. Quality

The customer values product/service quality very highly. Examples of quality metrics include defect rates, product return rates, warranty claims rates, and field service call rates. Some businesses set up entire departments to measure and track the quality perspective. That may not be appropriate for all organizations. However, customer satisfaction often hinges on quality; so, somebody had better be tracking it.

h. Price

This is a very important customer consideration. Product/service price is at the heart of competition. The customer is always concerned with price. Pricing is a study in itself. Prices that are too high drive customers away, lower profits and make shareholders unhappy. Prices that are too low may bring in customers but may also reduce profitability if volume does not make up the difference. Careful study of the market is required prior to establishing prices. In the public sector prices should cover costs. Managers, therefore, must have accurate knowledge of their cost structures prior to setting prices.

The business that can deliver quality goods/services, on time and at the right price, while simultaneously maintaining strong customer relationships, will dominate its market.

This same philosophy holds true in the public sector. Any efforts to improve those four attributes will surely improve the effectiveness of government.

3. The Internal-Business-Process Perspective

This perspective looks at the internal business processes that are most important in achieving the goals of increasing shareholder value. As discussed above, we know that to increase value the business must ultimately increase customer satisfaction. Senior managers must understand which of their internal business processes ultimately increase customer satisfaction. This requires a thorough evaluation of the overall business process. The measures developed by management must highlight those areas that improve the "integrated business process" and not just a particular department or segment of the organization [Ref. 26]. Figure 4.3 provides a generalized value chain for a business. The internal business process perspective focuses on the innovation process, the operations process, and the post-sale service process. Each of these processes will be briefly discussed.

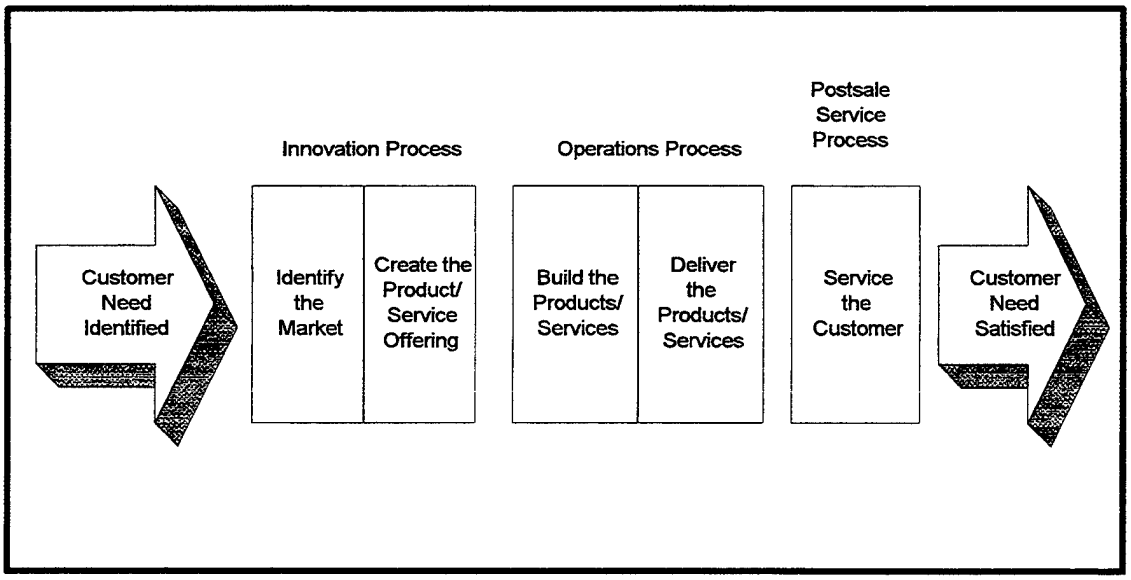

Figure 4.3. The generalized value chain. [Ref. 26]

a. Innovation process

This process identifies the customer's needs then creates a product or service to meet those needs. This is a critical process. The longer the design/development time, the more important the innovation process becomes in value chain analysis. The traditional emphasis is usually on the operations process. That is where the product is actually produced. Conventional wisdom believes that, since the operations process is where the majority of the direct labor and material costs are, most of the cost cutting and performance measurement initiatives need to be in that process. However in many cases, the innovation process is at least as long if not longer than the operations process. Additionally, it is in the innovation process that most of the costs of the operations process are built in. The more thorough a job the innovation process performs the more smoothly the operations process runs. With this in mind, we can now understand why managers must spend more time examining the innovation process. [Ref. 26]

A NSY does not create new products and services. However, for the purposes of this thesis it is assumed that the planning effort that starts prior to the actual availability is part of an "innovation cycle." As in the private sector example, the more thorough the planning effort, the more smoothly the availability proceeds.

b. Operations process

This is the process where the production work is accomplished. It is here that the product or service is built and delivered to the customer. As previously discussed, this is the process that is usually studied the most, looking for cost savings.

c. Post-sale service process

This process is concerned with servicing the customer. Once again we see the importance to the value chain in taking care of the customer. This process, if correctly carried out, can go a long way towards building customer satisfaction and loyalty. Of course, if the post-sale service is as a result of warranty claims and repair work, then clearly that will not make the customer too happy. Hopefully, the innovation process designed a high quality product and the operations process built the product to the same high standards. Post-sale service feedback can provide an excellent source of information regarding the previous two processes.

The two metrics usually used in the internal business process evaluation are cycle-time and first pass yield.

d. Cycle-time

The traditional measure of cycle-time was originally developed for the operations process of manufacturing. It is called Manufacturing Cycle Effectiveness (MCE). MCE is processing time divided by throughput time. Throughput time is defined as the sum of processing time, inspection time, movement time, and waiting/storage time. While developed for manufacturing, the idea is easily converted to any of the internal business processes. A NSY example will illustrate an innovation process application. Throughput time is the sum of contracting time plus planning time plus review/approval time plus any waiting time. MCE would be planning time divided by throughput time. For the post-sale service process cycle-time could be the time from the initial customer call for service to the time the service action is completed. With a little imagination, a variety of measures can be developed around the cycle-time theme. Of course the

manager must be careful in the conclusions drawn from the numbers the measures provide. For example, each product development cycle is different because each product is different. Therefore each application of cycle-time should be separately evaluated. In some cases different cycle-times can be compared and sometimes they cannot. [Ref. 26]

e. First pass yield

This is a quality measure. As with cycle-time it can be applied to any of the internal business processes. For instance, in the innovation process it could be work package rejection rate; in the operation process, the job rework rate; and for the post-sale service process, it could be the number of times service must be performed before the customer is satisfied. Again, with a little imagination many specific measures can be developed. [Ref. 26]

Performance measures for the internal business perspective are best determined by the people in the business. While a generic discussion of cycle time and first pass yield makes the process sound easy, in practice is will be very difficult. Obtaining agreement on the components to be used in these measures can be as difficult as obtaining the data with which to measure.

4. The Learning and Growth Perspective

The organization must have the ability to learn and grow if it is to meet the targets set in the financial, customer, and internal business process perspectives. As Norton and Kaplan state, "the enablers for learning and growth come primarily from three sources: employees, systems, and organizational alignment." This perspective requires "significant investments in people, systems, and processes that build organizational capabilities." [Ref. 26]

Past benchmarks soon become tomorrow's baselines. New process innovation must come from those who are the closest to the process. These are generally the front line employees and supervisors. To be effective innovators requires that these people be re-trained so that they can see how their part in the process fits in to the organization's overall objectives. Additionally, an environment must be created at all levels that allow past lessons to be remembered and incorporated into the development of future processes.

Three "core employee measures" are usually used to define this perspective. They are employee satisfaction, employee retention, and employee productivity.

a. Employee Satisfaction

Unhappy workers are not productive workers. This metric seeks to determine the level of worker satisfaction and therefore their capacity for productive work. It is usually measured with surveys. As with the customer satisfaction surveys, the development and implementation of a survey is a science in itself. Care is required in the formulation of questions, the way in which the survey is administered, the analysis of data, and the publication of the results. In the private sector there are many companies that specialize in performing surveys for businesses.

b. Employee Retention

The loss of skilled employees is a loss of intellectual capital. It is in the company's best interest to keep those people in whom a lot has been invested. This measure can help management track the trend. The usual metric is calculated as a percentage of total employees or as key staff turnover.

c. Employee Productivity

This is an important measure as it supports the employee satisfaction metric. Employee productivity is often measured as a ratio of revenue to employees. As with any ratio, its measure can be affected by changing either the numerator or denominator. Improving productivity can be shown by increasing revenue relative to the number of employees or by reducing the number of employees while holding revenue constant. One or both of the methods may suit the organization's (and shareholder's) purpose. Senior management must closely examine the ratio's components and ensure that the incentive system is not affecting the components in a manner that is detrimental to the goal of increasing shareholder value. Along the same lines, cost per production manday is also an employee productivity measure.

E. SUMMARY

A strategic plan is a vital component to any organization's makeup. There must be a guiding vision along with measurable goals and objectives. A key part to the strategic plan is a performance measurement system that can determine whether the goals and objectives are being achieved. Regardless of the measures, leading, lagging, objective, subjective, internal, external, financial, or non-financial, managers must have a system in place to track the performance of their organizations. This chapter provided an example of a framework for a performance measurement system. That system is called the "Balanced Scorecard." The BSC is a very popular performance measurement system in the private business community.

Four "perspectives" are used to group similar measures. Those perspectives are the financial perspective, the customer perspective, the internal business perspective, and the learning and growth perspective. Within each of these perspectives a set of practical measures are defined and developed. Although the measures are generic, they can be easily (in some cases) tailored to the exact needs of a specific organization. The BSC will now be applied to the metrics proposed by NAVSEA and the NAS to see if they fit into the framework. Where holes exist, a search will be conducted for other measures to fill in the gaps to achieve more balance.

V. PHNSY & IMFAC AND THE BALANCED SCORECARD

Chapter III provided a detailed examination of the performance measures proposed in the NAVSEA's Pearl Harbor Pilot Test Plan. NAVSEA commissioned the Naval Audit Service (NAS) to review and formalize those measures so that they can be presented to OSD, OMB, and the Congress. Additionally, the NAS was tasked with developing the financial cost baseline of the two separate organizations (PHNSY and NIMF) for FY 1997. The five metrics that were chosen were evaluated as excellent measures on which to base decisions regarding the future of PHNSY & IMFAC. However, there may be other metrics that can be applied to further enhance the quality of information used to make future decisions.

Measuring the output of a NSY is not easy. Unlike a manufacturing plant making widgets, NSYs repair and modernize ships. Each ship is different and therefore each project work package is different. A work item to overhaul a pump on one ship can involve much more work than the same pump on another ship of the same class. There is no standard overhaul work package. There are standard preventive maintenance work items to accomplish on each ship, depending on the age of the ship. However, each ship's corrective maintenance work package and modernization work package are different. This makes it very difficult to develop outcome measures of effectiveness. However some progress in this area has been made.

The intent of this thesis is to evaluate the performance measures that have been developed for implementation at PHNSY & IMFAC. To evaluate these measures effectively, the PHNSY & IMFAC strategic plan must also be examined. Remember that

an organization must accurately define its purpose, direction, and goals. Only after that has been accomplished should performance measures be developed. The measures support attainment of the strategy.

At the time of this writing, PHNSY & IMFAC management had not yet completed work on their strategic plan. An executive steering committee comprised of senior leadership at PHNSY & IMFAC is currently working on the strategic plan. It is scheduled for completion in August 1998. However, NAVSEA 072 (NSY Business Operations) does have a strategic plan for the NSYs. Since NAVSEA will retain operational control over PHNSY & IMFAC, it is likely that the strategic plan will pertain to PHNSY & IMFAC as well as the other three NSYs. In any event, the NAVSEA plan was very well written and provided clear direction. Its implementation in 1995 provided a significant shift in how NSYs viewed themselves and their customers. The content of the plan directly affects the situation in Pearl Harbor.

In August 1995, NAVSEA 07 issued a document called "Business Policy and Guidance for Naval Shipyards" (The Policy). This document effectively acts as the overriding business policy of each of the NSYs. A close examination reveals that it is actually a strategic plan for the NSYs. It provides the basic information found in a strategic plan: the purpose of the NSYs, a description of their customers, and the goals and objectives of NSY operations. The central policy is: [Ref. 21]

> Our corporate business policy is to simultaneously deliver cost, quality, and schedule performance to our customers (as judged by them) while maintaining shipyard and corporate financial solvency.

The Policy further defines the specific performance attributes necessary to ensure the success of the central policy. The central policy is divided into two parts. The first

comprises cost, quality and schedule. The second involves shipyard and corporate financial performance. Each variable in the first part of the central policy is defined below exactly as contained in The Policy [Ref. 21].

- Cost performance: Price all work fairly as benchmarked against best practices of similar work performed in either private or naval shipyards. Deliver ships at or below initial sales estimates. Eliminate 'surprise' price increases to the customers.

- Schedule performance: Deliver ships on or ahead of schedule as initially agreed with the customer -- the CNO schedule at the start of the availability.

- Quality performance: We must work closely with customers to determine their actual needs, requirements, and affordability. We will then meet those needs by performing quality work, but not increase the cost or schedule by unnecessarily exceeding requirements or performing more than the agreed upon work.

The second part of the central policy, shipyard and financial performance, is described in more general terms. The Policy states that long range financial plans will be established for each shipyard and the corporation. Additionally, it states: [Ref. 21]

> We will create financial indicators appropriate to every level and function in the corporation and regularly use them to monitor performance, identify variances and causes, and ensure that corrective actions are taken; and, we will make sound business decisions.

The Policy then states twelve business rules that "provide the structure necessary to successfully carry out the business policy and ultimately achieve business success." However, six of the business rules will be singled out as they serve the greater purpose of the discussion regarding measures, incentives, and their congruence with the desired outcome. These rules are:

- Long-range financial plans will be developed and maintained for each shipyard and the corporation.

- Financial indicators...will be established and regularly used to monitor performance...and ensure that corrective actions are taken.
- Financial performance will be a crucial success indicator at every managerial level of the corporation.
- Shipyard performance within approved budgets is mandatory.
- Financial performance will be regularly reviewed and discussed by shipyard commanders in joint session with their senior shipyard managers.
- Internal Control Practices (ICPs), sales estimates, and fixed price offers will be benchmarked against the best performance achieved for like work on other availabilities with the corporation or in private shipyards.

It is obvious that financial performance is an important part of NAVSEA's strategic plan for the NSYs. Of the six business rules that were not listed, one was financial, one involved ensuring budgets included provisions for workforce training and maintenance of real property, three discussed the systems to be used to budget and progress work and plan personnel workloads, and one discussed the need to coordinate frequently with the customer.

Following the business rules there is a discussion of the business practices. Business practices support and generally expand on the business rules. As with the business rules, the practices focus primarily on the financial perspective. One of the practices even states, "financial performance is to be included as a factor for each manager's yearly performance evaluation."

It is important for an organization as large as a shipyard to track financial performance. The Policy seems to emphasize that financial performance is the single most important element of the strategic plan. Remember that the business policy of the NSY is "to simultaneously deliver cost, quality, and schedule performance to our customers." Certainly cost is well represented in the strategic plan. But quality and schedule are

mentioned only briefly in general terms. Which of these goals do our current performance measures support? The policy states that a manager's performance is measured against his or her ability to keep costs within budget. It would appear that internal shipyard activities aimed at controlling costs have a high priority.

A. BENCHMARKING

In the research for this thesis no formally recognized benchmarks could be found to evaluate PHNSY & IMFAC performance measures. While not the thrust of this thesis, the concept of benchmarks is vital in the development, usage, and especially the analysis of performance measures. The Policy states that benchmarks will be used to evaluate NSY performance measures. However, benchmarking data on NSY performance were not found. This resulted in the development of a partial set of benchmark data culled together from private and public shipyard information that was readily available. The process will be briefly described.

There are nearly one hundred private shipyards in this country. Of these the "big-six" comprise the greatest proportion of revenue and more than 98% of the Navy's shipbuilding budget. These are Avondale Industries Incorporated, Bath Iron Works Corporation, Electric Boat Corporation (EB), Ingalls Shipbuilding, National Steel & Shipbuilding Company (NASSCO), and Newport News Shipbuilding (NNS). Of these only NNS and Avondale are independent, publicly traded companies for whom financial data is easily obtained. Bath and EB are subsidiaries of General Dynamics Corporation, Ingalls is a subsidiary of Litton Industries Incorporated, and NASSCO is employee owned (independent, but not publicly traded).

Financial information from these private shipyards was used in an attempt to create a picture of the "industry" in which the four public shipyards operate. Since some of the financial data was difficult to obtain for the subsidiary companies, financial data from the number seven and eight shipyards, Halter Marine Group (Halter) and Todd Shipbuilding were also used. Figure 5.1 shows the relative size of PHNSY in comparison to the private yards evaluated. PHNSY is roughly one-fifth the size of the largest shipyard and more than three times larger than the smallest.

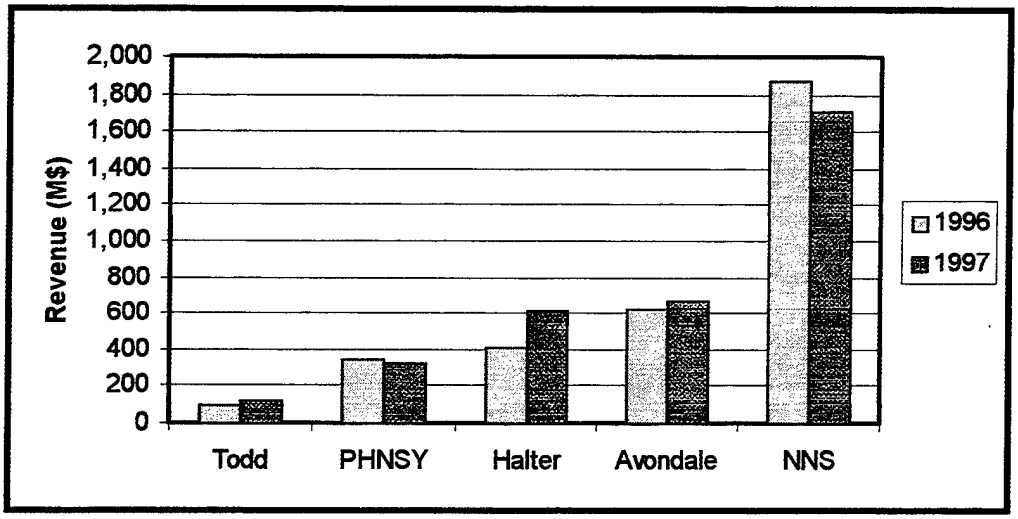

Figure 5.1. Shipyard industry revenue comparison.

The choice of these companies and the use of their financial data for comparison purposes makes several assumptions. The first is that they are in a business that is similar to PHNSY & IMFAC. In fact, much of these private shipyards revenue comes from shipbuilding and not ship repair. For purposes of this thesis, those two operations, shipbuilding and ship repair, are assumed to be very similar in operations, cost, and asset investment. Secondly, the financial reports from PHNSY (Financial & Operating

Statement) are assumed to have an account structure similar to the private financial reports. The CFO Act of 1990 requires that federal financial reporting move towards the content and structure of the private sector. The point of this is to be able to compare, to some degree, the financial information of the public and private sector shipbuilding/ship-repair industry.

B. THE FINANCIAL PERSPECTIVE

In applying this perspective to the PHNSY & IMFAC problem, financial data from the companies described above were used. For the public sector there are no market ratios since there is no stock outstanding. However, the other financial ratios, (liquidity, asset management, debt management, and profitability) can be used to evaluate the financial performance of a NSY. When compared to the same ratios within the private sector we get a picture not only of the health of the public shipyard but also a comparative standing of the public shipyard within the private shipyard industry as well.

1996	Todd	Halter	Avondale	NNS	Average	PHNSY
Current ratio	3.47	2.38	2.16	1.92	2.48	(0.77)
Days of inventory	6.24	11.13	14.64	9.49	10.37	35.08
Total asset turnover	0.62	1.63	1.28	0.80	1.08	1.15
1997						
Current ratio	2.11	No data	2.66	1.28	2.02	0.82
Days of inventory	5.14	No data	15.74	9.29	10.06	31.81
Total asset turnover	0.70	No data	1.22	0.71	0.88	0.81

Table 5.1. Financial Perspective Ratios showing PHNSY and the "Industry."

Table 5.1 shows an example of the results of this type of analysis for the years 1996 and 1997. While these calculations were performed with only PHNSY data, once NIMF data is input into SYMIS, composite ratios can be calculated. Recall from Chapter

III that current ratio is current assets divided by current liabilities, inventory turnover is sales divided by inventory value, days of inventory is 365 divided by inventory turnover, and total asset turnover is sales divided by the sum of total assets plus accumulated depreciation. All of the financial ratios previously discussed were calculated and can be reviewed in Appendix D. However, since one of the goals of the BSC is to keep the number of performance measures to a minimum, three ratios have been chosen to define the financial perspective. They are current ratio, days of inventory, and total asset turnover. These were chosen because they emphasize liquidity and asset management and have the most applicability for comparison to the private sector. They reflect the invested capital in the organization that managers should employ to improve the rate of return.

The debt management ratios were calculated but not considered because the debt and equity structure of a public agency is fundamentally different than in the private sector. Also, the profitability ratios were calculated but not used since the financial goal of a NSY is to break even (i.e., net income of zero).

Table 5.1 shows the results of the financial analysis for each of the shipyards mentioned. As with any ratio analysis, the ratios in themselves mean little. They must be compared with other similar ratios to determine their importance. For example, inventory turnover implies 32 days of inventory at PHNSY compared with 9.3 days for NNS (in 1997). Even though it is a non-manufacturing shipyard (i.e., no new construction), PHNSY has nearly three times the inventory on hand as the other shipyard. While the ratios may not be useful by themselves, when used as a basis for comparison, both in year-to-year (trends) and with other organizations, they can be important tools in management's decision-making processes.

Another point to discuss regarding ratios is their difference from period to period. A business may make strategic decisions for the long-term health of the company that, in the short run, move a particular ratio in the "wrong" direction. Management must examine the underlying components of the ratio to determine exactly why it moved in a particular direction. For example, in 1996 PHNSY's current ratio was negative. This was because it had a significant negative cash flow in the amount of about $70 million that resulted in a negative value for current assets.

1. Current Ratio

Current ratio was chosen because it is an excellent measure of the ability of the business to cover its current liabilities. Management seeks to increase this ratio. For 1996, PHNSY had a negative current ratio for the reasons discussed above. In 1997, the ratio was greater than zero, but well below the average. A current ratio as low as PHNSY's 1996 and 1997 values would be a source of concern in private industry.

2. Days of Inventory

Days of Inventory was chosen because it is an excellent measure of the amount of resources devoted to inventory. With the private sector's recent emphasis on Just-In-Time (JIT) inventory management, the number of days of inventory has been steadily decreasing. For comparison purposes, a true JIT inventory management system approaches 365 turns, or an average of 1 day of inventory on hand. For both 1996 and 1997, PHNSY was significantly above the industry average. This indicates PHNSY has significantly more cash tied up in inventory than the private shipyards. PHNSY management might see this as an area to investigate to determine if reductions in inventory could be made. This would allow the flow of resources to other functions within the

shipyard that could be used to increase the value added to the customer's product (e.g., increased man-hours for habitability improvements). Inventory control was a driving factor in the transfer of much of the PHNSY supply function to FISC Pearl Harbor. That transfer alone should decrease the days of inventory. (Note that PSNSY carried 94 days of inventory in FY 1997!).

3. Total Asset Turnover

Total asset turnover measures the effectiveness of the organization's total assets in generating sales. The fewer assets needed to obtain a particular level of sales the better. The higher this ratio the better. For this calculation accumulated depreciation was added back to total assets. In this way the total extent of a shipyard's historical cost of property, plant, and equipment can be compared. If depreciation were not added back, then older shipyards could have a higher ratio simply because of the large amount of accumulated depreciation that had been generated over the years. This ratio will also be a good indicator of the infrastructure reduction efforts. As infrastructure is reduced (i.e., buildings are demolished or turned over to Pearl Harbor Naval Station), total assets will decrease. This will increase the ratio. Additionally, with increased attention to reducing inventory this ratio, as well as the days of inventory, will decrease. In 1996 and 1997, PHNSY was well within the "industry" average values.

4. Production, Plant, and Equipment Ratio

Another ratio that might be useful in measuring infrastructure reduction would be a property, plant, and equipment (PPE) ratio. The ratio would be the current year's PPE divided by the 1997 PPE for both organizations. Over time the ratio should decrease and then stabilize. As this ratio is for future use, no calculations have been made for it.

It is important to note that the financial ratios presented here were calculated using only PHNSY data. The NIMF financial data were not included. As described in Chapter III, financial reporting for mission funded organizations is very different than for NWCF organizations. The mission-funded organizations utilize the STARS-FL system, which reports on forms NC 2199 and NC 2171. The concepts of revenue, expense, and asset are not reported in a way that is easily decipherable. After the consolidation, the NIMF financial data will begin to flow into SYMIS. This will provide the NIMF with the same cost visibility the NSYs enjoy. This will also place the NIMF's accounting information in a more useable format in terms of ratio analysis. The intent here is to demonstrate the concept and also to show that, at least for 1996 and 1997, PHNSY's "numbers" were well within private and public industry standards.

In comparison, Table 5.2 shows the ratios for all four of the NSYs as well as the public sector average. Table 5.3 shows PHNSY ratios versus the private and public averages.

1996	PHNSY	PNSY	NNSY	PSNSY	Average
Current Ratio	(0.77)	0.47	0.95	1.00	0.41
Days of Inventory	35.1	38.5	66.5	79.7	54.9
Total Asset Turnover	1.15	0.69	0.96	0.87	0.92
1997					
Current Ratio	0.82	2.15	0.91	1.10	1.25
Days of Inventory	31.8	91.3	7.0	94.0	56.0
Total Asset Turnover	0.81	0.72	1.33	0.95	0.95

Table 5.2. Financial ratios for the public shipyards.

1996	Private Average	Public Average	PHNSY
Current Ratio	2.48	0.41	(0.77)
Days of Inventory	10.4	54.9	35.1
Total Asset Turnover	1.08	0.92	1.15
1997			
Current Ratio	2.02	1.25	0.82
Days of Inventory	10.1	56.0	31.8
Total Asset Turnover	0.88	0.95	0.81

Table 5.3. Private and Public financial ratio averages and PHNSY.

Table 5.3 shows that, with the exception of the 1996 current ratio, PHNSY is operating close to the averages of the public sector shipyards. It is interesting to note the differences in the averages of the public and private sectors. The total asset turnover ratios are very close. This indicates that the capital asset structure required to achieve sales is approximately the same for the private and public shipyards. The variance in current ratios highlights the differences in cash management and the structure of the liabilities portion of the balance sheets of private and public organizations. Where the private firm will show short term debt, leases, and accrued expenses for current liabilities, the public firm shows mainly accrued expenses. That means the NSY requires less cash to cover current liabilities. The days of inventory numbers show a significant difference in the way inventory is managed in the private and public shipyards. Private shipyards are able to perform a very similar mission as the public shipyards with a lot less inventory. Though not an *efficient* use of resources, the higher than "average" inventory levels may be *effective* from a national strategic maintenance view point. The only way to find out is

to conduct a detailed value chain analysis of the inventory management process, including the supply value chain.

C. THE CUSTOMER PERSPECTIVE

1. CSMP Backlog

CSMP backlog is a good measure of the outcome performance of PHNSY & IMFAC. As discussed in the previous chapter, the consolidation should enable seamless transfers of personnel and equipment between I and D level maintenance projects. This should allow management to "level-load" the workforce. Resources will be shifted between the two levels of maintenance as necessary to promote their most efficient use. This should improve workload.

One way to measure the increase in work output is by observing a decrease in backlogged work items in each ship's CSMP. In order for this metric to be an effective tool to measure PHNSY & IMFAC's work output, two important points must be made. First, each CSMP must be thoroughly "scrubbed" to ensure that it is complete and accurate. As noted in Chapter II, each ship is responsible for maintaining its own CSMP. The ship's ISIC has a measure of responsibility in the CSMP as well, but it is primarily the ship that sets the standard of what is considered a "clean" CSMP. For "CSMP backlog" to be a useful measure, each ship and its ISIC must work closely together to ensure the CSMP is as accurate as possible. While any performance measuring system can be "gamed" to some extent, the CSMP is so highly regarded as the measure of a ship's material condition that most ships work very hard to keep it "clean." Of course, increased ISIC oversight is often effective at ensuring the system is not "gamed."

Second, consensus must be reached regarding what items in the CSMP will be measured. CSMPs contain the entire history of maintenance on the ship. This includes past problems as well as current problems. Obviously, we are only interested in the current issues, but which ones? The CSMP comprises jobs that are assigned to maintenance activities and those which are not. Each level of the Naval Ship Maintenance Program is represented: organizational, intermediate, and depot. Additionally, there may be work items that have been assigned to contractors (private or public). Aside from the responsible maintenance activity, each job is coded with a priority number (PRI) designating the importance of the job. Some are "safety of ship," "safety of systems," or simply "must fix" (the PRI-2 jobs); and some are "fix it when we can" (PRI-4 jobs).

If the ship's CSMP has been managed properly there should be few depot-designated jobs older than the last depot maintenance period. Additionally, there should be few intermediate-designated jobs older than the last I-level availability (there will be jobs deferred or unfinished from the last availability). The recommendation here is to measure the following items:

- Intermediate level jobs that are older than ninety days (TA-2 >90 days). Since there are nominally ninety days between upkeeps, those jobs that are greater that ninety days old are either unassigned or deferred. Since, due to the consolidation and the ability to move the workforce to where the work is, there will be more maintenance time available from PHNSY & IMFAC, we should expect to see the numbers of these jobs decrease.
- Depot level jobs input since the last SRA. Again, since more production time is available, let us put it to work on these jobs in a piecemeal fashion rather than waiting for the next depot availability.
- Organizational level jobs which are greater than one hundred and twenty days old (TA-4 >120 days). Maintenance that the ship plans to perform should not take more than 120 days to complete.

In addition to providing the ship an opportunity to have the problem fixed by PHNSY & IMFAC, these measures also provide the ISIC and the ship with an indication of the "health" of the CSMP. While PHNSY & IMFAC may not fix all of the maintenance issues in the metric areas described above, at least the condition of each ship's CSMP will be visible.

2. Guarantee Work Index

This measure would track the number of man-hours expended by PHNSY & IMFAC production personnel to correct post-depot availability problems. During depot availabilities the ship and NSY management keep track of items which require further work. Even during post availability sea-trials, maintenance personnel are performing corrective maintenance on the ship. After sea trials, the ship, the ISIC, and the NSY come to an agreement on the remaining "guarantee" work that must be performed to formally complete the depot availability. This work normally occurs during a ninety-day guarantee work period that follows the end of the depot availability.

Although the size and magnitude of the list varies from ship-to-ship, a metric which tracked the total mandays required to perform that guarantee work would be a useful measure of the quality of the maintenance performed during the depot availability. Additionally, by dividing the post-availability guarantee work mandays by the total mandays expended on the ship, a ratio could be developed that would be comparable on a ship-to-ship basis. The Guarantee Work Index (GWI) is, then, mandays expended during the guarantee period plus total mandays expended during the depot availability divided by the total mandays expended during the depot availability. If no guarantee work were performed the GWI would be "one." This would be the ideal to strive for.

D. THE INTERNAL BUSINESS PROCESS PERSPECTIVE

This is a difficult area in which to develop performance measures. Performance measures for this perspective must be developed by workers and managers who are intimately involved in the process. Value chain analysis and process improvement are two techniques that can be employed to examine PHNSY & IMFAC's processes in detail. As stated above, the innovation process is often overlooked during analysis. Since the process of screening and accepting work, planning the jobs/availability, and ordering parts and material is often as long as the actual availability, much attention should be paid here.

Previously, cycle time and rework were offered as two common metrics for this perspective. Used in conjunction with one another, they can provide insight regarding how improved cycle time is affecting the quality of work (as measured by rework).

1. Cycle time

This measures the time it takes to complete a process. It could measure the time to write and approve a work package, the time to order, receive and distribute material, or the time it takes to complete a particular job. The measures could be determined for both individual events as well as system aggregates, or entire availabilities. As with any measure, the data are not always easy to obtain. Value chain analysis can help break down the components of the processes so that individual parts of the whole can be measured.

2. Rework

Rework concerns itself with quality, but here it is not used as a customer satisfaction measure. Rather it is used to "grade" the internal workings of the process. If the innovation and operations processes are carried out properly, there should be no

rework. By tracking the rates at which rework occurs, management can get a "feel" for when the process is not working properly. Again, data may not be easily obtainable.

E. THE LEARNING AND GROWTH PERSPECTIVE

In this perspective PHNSY & IMFAC seek to answer the question: how do we learn and innovate to create the future? As described above, this perspective is usually defined using employee-related measures.

1. Employee Satisfaction

Employee satisfaction is normally measured with surveys. As DOD organizations, both PHNSY and NIMF conduct annual workforce surveys. These surveys evaluate the working climate by examining many different areas within the organization. To be effective, management must thoroughly analyze the results and make decisions or take action that increases employee satisfaction and adds value to the customer.

2. Employee Retention

Employee retention is a measure of employee satisfaction and the loss of intellectual capital that results when highly skilled workers leave the company. There should be measures at several different levels. This measure should be tracked for PHNSY & IMFAC as a whole and for each department/division. Benchmarking this area will be difficult. Private data are just not available. However, with consensus on the specific measure, each of the NSYs could provide numbers that senior management could then compare. The ratio itself should be rather simple: number of employees leaving the shipyard divided by the total number of employees at the shipyard. There would also be

measures for each department/division. For PHNSY & IMFAC these ratios should measure only the civilian workforce.

3. Employee Productivity

Several measures are currently in place at NIMF and PHNSY. However, there are no standards against which to measure performance. Productivity measures seek to determine how much time is spent performing the required work versus the total time available to do work (the total capacity). In this area, there is a kind of benchmark against which to measure. OPNAVINST 1000.16H (*Manpower Requirements*) defines the "Navy standard workweek." The definitions cover both active-duty Navy personnel and civilians employed by the Navy. Wartime, peacetime, sea-duty assignments, and shore-duty assignments are all discussed. Table 5.4 shows the composition of the Navy standard workweek for "Peacetime shore activities." It should be noted that both the active duty and civilian workers are expected by the CNO to "put in the same hours."

OPNAVINST 1000.16H		
	Military (hours)	Civilian (hours)
Workweek	40.0	40.0
Training	1.5	0.3
Diversions	1.0	0.2
Leave	2.6	4.6
Holidays	1.5	1.5
Total available work time	33.4	33.4
% accepted capacity	83.5%	83.5%
% accepted lost capacity	16.6%	16.6%

Table 5.4. The composition of the standard Navy workweek [Ref. 32]

Using this data, we may be able to determine the work capacity of an organization. Table 5.4 shows the ideal number of productive working days a Navy shore based activity

can expect to obtain during peacetime. If an index could be obtained to compare to the ideal, we could measure the actual working capacity of the organization. While private sector data are not available, NSY data are.

1997	PHNSY	Portsmouth NSY	Norfolk NSY	Puget NSY	Totals
Workload (mandays)	353,000	515,000	1,117,000	1,420,000	3,405,000
Total Employees	2,680	3,335	6,944	9,085	22,044
Days Worked Ratio	131.7	154.4	160.9	156.3	154.5

Table 5.5. The days worked ratio and the four NSYs. [Data from NAVSEA]

Table 5.5 shows the total workload (in mandays) charged and the total number of personnel at each of the NSYs in 1997. By dividing manday workload by people, the unit analysis yields "days." For example, if a job was planned to take 100 mandays and there were 10 men to work on it, the job should take 10 days. While this example is an oversimplification of a complex process, it does get the idea across. Table 5.5 shows that the four NSYs produced an average of 154.5 "days worked" in 1997. When compared to the ideal of 218 days (365 days minus 104 weekend days times the 83.5% from Table 5.2), the actual capacity is 73.7%. The question is: why did the NSYs not work 218 days? The answer is simple; it shouldn't be equal to 218 days. The numerator is the total direct production time in mandays, while end strength is the total number of employees at the NSY. Not all of the employees at a NSY are direct production workers. Some employees perform indirect work and others are counted as overhead. Is the days-worked ratio (DWR) a misleading measure? This researcher believes it is an excellent indicator of the overall process health of a NSY. It provides a quick snapshot of all personnel resources required by a NSY to perform direct production work. While the ratio will never be equal

to 218 days, it can be compared to the other NSYs and it can be tracked over time to evaluate the trend.

Where the "218 days" value may come in handy is in an analysis of the total work charged at the NSY and the total number of personnel that produced the work. For example, in 1997 the total straight time mandays worked by "productive" shops were 206,142 [Ref. 29]. That work was performed by approximately 950 people (averaged over the year) [Ref. 29]. Calculating the DWR with these two numbers yields a value of 217 days worked. While not exactly 218, it is close enough. One problem with this measure is that it may be just a validation of the time keeping process. All work must be charged to a direct or indirect JON, so it is probably no surprise that the ratio comes out close to 218. This line of reasoning could be applied to any area where time data and personnel data are available.

It is interesting to note that the DWR is the lowest at PHNSY when compared to the other three NSYs. PHNSY is the smallest yard in terms of both personnel and production work. There is certainly a base level of overhead infrastructure and personnel that are required to operate a NSY. One could then make the argument that PHNSY should have a lower DWR. However, PHNSY is not that much smaller than Portsmouth NSY, yet the PHNSY DWR is 15% lower. This metric might be used to examine the reasons why the total population of PHNSY produces less output mandays than the other NSYs.

Another measure within this perspective is "revenue per employee." This is similar in concept to the currently proposed "cost per unit of output." In both instances there is an attempt to show the relationship between dollars and people, one in terms of dollars

earned and the other in terms of dollars spent. The first measure compares total revenue to total employees. That measure is a common ratio used to compare productivity between different companies. In general, the higher the ratio the more productive is the workforce. The second measure compares total cost to some unit of output. That unit is normally "labor hours worked." While that is a good measure that can be compared within the public sector, it is very hard to compare to the private sector. A more universal cost measure might be "cost per employee," using cost of goods/services sold.

It must be remembered that the goal of the NSY is to minimize *cost* per employee not maximize *revenue* per employee. The private yards seek to meet both objectives simultaneously. That said, PHNSY revenues do not include the 3-5% profit margin the private shipyards include. That means the PHNSY revenue per employee value is actually understated. The advantage of the "revenue/cost per employee" metric is that there are a wealth of data available from private industry against which the NSYs can be compared. Table 5.6 shows the ratios for PHNSY and several of the private shipyards previously discussed. Table 5.7 shows the ratios using the public shipyards. PHNSY's "revenue per employee" is above the average for both 1996 and 1997 (that is good) while the "cost per employee" is higher in 1996 (bad) and lower in 1997 (good). However, even for the "bad" year in 1996, PHNSY's cost per employee is well within the range of values. The overall conclusion is that PHNSY appears to be at least as productive per employee and as cost effective per employee as the private shipyards.

	Todd	Halter	Avondale	NNS	Average	PHNSY
1996 Revenue (K$)	101,687	406,797	624,929	1,870,000		340,101
Total Employees	1,100	4,300	5,600	17,937		2,922
Revenue (K$) per Employee	92.4	94.6	111.6	104.3	100.7	116.4
1996 Cost of goods/services	71,674	355,209	543,102	1,730,000		272,663
Cost (K$) per employee	65.2	82.6	97.0	96.4	85.3	93.3
1997 Revenue (K$)	114,398	670,200	613,993	1,707,000		326,153
Total Employees	1,100	5,300	5,500	16,500		2,726
Revenue (K$) per Employee	104.0	126.5	111.6	103.5	111.4	119.6
1997 Cost of goods/services	93,982	589,500	538,515	1,729,000		244,261
Cost (K$) per employee	85.4	111.2	97.9	104.8	99.8	89.6

Table 5.6. Revenue/Cost per Employee ratios for the Industry.

	PHNSY	PNSY	NNSY	PSNSY	Average
1996 Revenue (K$)	340,101	293,019	680,010	926,692	
Total Employees	2,922	3,686	6,944	9,478	
Revenue (K$) per Employee	116.4	79.5	97.9	97.8	97.9
1996 Cost of Goods/Services	272,663	221,056	502,274	686,272	
Cost (K$) per Employee	93.3	60.0	72.3	72.4	74.5
1997 Revenue (K$)	326,153	399,116	920,265	969,542	
Total Employees	2,726	3,388	6,944	9,140	
Revenue (K$) per Employee	119.6	117.8	132.5	106.1	119.0
1997 Cost of Goods/Services	244,261	179,955	675,443	711,794	
Cost (K$) per Employee	89.6	53.1	97.3	77.9	79.5

Table 5.7. Revenue/Cost per employee ratios for the Public Shipyards.

The Test Plan metric, cost per unit, is a ratio of the total cost of the organization to the number of direct production mandays worked. This ratio was discussed in Chapter III. As a surrogate for productivity, it belongs in the "Learning and Growth Perspective."

A final measure that can be used to evaluate the consolidation is the deferred/rejected jobs ratio. This measure is more appropriately calculated for the I-level component of work at PHNSY & IMFAC. During intermediate maintenance periods,

some jobs are deferred to the next upkeep while others are rejected. This may occur for several reasons. If it is decided by I-level management that a job is not within the capability of the particular maintenance activity or the activity does not have the capacity to do the job within the allotted time, it is rejected from the work package. In other cases, a job may have been in planning or actually in progress when an issue developed which precluded the maintenance activity's ability to complete the job during the availability. These jobs are deferred to a voyage repair period or to the next I-level maintenance period. If the consolidation works as planned then, depending on the D-level workload, capacity should be available to complete all of the jobs a ship requests. The numbers of deferred and rejected jobs in a ship's CSMP should decrease following the consolidation. As this is a measure that NIMF already tracks, it is easy to add to the list and it can provide another source of feedback regarding the success of the consolidation.

F. POTENTIAL RESULTS OF THE CONSOLIDATION

Based on this in depth review of PHNSY & IMFAC consolidation, one can't help but wonder whether or not productivity will actually increase. If it does, it will provide more "maintenance per dollar." That will reduce the cost per unit of production for the customers. The question is, how much of an increase in productivity can we expect? How much of a reduction in cost per unit production can we hope to see? While there will be no actual answers to these questions until FY 1999, the data provide several clues.

The Pilot Transition Team Study Report [Ref. 8] predicts an eighteen percent increase in "wrench-turners" (Code 900 production workers) and a twenty-three percent increase in the ratio of "workers" to "supervisors" as a result of the transfer of personnel

from indirect, overhead functions to direct production shops. As a result of these transfers the Pearl Harbor Pilot Test Plan [Ref. 35] predicts:

- A three to five percent reduction in cost per unit of production. This would equate to a decrease, using the five percent figure, from $784.21 in FY 1997 to $745.00 in FY 1999 (not adjusted for inflation).
- A three to five percent reduction in the production efficiency and resource utilization ratio. Remember this is a measure of the total activity labor man-hours charged per man-hour of direct production shop time. PHNSY & IMFAC are planning to increase the denominator of this ratio through improved workload management and an increase in the number of production workers. This level of reduction would equate to a decrease from 2.28 in FY 1997 to 2.17 in FY 1999.
- A seven to ten percent reduction in the total line items of CSMP backlog. Using the ten percent figure, this would equate to a "per ship backlog" decrease from 530 to 477 jobs for surface ships and 390 to 351 jobs for submarines over the period of FY 1997 to FY 1999.

G. SUMMARY

The process of developing a strategic plan and the measures to evaluate the success or failure in achieving the goals and objectives of the plan is a challenging problem for senior leadership in our NSYs. It is vital that the process be undertaken to ensure goals and objectives are set and clearly understood by management, the workforce, and the stakeholders outside the direct boundaries of the organization. Once the goals are clearly defined, performance measures must be developed to allow all levels of the NSY the opportunity to gauge the extent to which the goals are being met. This chapter briefly described the framework of the process of developing performance measures. The example used in this thesis to describe the application of the framework is a Naval Shipyard. However, the process will work at any organization. In fact GPRA requires that the process be undertaken at all public agencies.

VI. FINDINGS AND RECOMMENDATIONS

A. FINDINGS

This thesis has examined many aspects of the PHNSY & IMFAC consolidation in Pearl Harbor. In particular the performance measures selected to evaluate the efficacy of the consolidation were presented and discussed in detail. The five metrics proposed by NAVSEA and the NAS are very appropriate measures with which to evaluate the success of the PHNSY & IMFAC consolidation. They effectively represent two of the four perspectives of the Balanced Scorecard. It must be remembered that one of the perspectives, the internal-business perspective was not considered an appropriate area for external concern. Therefore the only perspective not covered by the proposed metrics is the financial perspective. For that perspective, total asset turnover, a financial measure, would be an excellent measure to include. That ratio not only provides an evaluation of how well NSY resources are being used, it tracks inventory and infrastructure reductions as well.

Figure 6.1 shows how the metrics recommended for PHNSY & IMFAC fit into the Balanced Scorecard. The measures shown in the figure and discussed in Chapter V are excellent measures for PHNSY & IMFAC senior management to track. Now the question is: what metrics should OSD and Congress review to measure the success of consolidation? The following list provides one possible answer.

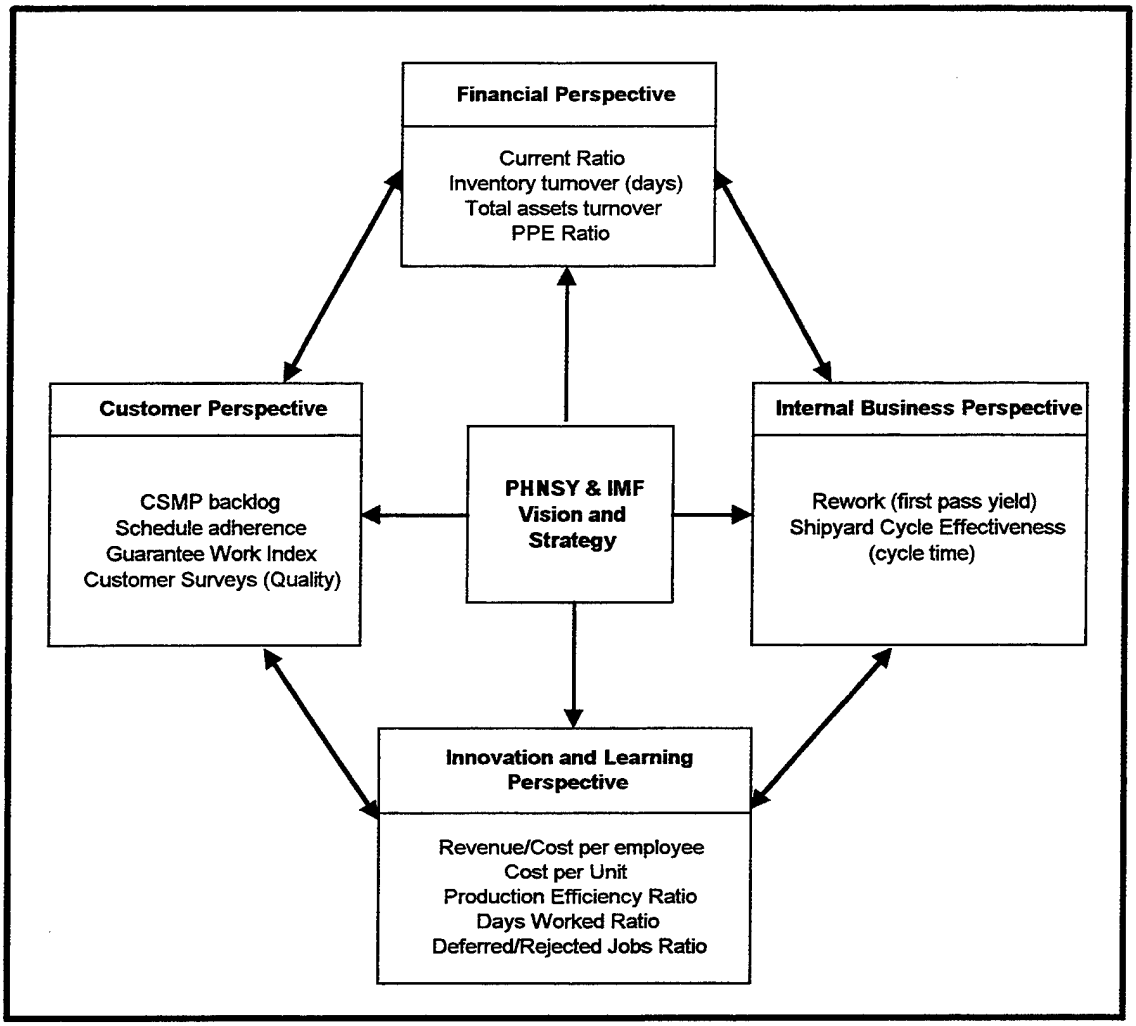

Figure 6.1. PHNSY & IMFAC and the Balanced Scorecard.

1. The Customer Perspective

- CSMP backlog should be a primary indicator of the success of the consolidation. As has been discussed in detail this measure should decrease as more production capability is generated as a result of the consolidation. Again, it is imperative that every effort be made to ensure the CSMPs are as accurate as possible.
- Schedule adherence is important to both the ship and the Fleet commander for obvious reasons. It may not be obvious why it is also important to PHNSY & IMFAC. Depot and intermediate level availabilities are scheduled well into the future. If an availability runs longer than originally planned it affects the other availabilities that are already in progress or just starting. Production shops get

overloaded and all work slows down. This affects the other availabilities and they tend to run longer also, and the cycle continues.

- The Test Plan intends to measure a "quality" metric through the use of customer satisfaction surveys. Surveys certainly have their place. It is important that the surveys ask the proper questions and that action is taken to address the concerns of the customers. If those two areas are not addressed the surveys will not be effective.

2. The Financial Perspective

Total asset turnover should be the measure OSD and Congress review in this perspective. It captures not only the relationship between revenue and total assets, but it will also track the efforts to reduce inventory and infrastructure. It therefore becomes a single measure that tracks how well the public's money is being utilized by PHNSY & IMFAC.

3. The Internal Business Perspective

For this perspective there are no specific metric recommendations for OSD and Congress. Both cycle-time and rework metrics would be very useful measures to track. As discussed, the development of those measures will be difficult. By focusing on one process, attention to another process might slip. Gains in one area might be made at the expense of other areas. However, this is a perspective in which some very important metrics could be developed that would be useful in measuring the success of the consolidation. Both OSD and the Congress would probably be interested in knowing the effect on specific internal processes resulting from the consolidation. This is an important perspective for PHNSY & IMFAC to explore.

4. The Innovation and Learning Perspective

- Cost per unit of production is a good measure. Again, this metric was placed in this perspective instead of the financial perspective because the metric is a surrogate productivity measure. The metric does not directly measure productivity, however, it does measure an area in which productivity gains are expected: namely, direct production man-hours. Additionally, it is a measure that PHNSY & IMFAC and NAVSEA are already tracking in some form or another.
- The Days Worked Ratio (DWR) will be useful to compare to the other three NSYs. Currently the PHNSY DWR is quite a bit lower than the other NSYs. Hopefully the movement of personnel into the production shops and away from overhead activities will result in an increase in the DWR.
- Revenue/Cost per employee is useful because it can be directly compared to private sector businesses in the same industry as the NSYs. It is also an excellent productivity measure that will work in concert with the other metrics in this perspective.
- Production Efficiency is a metric that attempts to measure the capacity usage of PHNSY & IMFAC. This measure in conjunction with the DWR will provide an excellent picture of how productive PHNSY & IMFAC is, both in terms of internal capacity utilization and personnel resource utilization.

As time and the consolidation progress, there will be other metrics to measure and track. The performance measures developed in this thesis are but a handful of the total number that could be used. However, in keeping with the BSC goal of reducing the number of metrics to track, fifteen were proposed. Of those, five had been previously proposed by Pearl Harbor Pilot Test Plan. Those five metrics were evaluated as excellent measures with which to judge the performance of PHNSY & IMFAC in FY 1999. Additionally, three other metrics, total asset turnover, the days worked ratio, and revenue/cost per employee were introduced. These three metrics "back-up" some of the other five metrics as well as capture other important aspects of the consolidation's

performance. As a package, the eight metrics are considered "strategically valuable" for review at the OSD and Congressional level.

B. RECOMENDATIONS FOR FURTHER STUDY

Many areas are available for further study. Four have been selected and will be presented.

1. The Financial Perspective

A detailed financial comparison between the private and public shipyards would be very useful to decision-makers in NAVSEA. Currently there has not been a concerted effort to determine whether or not public shipyards are comparable to private shipyards. Additionally, a financial comparison between the four NSYs might also be useful. The proposed study should first examine the account structure differences between the public and private sector.

a. The Balance Sheet

The assets side of the balance sheet should be closely studied to ensure the assumptions made in this thesis are in fact valid. If they are, then the ratio analysis is also valid and direct comparisons can be made between the public and private shipyards. If the assumptions are not entirely valid, then the study should seek to determine if any corrections could be applied to allow direct comparison of the financial statements. On the other side of the balance sheet, the concepts of liability and equity (capital) are treated very differently. However some commonality may be found that would allow more areas of comparison between the private and public shipyards. The common areas would then facilitate more comparison.

b. The Income Statement

As with the balance sheet, each portion of the income sheet should be examined to determine how closely the account structure "lines-up." Most of the expense accounts shown on the income portion of the NSY's Financial & Operating Statement appear to match the private financial statements. Some of the revenue accounts, however, do not. How does that affect the comparison? Can adjustments be made to facilitate comparison? These are but a few of the questions that were raised during the course of this thesis.

2. The Customer Perspective

Several customer-related metrics have been presented and discussed in this thesis. One area that requires further analysis is the concept of "readiness." What is readiness? Can it be measured? How can it be measured? There has been previous research dedicated to this subject area. However no entirely satisfactory measures have resulted. TYCOMs and Fleet Commanders would like to know whether or not a ship is ready to go on deployment. Is the ship ready for combat? Can the ship carry out its mission? These are important questions. While there are some measures to fall back on (e.g., inspection results, training conducted), in the end, senior commanders make these decisions based on subjective measures. While there is nothing wrong with this, perhaps a few new objective measures can be developed to aid the decision making process.

3. The Internal Business Perspective

Previously it has been asserted that this perspective is the domain of internal managers. However, outside research into the different internal processes that make up a shipyard and a ship overhaul could provide insights that would be helpful to managers at

the shipyard. Value chain analysis and process analysis are two of the commonly used methods for this type of investigation. Ideas for specific areas to research could be provided by NASVEA or by one of the NSYs.

4. The Innovation and Learning Perspective

This would be an excellent area of study. Central questions would be:

- What is the output of a NSY?
- How can that output be measured?
- What specific actions can be taken to sustain the ability of a NSY to change and improve?

This perspective gets at the heart of productivity and improvement. Managers at all levels of the NSYs and at NAVSEA are vitally interested in improving shipyard efficiency and effectiveness. Any studies that shed light on potential areas of improvement would be well received.

C. FINAL THOUGHTS

The four perspectives presented in Chapter IV and V provide a slightly different view of NSY operations than has been presented before. In fact, in terms of financial performance, PHNSY is on equal footing with the four private shipyards that were used for comparison purposes. Public management is not like private management. If anything, managing a large public process like a NSY is much more difficult than in the private shipyard industry. In the private sector creating shareholder value is the bottom-line. All efforts are aimed at that goal. The public sector is interested in creating stakeholder value although, in the past, that goal was not the priority. The GPRA has

rearranged the priorities of the public sector manager. They must now think in terms of stakeholder value, efficiency, and effectiveness in much the same way the private sector manager does. However, the measures that have traditionally been used in the private sector are not directly transferable to the public sector. The public sector manages to a budget; the private sector manages to the bottom-line. Fortunately there are several measures that tell a similar story in both sectors.

If the forecasted improvements discussed in Chapter V occur, they would be impressive gains in performance for PHNSY & IMFAC. While only estimates of future improvements, they highlight the possibilities that I & D level consolidations can achieve. We must now wonder if the same possibilities can be achieved with consolidations at Puget Sound Naval Shipyard & Trident Refit Facility and Norfolk Naval Shipyard & Regional Maintenance Center. The next year will be a critical time for PHNSY & IMFAC. Not only must they streamline the consolidated organization, they must do it under the watchful gaze of a host of other parties who are very interested in the outcome. In FY 1999, the baseline will be compared to the FY 1999 numbers. If the numbers indicate the experiment has been successful, the Navy should certainly look to the other co-located I&D sites for further consolidations.

In the end, if the Pilot is successful, the public as well as the Navy will be the winners. Improved maintenance effectiveness and efficiency will increase the readiness of our nation's warships, increase the Navy's ability to carry out its mission, and increase the public's "return on investment."

APPENDIX A

NAVAL INTERMEDIATE MAINTENANCE FACILITY
NAVCOMPT FORMS

LXR3417A 971804 70BB 39290 O

LXR3417A TRIAL BALANCE REPORT IN LIEU OF NAVCOMPT FORM 2199 FOR PERIOD ENDING 30 SEPTEMBER 1997 PAGE 1

FROM: 45924 DFAS HONOLULU OPLOC
BLDG 77 BOX 1392 FORD ISLAND 968607553

TO: AAA OF OB GRANTOR DFAS HONOLULU OPLOC
BLDG 77 BOX 1392 FORD ISLAND
UIC 45924
968607553

FOR: OB HOLDER NAVIMFAC 39290
PEARL HARBOR, HI 968606500

FOR OB GRANTOR: CINCPACFLT
250 MAKALAPA DR
UIC 0007C
968607000

APPRO 971804 S/H 70BB OB 39290 SX O

ACCOUNT NUMBER AND TITLE	BALANCES PRIOR MONTH		BALANCES CURRENT MONTH		CHANGES FOR MONTH	
ASSETS	DEBIT	CREDIT	DEBIT	CREDIT	DEBIT	CREDIT
1031 ALLOTMENTS/OBS AUTHORIZED	58294000.00	.00	58894000.00	.00	600000.00	.00
1040 FUNDS COLLECTED AUTO	3910092.61	.00	5174973.89	.00	1264881.28	.00
1041 FUNDS COLL AUTO INTRA APPN	3061687.89	.00	4205759.46	.00	1144071.57	.00
1042 FUNDS COLL AUTO OTH DEFENSE	848404.72	.00	969214.43	.00	120809.71	.00
1060 FUNDS DISBURSED	.00	48358520.58	.00	54320743.75	.00	5962223.17
1100 ACCOUNTS RECEIVABLE US GOVT AGEN	756958.37	.00	87867.15	.00	.00	669091.22
1110 ACCT RECV AUTO BILLED US GOVT	6036.07	.00	8353.54	.00	2317.47	.00
1112 A/R AUTO BILLED OTH DEF APPN	6036.07	.00	8353.54	.00	2317.47	.00
1120 ACCT RECV AUTO UNBILLED US GOVT	750922.30	.00	79513.61	.00	.00	671408.69
1121 A/R AUTO UNBILLED INTRA APPN	687854.97	.00	66455.34	.00	.00	621399.63
1122 A/R AUTO UNBILLED OTH DEF APPN	63067.33	.00	13058.27	.00	.00	50009.06
1512 TRAVEL ADVANCES	24308.00	.00	29477.00	.00	5169.00	.00
1810 REIMBURSABLE ORDERS RCVD AUTO	6482387.14	.00	5925385.31	.00	.00	557001.83
1811 R/O RCVD AUTO INTRA APPN	5169694.17	.00	4781966.19	.00	.00	387727.98
1812 R/O RCVD AUTO OTH DEF APPN	1312692.97	.00	1143419.12	.00	.00	169273.85
1960 UNMATCHED FUNDS DISBURSED	158468.63	.00	12268.34	.00	.00	146200.29

CERTIFICATION:
I CERTIFY THAT THE AMOUNTS HEREIN REPORTED ARE IN ACCORDANCE WITH 31 USC 200 AND PRESCRIBED ACCOUNTING PROCEDURES.

REPORTING FISCAL OFFICER: RUTH A. MATHER
SIGNATURE & TITLE/RANK: BY DIRECTION
DATE: 09/30/97

LXR3417A 971804 708B 39290 O

LXR3417A TRIAL BALANCE CONTINUATION SHEET IN LIEU OF NAVCOMPT FORM 2199A FOR PERIOD ENDING 30 SEPTEMBER 1997 PAGE 2
APPR: 17971804 SH: 708B AAA 45924 OB HOLDER 39290 TO AAA OF OB GRANTOR 45924 OB GRANTOR 00070

ACCOUNT NUMBER AND TITLE	BALANCES PRIOR MONTH		BALANCES CURRENT MONTH		CHANGES FOR MONTH	
	DEBIT	CREDIT	DEBIT	CREDIT	DEBIT	CREDIT
TOTAL ASSETS	69626214.75	48358520.58	70123971.69	54320743.75	1872367.75	7336833.98
LIABILITIES						
2000 ACCTS PAYABLE - US GOV AGENCIES	.00	690689.31	.00	700442.17	.00	9752.86
2010 ACCTS PAYABLE - US GOV AGENCIES	.00	690689.31	.00	700442.17	.00	9752.86
2100 ACCTS PAYABLE - PUBLIC	.00	1383658.05	.00	1567435.23	.00	183777.18
2140 ACCTS PAY - PUBLIC	.00	1383658.05	.00	1567435.23	.00	183777.18
TOTAL LIABILITIES	.00	2074347.36	.00	2267877.40	.00	193530.04
INVESTMENTS						
3211 UNCOM/UNOBL AUTH - DIRECT PGM	.00	2792522.53	.00	.00	2792522.53	.00
3212 UNCOM/UNOBL AUTH - REIMB PGM	.00	96688.48	.00	.00	96688.48	.00
3221 UNOBL COM - DIRECT PGM	.00	804269.83	.00	.00	804269.83	.00
3222 UNOBL COM - REIMB PGM	.00	25736.26	.00	.00	25736.26	.00
3223 UNOBL COM - REIMB INTRA APPN	.00	23466.28	.00	.00	23466.28	.00
3224 UNOBL COM - REIMB OTH DEF APPN	.00	2269.98	.00	.00	2269.98	.00
3230 UNDELIVERED ORD/OUTSTAND OBLIG	.00	9114167.31	.00	7609595.12	1504572.19	.00
3231 UNDEL ORD/OUTSTAND OBL - DIRECT	.00	8622383.42	.00	7070946.82	1551436.60	.00
3239 UNDEL ORDER DIRECT PGM MRP	.00	491783.89	.00	538648.30	.00	46864.41

CERTIFICATION:
I CERTIFY THAT THE AMOUNTS HEREIN REPORTED ARE IN ACCORDANCE WITH 31 USC 200 AND PRESCRIBED ACCOUNTING PROCEDURES.

REPORTING FISCAL OFFICER: SIGNATURE & TITLE/RANK: RUTH A. MATHER BY DIRECTION

DATE: 09/30/97

LXR3417A 971804 708B 39290 O

LXR3417A TRIAL BALANCE CONTINUATION SHEET IN LIEU OF NAVCOMPT FORM 2199A FOR PERIOD ENDING 30 SEPTEMBER 1997 PAGE 3
APPR: 17971804 SH: 708B AAA 45924 OB HOLDER 39290 TO AAA OF OB GRANTOR 45924 OB GRANTOR 00070

ACCOUNT NUMBER AND TITLE	BALANCES PRIOR MONTH		BALANCES CURRENT MONTH		CHANGES FOR MONTH	
	DEBIT	CREDIT	DEBIT	CREDIT	DEBIT	CREDIT
3232 UNDEL ORD/OUTOBL REIMB PROGRAM	.00	1692911.42	.00	662544.27	1030367.15	.00
3233 UNDEL ORDER REIMB INTRA APPN	.00	1601209.24	.00	509751.39	1091457.85	.00
3234 UNDEL OR/OUTOBL RMB OTH DEF A	.00	91702.18	.00	152792.88	.00	61090.70
3280 DIR UNOBL BAL AVAIL EXPIRED ACC	.00	.00	.00	370.11	.00	370.11
3310 ACCRUED EXPENDITURES - DIRCT PGM	.00	45583040.33	.00	51284034.77	.00	5700994.44
3320 ACCRUED EXPENSES - REIMB PROGRAM	.00	4667050.98	.00	5262841.04	.00	595790.06
TOTAL INVESTMENTS	.00	64776387.14	.00	64819385.31	6362111.55	6405109.72
INCOME						
4010 INCOME - AUTOMATIC	.00	4667050.98	.00	5262841.04	.00	595790.06
4011 INCOME - AUTO INTRA APPN	.00	3749542.86	.00	4272214.80	.00	522671.94
4012 INCOME - AUTO OTH DEF APPN	.00	917508.12	.00	990626.24	.00	73118.12
TOTAL INCOME	.00	4667050.98	.00	5262841.04	.00	595790.06
EXPENSES						
5010 COST WORK FOR OTHERS CURRENT YR	4667050.98	.00	5262841.04	.00	595790.06	.00
5321 GEN EXPENSES - OTHER CURRENT YR	45125502.92	.00	50791711.85	.00	5666208.93	.00
5324 GEN EXPENSES - MRP CURRENT YR	457537.41	.00	492322.92	.00	34785.51	.00
TOTAL EXPENSES	50250091.31	.00	56546875.81	.00	6296784.50	.00

CERTIFICATION:
I CERTIFY THAT THE AMOUNTS HEREIN REPORTED ARE IN ACCORDANCE WITH 31 USC 200 AND PRESCRIBED ACCOUNTING PROCEDURES.

REPORTING FISCAL OFFICER SIGNATURE & TITLE/RANK: RUTH A. MATHER BY DIRECTION

DATE: 09/30/97

LXR3417A 971804 70BB 39290 O

LXR3417A TRIAL BALANCE CONTINUATION SHEET IN LIEU OF NAVCOMPT FORM 2199A FOR PERIOD ENDING 30 SEPTEMBER 1997 PAGE 4
APPR: 17971804 SH: 70BB AAA 45924 OB HOLDER 39290 TO AAA OF OB GRANTOR 45924 OB GRANTOR 00070

ACCOUNT NUMBER AND TITLE	BALANCES PRIOR MONTH DEBIT	BALANCES PRIOR MONTH CREDIT	BALANCES CURRENT MONTH DEBIT	BALANCES CURRENT MONTH CREDIT	CHANGES FOR MONTH DEBIT	CHANGES FOR MONTH CREDIT
MEMORANDUM/BUDGETARY						
TOTAL MEMORANDUM/BUDGETARY	.00	.00	.00	.00	.00	.00
GRAND TOTAL	119876306.06	119876306.06	126670847.50	126670847.50	14531263.80	14531263.80
STATISTICAL						
0931 UNOB ANL BAL AVL-GP OTH THN MRP	4546113.66	.00	1031341.33	.00	.00	3514772.33
0932 UNOB ANNUAL BAL AVAIL FOR MRP	.00	949321.30	.00	1030971.22	.00	81649.92
0949 MRP GROSS ADJ OBLIG	949321.30	.00	1030971.22	.00	81649.92	.00
0966 ANNUAL LEAVE CONTINGENT LIAB	.00	.00	2957275.75	.00	2957275.75	.00
0967 EARNED & UNPAID SALARY & WAGES	1163607.01	.00	1384504.48	.00	220897.47	.00
0971 GROSS ADJ OBLIG TRAVEL DIR PGM	205396.52	.00	190881.01	.00	.00	14515.51
0972 GROSS ADJ OBLIG TRAV REIMB PGM	43850.10	.00	45377.77	.00	1527.67	.00
0976 GROSS ADJ OBL-TRNSP THINGS-DIR	725815.15	.00	683922.01	.00	.00	41893.14
0977 GROSS ADJ OBL-TRNSP THINGS-RMB	71356.51	.00	65535.49	.00	.00	5821.02
0978 GROSS ADJ OBL ADMIN TRAVEL DIR	956.44	.00	956.44	.00	.00	.00
0983 AVIATION DLR GROSS ADJ OBLIG	23255.00	.00	16389.00	.00	.00	6866.00
0998 GROSS ADJ OBLIG-OBLIG AUTH	54697207.64	.00	58893629.89	.00	4196422.25	.00
0999 GROSS ADJ OBLIG-AUTO REIMB PGM	6359962.40	.00	5925385.31	.00	.00	434577.09
TOTAL STATISTICAL	68786841.73	949321.30	72226169.70	1030971.22	7457773.06	4100095.01

CERTIFICATION:
I CERTIFY THAT THE AMOUNTS HEREIN REPORTED ARE IN ACCORDANCE WITH 31 USC 200 AND PRESCRIBED ACCOUNTING PROCEDURES.

REPORTING SIGNATURE & TITLE/RANK FISCAL OFFICER:RUTH A. MATHER BY DIRECTION

DATE: 09/30/97

I HEREBY CERTIFY AS OF THIS DATE THAT THE ATTACHED 30 SEPT 1997 ACCOUNTING/FINANCIAL REPORTS HAVE BEEN PROPERLY AND CORRECTLY PREPARED REFLECTING ALL INFORMATION PROVIDED AND ALL OTHER REQUIRED DATA REPORTED TO THE DEFENSE FINANCE AND ACCOUNTING SERVICE, CLEVELAND CENTER - PEARL HARBOR.

REPORTING SIGNATURE & TITLE/RANK FISCAL OFFICER:RUTH A. MATHER BY DIRECTION

LXR2416A SUB-ACTIVITY GROUP/FUNCTIONAL CATEGORY/EXPENSE ELEMENT REPORT IN LIEU OF NAVCOMPT 2171 PERIOD ENDING 30 SEPTEMBER 1997

FROM-DFAS HONOLULU OPLOC
PEARL HARBOR HI 968607553

TO-CINCPACFLT
PEARL HARBOR HI 968607000

OB APPROVED FOR-NAVIMFAC
PEARL HARBOR, HI 968606500

REPORTING FISCAL OFFICER RUTH A. MATHER . BY DIRECTION

APPRO 971804 S/H 708B OB 39290 O CHARGEABLE UIC

CODE			EXPENSES		GROSS ADJUSTED OBLIGATIONS	
SAG	F/SF	E/E OOC	CURRENT MONTH	F.Y.T.D.	CURRENT MONTH	F.Y.T.D.
7B	Q	250	34,785.51	477,972.89	83,726.57	1,008,119.62
7B	T	260	.00	14,350.03	2,076.65-	22,851.60
7B	-TOTAL		34,785.51	492,322.92	81,649.92	1,030,971.22
GRAND TOTAL			6,296,784.50	56,546,875.81	3,761,845.16	64,819,015.20

REG 10 STANDARD SUMMARY CONTROL CARD

10 C 1804 708B 09 97 000108 39290 O 7 0005700994.44 0000595790.06 0004196422.25 0000434577.09-

APPENDIX B

NAVAL INTERMEDIATE MAINTENANCE FACILITY
MRMS DATA FOR 1997

APPENDIX B

NAVAL INTERMEDIATE MAINTENANCE FACILITY
MRMS DATA FOR 1997

	Oct-96	Nov-96	Dec-96	Jan-97	Feb-97	Mar-97	Apr-97	May-97
Total Mhrs Assigned	219,826	181,271	196,377	196,340	178,435	199,438	196,633	188,549
Gross Support Mhrs	58,608	47,752	54,496	56,400	51,579	58,616	57,943	54,759
Gross Prod Mhrs	161,218	133,519	141,881	139,940	126,856	140,822	138,690	133,790
Prod Mhrs deducts	49,540	44,769	52,064	44,171	33,893	35,926	45,285	40,924
Net Prod Avail Mhrs	111,678	88,750	89,817	95,769	92,963	104,896	93,405	92,866
Support Mhrs deducts	7,386	5,894	7,082	6,538	5,341	6,279	6,421	5,436
Net Supp Avail Mhrs Ex	51,222	41,858	47,414	49,862	46,238	52,337	51,522	49,323
Exp Prod Mhrs	98,111	87,792	81,313	91,278	86,483	99,968	87,274	87,849
Earned Mhrs	96,556	78,767	75,018	86,327	82,089	93,599	77,082	78,509
Mhrs Unasgnd to JCN	8,052	6,216	5,537	4,359	3,922	3,809	4,172	3,700
Lost Time Mhrs	2,383	2,665	3,481	3,511	4,445	3,719	2,965	2,887
Unaccounted Time	4,687	1,102	5,781	1,572	2,507	3,769	9,186	7,770
OT Mhrs Prod	632	742	425	505	896	508	358	497
OT Mhrs Prod Supp	1,804	1,018	608	1,450	1,103	1,498	1,449	1,437
MOEs								
Performance	0.865	0.888	0.835	0.901	0.883	0.892	0.825	0.845
Expended/Earned	1.016	1.115	1.084	1.057	1.054	1.068	1.132	1.119
Workload Performance	0.932	0.954	0.890	0.944	0.922	0.926	0.864	0.880
OT Prod Ratio	0.64%	0.85%	0.52%	0.55%	1.04%	0.51%	0.41%	0.57%
Utilization	0.693	0.665	0.633	0.684	0.733	0.745	0.673	0.694
Gross Utilization	0.508	0.490	0.457	0.488	0.521	0.526	0.475	0.493
Productivity	0.599	0.590	0.529	0.617	0.647	0.665	0.556	0.587
Total Deduction %	25.9%	27.9%	30.1%	25.8%	22.0%	21.2%	26.3%	24.6%
Load Ratio	0.928	0.930	0.938	0.954	0.958	0.964	0.955	0.960

Performance=Earned Mhrs/Net PAM
Workload Performance=Earned Mhrs/(Net PAM-Mhrs Unasgnd to JCN)
Utilization=Net PAM/Gross PAM
Gross Utilization=Net PAM/Total Mhrs Assigned

APPENDIX B

NAVAL INTERMEDIATE MAINTENANCE FACILITY
MRMS DATA FOR 1997

	Jun-97	Jul-97	Aug-97	Sep-97	Totals	Mdays
Total Mhrs Assigned	186,727	181,340	188,406	183,085	2,296,427	287,053
Gross Support Mhrs	54,670	47,926	42,682	40,669	626,100	78,263
Gross Prod Mhrs	132,057	133,414	145,724	142,416	1,670,327	208,791
Prod Mhrs deducts	47,494	44,966	47,873	46,147	533,052	66,632
Net Prod Avail Mhrs	84,563	88,448	97,851	96,269	1,137,275	142,159
Support Mhrs deducts	6,495	5,009	5,259	5,037	72,177	9,022
Net Supp Avail Mhrs Exp	48,175	42,917	37,423	35,632	553,923	69,240
Exp Prod Mhrs	79,032	80,092	89,391	89,275	1,057,858	132,232
Earned Mhrs	87,433	81,352	98,178	103,788	1,038,698	129,837
Mhrs Unasgnd to JCN	6,575	4,993	4,469	4,050	59,854	7,482
Lost Time Mhrs	2,488	1,941	1,807	1,574	33,866	4,233
Unaccounted Time	(11,933)	162	(6,603)	(13,143)	4,857	607
OT Mhrs Prod	330	254	1,398	2,310	8,855	1,107
OT Mhrs Prod Supp	1,224	768	1,134	1,349	14,842	1,855
MOEs						
Performance	1.034	0.920	1.003	1.078	0.913	
Expended/Earned	0.904	0.985	0.910	0.860	1.018	
Workload Performance	1.121	0.975	1.051	1.125	0.964	
OT Prod Ratio	0.42%	0.32%	1.56%	2.59%	0.84%	
Utilization	0.640	0.663	0.671	0.676	0.681	
Gross Utilization	0.453	0.488	0.519	0.526	0.495	
Productivity	0.662	0.610	0.674	0.729	0.622	
Total Deduction %	28.9%	27.6%	28.2%	28.0%	26.4%	
Load Ratio	0.922	0.944	0.954	0.958	0.947	

Productivity=Earned Mhrs/Gross PAM
Load Ratio=(Net PAM-Mhrs Unasgnd to JCN)/Net PAM
Earned Mhrs=ETV
Expended Mhrs=Actual clock time

APPENDIX C

PEARL HARBOR NAVAL SHIPYARD
FINANCIAL AND OPERATING STATEMENT
HIGHLIGHTS FOR 1997

EXHIBIT A

PEARL HARBOR NAVAL SHIPYARD
STATEMENT OF FINANCIAL CONDITION
AS OF 30 SEPTEMBER 1997

GENERAL LEDGER ACCTS	DESCRIPTION	ACTUAL	PRES BUD EOFY ($000)
	ASSETS		
1110	CASH	$ 36,522,611.15	6,559
1120	a. COLLECTED OPERATIONS	344,295,334.91	
1131	b. COLLECTED CAPITAL ASSETS SURCHG	4,265,048.16	
1136	c. COLLECTED UNDISTRIBUTED DBOF	0.00	
1150	d. DISBURSED OPERATIONS	(316,365,013.77)	
1160	e. DISBURSED CAPITAL ASSETS	(3,416,513.95)	
1163	f. DISBURSED UNDISTRIBUTED DBOF	7,743,755.80	
1200	ADVANCES/LOANS	0.00	
1300	ACCOUNTS RECEIVABLE	351,061.49	
1310	a. GOVERNMENT	155,800.29	
1320	b. OTHER	0.00	
1321/24	(1) COMMERCIAL/EMPLOYEES	0.00	
1325	(2) MISCELLANEOUS	0.00	
1330	c. CREDITS PENDING--GOV'T SOURCES	195,261.20	
1390	d. ACCOUNTS RECEIVABLE--UNBILLED	0.00	
1391	(1) UNFUNDED COMMANDERS ORDERS	0.00	
1392	(2) COST OVERRUNS--GOVERNMENT	0.00	
1400	TOTAL INVENTORIES	21,285,231.76	
1410	a. WORK-IN-PROCESS	2,418,309.53	
1411	(1) IN-HOUSE */a/*	11,763,183.46	
2410	(2) LESS PROGRESS PYMTS RECEIVED	(9,344,873.93)	
1418	b. WIP - ACTIVITY RETENTION	3,288,073.51	
1420	c. MATERIALS AND SUPPLIES	14,199,530.10	
1421	(1) MATERIAL & SUPPLIES-ACTIVE	10,284,612.68	
1422	(2) MATERIAL & SUPPLIES-INSURANCE	1,979,458.61	
1423	(3) M&S-FORESEEABLE FUTURE REQMT	1,935,458.81	
1430	d. DIRECT MATERIAL	6,170,667.73	
2420	e. LESS PROGRESS PYMTS RECEIVED	0.00	
1460	f. ALLOWANCE FOR LOSS ON INVENTORY	(4,940,930.68)	
1461	(1) ALLOW FOR MATERIAL&SUPPLIES	(3,444,193.06)	
1462	(2) ALLOW FOR DIRECT MATERIAL	(1,496,737.62)	
1490	g. MATERIAL-IN-TRANSIT	149,581.57	
1491	(1) GOVERNMENT	149,581.57	
1492	(2) FROM CONTRACTOR'S PLANTS	0.00	
1493	(3) UNMATCHED	0.00	
1500	OTHER ASSETS	8,054,391.68	
1510	a. DEFERRED CHARGES	6,210,672.48	
1511	(1) MISCELLANEOUS	6,210,672.48	
1520	b. TRAVEL ADVANCES	409,987.04	
1540	c. UNALLOCATED COSTS	(6,073,698.63)	
1541	(1) UNMATCHED	64,593.28	
1542	(2) UNMATCHED OTHER	1,608,286.88	
1543	(3) UNMATCHED REFUND/COLL	(2,822.99)	
1545	(4) UNDISTRIB DISB--DBOF--SUMM REG	(7,743,755.80)	
1546	(5) UNDISTRIB COLL--DBOF--SUMM REG	0.00	
1590	d. ASSETS UNDER DEVELOPMENT	7,507,430.79	
1592	(1) EQUIPMENT	4,942,068.55	
1594	(2) MINOR CONSTRUCTION	2,565,362.24	
1750	FIXED ASSETS	128,400,388.30	
1610/20/30	a. CONTRIB/NEW CONTRIB/PURCHASED	323,095,407.08	
1640/50/60	(1) LESS ACCUM DEPRECIATION	(207,260,787.54)	
1670	b. NOT IN USE	0.00	
1680/90	c. OTHER	12,565,768.76	
	TOTAL ASSETS	$ 194,613,684.38	

EXHIBIT A

PEARL HARBOR NAVAL SHIPYARD
FIXED ASSETS ON THE
STATEMENT OF FINANCIAL CONDITION
AS OF 30 SEPTEMBER 1997

GENERAL LEDGER ACCTS	DESCRIPTION	ACTUAL	PRES BUD EOFY ($000)
1750	TOTAL FIXED ASSETS LESS ACCUM DEP	$ 128,400,388.30	
1610	CONTRIBUTED FIXED ASSETS	323,095,407.08	
1611	LAND	69,067.00	
1612	BLDGS STRUCT&UTILITY	147,525,085.64	
1613	PLANT EQUIPMENT	147,566,939.92	
1614	PRODUCTION EQUIPMENT	27,934,314.52	
1615	OTHER EQUIPMENT	0.00	
1616	SOFTWARE	0.00	
1620	NEW CONTRIBUTED FIXED ASSETS	0.00	
1621	LAND	0.00	
1622	BLDGS STRUCT&UTILITY	0.00	
1623	PLANT EQUIPMENT	0.00	
1624	PRODUCTION EQUIP	0.00	
1625	OTHER EQUIPMENT	0.00	
1626	SOFTWARE	0.00	
1630	PURCHASED FIXED ASSETS	0.00	
1632	BLDGS STRUCT&UTILITY	0.00	
1633	PLANT EQUIPMENT	0.00	
1634	PRODUCTION EQUIP	0.00	
1635	OTHER EQUIPMENT	0.00	
1636	SOFTWARE	0.00	
1640	ACCUM DEP CONTRIBUTED FIXED ASSETS	(207,260,787.54)	
1642	BLDGS STRUCT&UTILITY	(107,459,861.54)	
1643	PLANT EQUIPMENT	(82,032,126.00)	
1644	PRODUCTION EQUIPMENT	(17,768,800.00)	
1645	OTHER EQUIPMENT	0.00	
1646	SOFTWARE	0.00	
1650	ACCUM DEP NEW CONTR FIXED ASSETS	0.00	
1652	BLDGS STRUCT&UTILITY	0.00	
1653	PLANT EQUIPMENT	0.00	
1654	PRODUCTION EQUIPMENT	0.00	
1655	OTHER EQUIPMENT	0.00	
1656	SOFTWARE	0.00	
1660	ACCUM DEPRECIATION PURCHASES	0.00	
1662	BLDGS STRUCT&UTILITY	0.00	
1663	PLANT EQUIPMENT	0.00	
1664	PRODUCTION EQUIPMENT	0.00	
1665	OTHER EQUIPMENT	0.00	
1666	SOFTWARE	0.00	
1670	NOT IN USE	0.00	
1680	EXPENSED FIXED ASSETS	0.00	
1682	BLDGS STRUCT&UTILITY	0.00	
1683	PLANT EQUIPMENT	0.00	
1684	PRODUCTION EQUIPMENT	0.00	
1690	PROPERTY AWAITING DISPOSAL	12,565,768.76	

PEARL HARBOR NAVAL SHIPYARD
STATEMENT OF FINANCIAL CONDITION
AS OF 30 SEPTEMBER 1997

GENERAL LEDGER ACCTS		DESCRIPTION	ACTUAL	PRES BUD EOFY ($000)
		LIABILITIES		
2100		ACCOUNTS PAYABLE	$ 6,589,716.57	
2110		a. GOVERNMENT AGENCIES	1,877,372.16	
2140		b. HOLDBACK PROG BILL FROM CONTRACTOR	0.00	
2150		c. OTHER	4,712,344.41	
2151		(1) COMMERCIAL	4,712,344.41	
2152		(2) TRANSPORTATION REQUEST	0.00	
2153		(3) CAPITAL LEASES	0.00	
2154		(4) MISCELLANEOUS	0.00	
2160		d. INTEREST	0.00	
2170		e. UNFUNDED COSTS/SURCHARGES	0.00	
2200		ACCRUED EXPENSES	40,574,979.70	
2210		a. LEAVE	13,210,215.82	
2220		b. SALARIES AND WAGES–CIVILIAN	7,867,452.81	
2230		c. FRINGE BENEFITS	995,744.29	
2250		d. MILITARY LABOR	1,088,784.00	
2270		e. OTHER	17,412,782.78	
2300		ADVANCES/LOANS	27,440,874.68	
2315		a. GOVERNMENT	27,010,531.14	
2313		(1) ADVANCE BILLING	23,432,030.60	
2314		(2) ADVANCES–REV RECOGNITION	3,578,500.54	
2320		b. OTHER	430,343.54	
2500		OTHER LIABILITIES	6,623,556.62	
2570		a. MISCELLANEOUS OTHER LIABILITIES	6,623,556.62	
		SETTLEMENT OF CLAIMS	0.00	
		TOTAL LIABILITIES	$ 81,229,127.57	
		TOTAL CAPITAL (EXHIBIT A-1)	113,384,556.81	
		TOTAL LIABILITIES AND CAPITAL	$ 194,613,684.38	
		UNDELIVERED ORDERS		
9510		1. OBLIGATED TO GOVERNMENT	$ 42,120,941.98	
9520		2. OBLIGATED TO PUBLIC	17,719,686.05	
9900		UNBILLED BAL OF CUSTOMER ORDERS	$ 76,885,778.53	
9460	/a/	CONTAINS UNBILLABLE WIP OF	$ 1,332,020.21	
6021		SPONSOR FURNISHED MATERIAL	$ 389,137.50	
6110		SPONSOR-OWNED EQUIPMENT - IN USE	4,190,000.00	
6130		ACCUMULATED DEPRECIATION	(2,979,544.00)	
6300		UNFUNDED CONTRIBUTED CAPITAL	(1,599,593.50)	

"I hereby certify that the amounts shown in this report are correct. All known transactions meeting the criteria of 31 U.S.C. 1501 (a) have been obligated and are so reported."

DATE 20 OCT 1997 SIGNATURE L. C. Mitchell

POSITION TITLE: L. C. MITCHELL, CAPT, USN, COMPTROLLER

EXHIBIT A-1

PEARL HARBOR NAVAL SHIPYARD
ANALYSIS OF CAPITAL FUND
AS OF 30 SEPTEMBER 1997

GENERAL LEDGER ACCTS		AT INCEPTION	PRIOR FISCAL YEAR	CURRENT FISCAL YEAR	INCEPTION TO DATE
	PRINCIPAL				
2910	CASH ALLOCATION	$ 7,500,000.00	$ (7,500,000.00)	$ 28,024,000.00	$ 28,024,000.00
2921	DONATED MATERIAL & WORK-IN-PROCESS	320,821.00	1,093,164.32	607,219.59	2,021,204.91
2922	CONTRIBUTED FIXED ASSETS	0.00	31,164,297.38	8,405,148.80	39,569,446.18
2923	LIABILITIES ASSUMED	0.00	0.00	0.00	0.00
2924	ASSETS CAPITALIZED-PRIOR TO WCF	0.00	90,370,649.94	(292,713.16)	90,077,936.78
2942	TRF-IN FROM OTHERS W/O REIMB-CAP-WCF	0.00	0.00	0.00	0.00
2951	TRF-OUT TO OTH W/O REIMB-GOVT AGENCIES	0.00	0.00	0.00	0.00
2953	TRF-OUT TO OTH W/O REIMB-WCF	0.00	0.00	(2,118,652.82)	(2,118,652.82)
2954	TRF-OUT TO OTH W/O REIMB-CAP WCF	0.00	(42,787.93)	42,827.93	40.00
2961	NET TREASURY CASH-WCF	0.00	(82,075,697.05)	69,909,118.35	(12,166,578.70)
2970	RESERVES	0.00	6,755,652.04	4,261,361.01	11,017,013.05
2971	a. CAPITAL EQUIPMENT PURCHASES	0.00	(32,479.47)	32,479.47	0.00
2972	b. MAJOR MAINTENANCE AND REPAIR	0.00	0.00	0.00	0.00
2973	c. MINOR CONSTRUCTION	0.00	36,166.62	(36,166.62)	0.00
2974	d. CASH LEVEL REQUIREMENTS	0.00	0.00	0.00	0.00
2975	e. SOFTWARE SYSTEMS DEVELOP EFFORTS	0.00	0.00	0.00	0.00
2976	f. OTHER	0.00	6,751,964.89	4,265,048.16	11,017,013.05
	NET PRINCIPAL	$ 7,820,821.00	$ 39,765,278.70	$ 108,838,309.70	$ 156,424,409.40
2930	ACCUMULATED OPERATING RESULTS	0.00	(37,022,457.14)	(6,017,395.45)	(43,039,852.59)
2932	a. OVER/UNDER APPLIED VARIANCE			3,953,416.16	
2934	b. RATE STAB VARIANCE ON CR ORDERS			139,058.15	
2935	c. COST OVERRUNS ON CR ORDERS			23,778.12	
2936	d. FIXED PRICE--RATE STAB VARIANCE			(10,474,613.33)	
2937	e. FIXED PRICE--OTHER VARIANCE			2,133,778.59	
2933	f. EXTRAORDINARY CURRENT YEAR VARIANCE			(1,792,813.14)	
2939	g. OTHER ADJUSTMENTS			0.00	
	TOTAL CAPITAL	$ 7,820,821.00	$ 2,742,821.56	$ 102,820,914.25	$ 113,384,556.81

PEARL HARBOR NAVAL SHIPYARD
STATEMENT OF REVENUE AND COSTS
PERIOD ENDING 30 SEPTEMBER 1997

GENERAL LEDGER ACCTS	DESCRIPTION	ACTUAL	PRES BUD EOFY ($000)
3000	**REVENUE**		
3010	MANUFACTURING & ASSEMBLY	$ 0.00	
3020	CONSTRUCTION & CONVERSION	813,945.74	
3030	OVERHAUL, REPAIR & RENOVATION	246,342,986.79	
3040	ALTERATION & MODIFICATION	26,342,583.05	
3050	RESEARCH & DEVELOPMENT	979.43	
3100	SUPPORT OF SERVICE-WIDE SUPPLY	0.00	
3110	SUPPORT OF TENANTS & SATELLITES	1,874,164.06	
3120	ADDNS & IMPROVEMENTS TO PLT/EQ	0.00	
3140	OTHER PRODUCTS & SERVICES	14,194,373.48	
3161	REV FR DEPR-OTHER-SVCS PROVIDED	2,825,831.56	
3162	REV FR DEPR-MILCON-SVCS PROVIDED	1,469,241.00	
3171	CAPITAL ASSET SURCHARGE	4,265,048.16	
3173	MILCON SURCHARGE	0.00	
3175	CASH SURCHARGE	28,024,000.00	
	TOTAL REVENUE	$ 326,153,153.27	353,553
	COSTS		
4500	DIRECT COSTS INCURRED	$ 162,014,388.31	144,461
4510	1. SALARIES & WAGES--CIVILIAN	99,463,343.01	94,178
4520	2. MATERIALS, SUPPLIES & PARTS USED	29,255,327.02	23,066
4530	3. OTHER COSTS	1,838,269.47	2,153
4540	4. CONTRACTUAL SERVICES	31,341,480.54	24,933
4550	5. DEPRECIATION EXPENSE	11,963.00	11
4590	6. TRANSFERS	104,005.27	120
4600	PRODUCTION EXPENSE	89,393,381.08	92,746
4610	1. SALARIES & WAGES--CIVILIAN	66,038,870.44	68,316
4619	2. MILITARY LABOR	2,643,067.00	2,475
4620	3. MATERIALS, SUPPLIES & PARTS USED	4,546,713.19	8,012
4630	4. OTHER COSTS	6,050,559.53	470
4640	5. CONTRACTUAL SERVICES	3,027,386.72	6,400
4650	6. DEPRECIATION EXPENSE	7,134,712.00	7,103
4690	7. TRANSFERS	(47,927.80)	(30)
4700	GENERAL AND ADMINISTRATIVE EXPENSE	68,986,781.06	77,198
4710	1. SALARIES & WAGES--CIVILIAN	24,411,434.96	30,737
4719	2. MILITARY LABOR	418,933.00	579
4720	3. MATERIALS, SUPPLIES & PARTS USED	3,003,251.95	5,240
4730	4. OTHER COSTS	2,491,574.92	2,073
4740	5. CONTRACTUAL SERVICES	35,318,063.42	34,801
4750	6. DEPRECIATION EXPENSE	3,399,600.28	3,858
4790	8. TRANSFERS	(56,077.47)	(90)
4900	TOTAL COSTS INCURRED FOR PERIOD	320,394,550.45	314,405
4960	LESS COSTS OF MFG FOR ACTY RETENTION	11,363,430.24	0
4970	COSTS OF GOODS & SERVICES PRODUCED	309,031,120.21	314,405
4980	(INCREASE)/DECREASE IN WIP	(10,942,432.79)	0
4990	COSTS OF GOODS & SERVICES SOLD	$ 298,088,687.42	314,405
5000	REVENUE LESS EXPENSES	$ 28,064,465.85	39,148
4200	LESS SURCHARGES	(32,289,048.16)	(31,864)
4300	EXTRAORDINARY EXPENSES	(1,792,813.14)	0
		$ (6,017,395.45)	7,284
	COSTS FUNDED BY OTHERS		
6300	1. DEPRECIATION-SPONSOR OWNED EQUIP	139,668.00	
6511/12	2. MILITARY PERSONNEL	734,880.00	
6420	3. MATERIAL	4,090,355.28	
	PERSONNEL ON BOARD-END OF PERIOD	2,726	
9021/22	1. MILITARY	46	
9010	2. CIVILIAN	2,680	2,731
9011	(a) GRADED	947	953
9012	(b) UNGRADED	1,731	1,775
9013	(c) TEMPORARY/OTHER	2	3
9014/15	3. FOREIGN NATIONALS	0	

PEARL HARBOR NAVAL SHIPYARD
ANALYSIS OF ACCUMULATED OPERATING RESULTS
PERIOD ENDING 30 SEPTEMBER 1997

GENERAL LEDGER ACCTS	DESCRIPTION	ACTUAL	PRES BUD EOFY ($000)
2931	ACCUMULATED OPERATING RESULTS-- BEGINNING OF PERIOD	$ (37,022,457.14)	(37,022)
	APPLIED EXPENSES		
4810	PRODUCTION EXPENSE	98,584,115.17	
4820	GENERAL EXPENSE	63,749,463.13	
4800	TOTAL APPLIED EXPENSES	162,333,578.30	
	ACTUAL EXPENSES		
4600	PRODUCTION EXPENSE	89,393,381.08	
4700	GENERAL EXPENSE	68,986,781.06	
	TOTAL ACTUAL EXPENSES	158,380,162.14	
2932	OVER/(UNDER) APPLIED EXPENSES	3,953,416.16	0
	BILLING VARIANCES		
	COST REIMBURSABLE ORDERS		
2934	RATE STABILIZATION VARIANCES /b/	139,058.15	0
2935	COST OVERRUNS	23,778.12	0
	COST REIMBURSABLE ORDERS VARIANCES	162,836.27	
	FIXED PRICE ORDERS		
2936	RATE STABILIZATION VARIANCES /b/	(10,474,613.33)	7,284
2937	OTHER VARIANCES	2,133,778.59	0
	FIXED PRICE ORDERS VARIANCES	(8,340,834.74)	
	TOTAL BILLING VARIANCES	(8,177,998.47)	
2933	EXTRAORDINARY EXPENSE VARIANCE /c/	(1,792,813.14)	0
	OTHER ADJUSTMENTS		
299A	PRIOR YEAR ADJUSTMENTS	0.00	0
299B	RESERVE BALANCING	0.00	
299E	EXCESS ACP WRITE-OFF	0.00	0
299P	PASSTHROUGHS	0.00	
299S	SURCHARGES	0.00	
299T	TRANSFERS	0.00	
2939	TOTAL OTHER ADJUSTMENTS	0.00	0
2930	ACCUMULATED OPERATING RESULTS-- END OF PERIOD	$ (43,039,852.59)	(29,738)

/b/ Stabilized Variances adjusted for JLSC PY 1995/96/97 surcharges billed of $624,573.83 for cost reimbursable orders and $3,659,630.18 for fixed price orders.

/c/ Recorded write off to extraordinary expenses for storm damage per NAVSEASYSCOM approval ltr 7640.2 Ser 015/105 dtd 28 Aug 97.

EXHIBIT C

PEARL HARBOR NAVAL SHIPYARD
STATEMENT OF CASH SOURCES AND APPLICATION OF FUNDS
PERIOD ENDING 30 SEPTEMBER 1997

	CASH ACCOUNT	
1. ACTIVITY CASH BALANCE - 30 SEPTEMBER 1996		$ (69,909,118.35)
2. NON-REVENUE CASH CHANGES		0.00
3. SOURCES OF OPERATING CASH		352,420,596.40
a. REVENUE		
(1) FROM OPERATIONS	$ 293,864,105.11	
(2) FROM SURCHARGES	32,289,048.16	
(3) FROM PASS THROUGHS, REFUNDS ETC.	0.00	
b. CHANGE IN ACCOUNTS RECEIVABLE	336,649.54	
c. CHANGE IN DEFERRED CHARGES	7,247,708.54	
d. CHANGE IN PROGRESS PAYMENTS	9,344,873.93	
e. CHANGE IN ADVANCES	9,338,211.12	
4. APPLICATIONS OF CASH		(307,547,969.32)
a. COSTS INCURRED FOR CUSTOMERS	(309,031,120.21)	
b. DEPRECIATION		
(1) BUILDINGS, STRUCTURES AND UTILITY SYSTEMS	2,447,179.28	
(2) EQUIPMENT	8,099,096.00	
(3) OTHER	0.00	
c. PURCHASED CAPITAL ASSETS		
(1) MINOR CONSTRUCTION	(435,161.87)	
(2) EQUIPMENT	(2,981,352.08)	
(3) OTHER	0.00	
d. CHANGE IN INVENTORY		
(1) MATERIALS AND SUPPLIES	3,861,668.78	
(2) DIRECT MATERIAL	1,099,490.64	
(3) OTHER	66,498.40	
e. CHANGE IN OTHER ASSETS	2,394,713.69	
f. CHANGE IN ACCOUNTS PAYABLE	130,011.87	
g. CHANGE IN ACCRUED EXPENSES	(9,094,661.10)	
h. CHANGE IN OTHER LIABILITIES	(4,104,332.72)	
5. OTHER		61,559,102.42
a. CHANGE IN GLA 2910/2921/2923/2924	28,338,506.43	
b. CHANGE IN GLA 2922 AND OTHER FIXED ASSETS	(4,792,197.18)	
c. CHANGE IN GLA 2940/50 TRF-IN/OUT	(2,075,824.89)	
d. CHANGE IN GLA 2961 NET TREASURY BAL-DBOF	69,909,118.35	
e. CHANGE IN GLA 2972/6 RESERVE--MM&R/OTHER	4,261,361.01	
f. OTHER ADJUSTMENTS, NET - GLA 2939	0.00	
g. SURCHGE/EXTRAORDNRY EXP - GLA 4200/4300	(34,081,861.30)	
6. ACTIVITY CASH BALANCE - 30 SEPTEMBER 1997		$ 36,522,611.15

APPENDIX D

THE FINANCIAL RATIOS
FOR 1996 AND 1997

APPENDIX D

THE FINANCIAL RATIOS (1996)

1996	Todd 96	Halter 96	Avondale 96	NNS 96	Private
Income Statement	**K$**	**K$**	**K$**	**K$**	**Averages**
Sales	101,687	406,797	624,929	1,870,000	
Surcharges					
Cost of Goods/Services	71,674	355,209	543,102	1,730,000	
Gross Profit	30,013	51,588	81,827	140,000	
Operating Expense	28,996	21,361	45,037		
Other Income/(expense)					
Operating Income	1,017	30,227	36,790	140,000	
Other Income/(expense)	3,115	0	2,691	0	
Interest Expense	3	3,224	4,986	38,000	
Pretax Income	4,132	27,003	34,495	102,000	
Tax Expense	541	10,887	3,700	47,000	
Net Income	3,591	16,116	30,795	55,000	
Preferred Dividends	0	0	0	0	
Common Income	3,591	16,116	30,795	55,000	
EPS	$0.36	$0.88	$2.13	$1.60	$1.54
Balance Sheet					
Cash					
Advance/Loans					
Inventory	1,225	10,827	21,780	45,000	
Accts Rcvable	9,030	36,053	119,130	182,000	
Other					
Current Assets	68,706	147,677	222,490	491,000	
Long Term Assets	51,865	61,734	140,370	998,000	
Fixed Assets (net Deprec)	26,499	61,449	127,600	836,000	
Depreciation	44,000	40,000	127,000	861,000	
Total Assets	120,571	209,411	362,860	1,489,000	
Accounts Payable					
Accrued Expenses					
Advance/Loans					
Other					
Current Liabilities	19,826	62,143	103,010	256,000	
Long Term Liabilities	33,365	53,967	78,000	1,001,000	
Total Liabilities	53,191	116,110	181,010	1,257,000	
Preferred Equity	0	0	0	0	
Common Equity/Capital	38,301	84,398	389,830	246,000	
Treasury Stock	(9,617)	0	(11,856)	0	
Retained Earnings/AOR	38,696	8,903	(196,120)	(14,000)	
Total Equity	67,380	93,301	181,854	232,000	
Total Liabilities + Total Equity	120,571	209,411	362,864	1,489,000	
Number of Employees	1,100	4,500	5,600	17,937	
Revenue per Employee	92,443	90,399	111,594	104,254	99,673
Cost per Employee	65,158	78,935	96,983	96,449	84,381

APPENDIX D

THE FINANCIAL RATIOS (1996)

1996	Todd 96	Halter 96	Avondale 96	NNS 96	Average
Common Shares Out	9,931,000	18,255,000	14,464,000	34,297,451	
Price per share	$4.00	$15.00	$27.00	$27.00	18.25
Market Capitalization	$39,724	$273,825	$390,528	$926,031	
Tax Rate	13.1%	40.3%	10.7%	46.1%	27.6%
Cost of Capital	10%	10%	10%	10%	
Liquidity Ratios					
Current ratio	3.47	2.38	2.16	1.92	2.48
Quick ratio	3.40	2.20	1.95	1.74	2.32
Asset Mngt Ratios					
Inventory Turnover	58.51	32.81	24.94	38.44	38.67
Inventory to Current Assets	1.78%	7.33%	9.79%	9.16%	7.0%
Days Inventory	6.24	11.13	14.64	9.49	10.37
Days Sales Outstanding	31.97	31.91	68.63	35.04	41.88
Fixed Asset Turnover	1.44	4.01	2.45	1.10	2.25
Total Asset Turnover	0.62	1.63	1.28	0.80	1.08
Debt Mngt Ratios					
Debt ratio (TL/TA)	0.441	0.554	0.499	0.844	0.58
Debt to Equity	0.789	1.244	0.995	5.418	2.11
TIE ratio	-	9.38	7.38	3.68	6.81
Profitability Ratios					
Profit margin	3.5%	4.0%	4.9%	2.9%	3.8%
Basic Earning Power	0.8%	14.4%	10.1%	9.4%	8.7%
ROA	3.0%	7.7%	8.5%	3.7%	5.7%
ROE	9.4%	19.1%	7.9%	22.4%	14.7%
Market Value Ratios					
P/E ratio	11.06	16.99	12.68	16.84	14.39
Book value per share	$6.78	$5.11	$12.57	$6.76	7.81
Market to book ratio	0.59	2.93	2.15	3.99	2.42

APPENDIX D

THE FINANCIAL RATIOS (1996)

1996	PHNSY 96	PortsNSY 96	NNSY 96	PSNSY 96	Public
Income Statement	K$	K$	K$	K$	Averages
Sales	340,101	293,019	680,010	926,692	
Surcharges		0	0	0	
Cost of Goods/Services	272,663	221,056	502,274	686,272	
Gross Profit	67,438	71,963	177,736	240,420	
Operating Expense	102,498	77,450	143,630	151,663	
Other Income/(expense)					
Operating Income	(35,060)	(5,487)	34,106	88,757	
Other Income/(expense)	0	0	0	0	
Interest Expense	0	0	0	0	
Pretax Income	(35,060)	(5,487)	34,106	88,757	
Tax Expense	0	0	0	0	
Net Income	(35,060)	(5,487)	34,106	88,757	
Preferred Dividends	0	0	0	0	
Common Income	(35,060)	(5,487)	34,106	88,757	
EPS					
Balance Sheet					
Cash		(50,601)	119,256	140,811	
Advance/Loans		0	0	107	
Inventory	26,204	23,337	91,452	149,780	
Accts Rcvable	688	21,722	(5,277)	11,103	
Other		41,890	31,705	58,959	
Current Assets	(43,017)	36,348	237,136	360,760	
Long Term Assets	138,541	0	0	0	
Fixed Assets (net Deprec)	119,617	172,232	176,129	353,717	
Depreciation	200,789	217,059	291,960	353,197	
Total Assets	95,524	208,580	413,265	714,477	
Accounts Payable		8,697	15,447	28,893	
Accrued Expenses		36,273	112,979	170,379	
Advance/Loans		31,777	118,770	146,703	
Other		1,251	2,522	13,285	
Current Liabilities	56,130	77,998	249,718	359,260	
Long Term Liabilities	28,830		0	0	
Total Liabilities	84,960	77,998	249,718	359,260	
Preferred Equity	0	0	0	0	
Common Equity/Capital	47,586	162,186	173,318	369,660	
Treasury Stock	0	0	0	0	
Retained Earnings/AOR	(37,022)	(31,603)	(9,739)	(14,470)	
Total Equity	10,564	130,583	163,579	355,190	
Total Liabilities + Total Equity	95,524	208,581	413,297	714,450	
Number of Employees	2,922	3,686	6,944	9,478	
Revenue per Employee	116,393	79,495	97,928	97,773	97,897
Cost per Employee	93,314	59,972	72,332	72,407	74,506

APPENDIX D

THE FINANCIAL RATIOS (1996)

1996	PHNSY 96	PortsNSY 96	NNSY 96	PSNSY 96	Average
Common Shares Out	-	-	-	-	
Price per share	-	-	-	-	
Market Capitalization	-	-	-	-	
Tax Rate					
Cost of Capital	6%	6%	6%	6%	
Liquidity Ratios					
Current ratio	(0.77)	0.47	0.95	1.00	0.41
Quick ratio	(1.23)	0.17	0.58	0.59	0.03
Asset Mngt Ratios					
Inventory Turnover	10.41	9.47	5.49	4.58	7.49
Inventory to Current Assets	-60.92%	64.20%	38.57%	41.52%	20.8%
Days Inventory	35.08	38.53	66.46	79.66	54.93
Days Sales Outstanding	0.73	26.69	(2.79)	4.31	7.23
Fixed Asset Turnover	2.84	0.75	1.45	1.31	1.59
Total Asset Turnover	1.15	0.69	0.96	0.87	0.92
Debt Mngt Ratios					
Debt ratio (TL/TA)	0.889	0.374	0.604	0.503	0.59
Debt to Equity	8.042	0.597	1.527	1.011	2.79
TIE ratio	-	-	-	-	
Profitability Ratios					
Profit margin	-10.3%	-1.9%	5.0%	9.6%	0.6%
Basic Earning Power	-36.7%	-2.6%	8.3%	12.4%	-4.7%
ROA	-36.7%	-2.6%	8.3%	12.4%	-4.7%
ROE	-73.7%	-3.4%	19.7%	24.0%	-8.3%
Market Value Ratios					
P/E ratio	-	-	-	-	
Book value per share	-	-	-	-	
Market to book ratio	-	-	-	-	

APPENDIX D

THE FINANCIAL RATIOS (1997)

1997	Todd 97	Halter 97	Avondale 97	NNS 97	Private
Income Statement	**K$**	**K$**	**K$**	**K$**	**Averages**
Sales	114,398	670,200	613,993	1,707,000	
Surcharges					
Cost of Goods/Services	93,982	589,500	538,515	1,729,000	
Gross Profit	20,416	80,700	75,478	(22,000)	
Operating Expense	46,209	38,700	31,885		
Other Income/expense		(2,800)		3,000	
Operating Income	(25,793)	39,200	43,593	(19,000)	
Other Income/expense	4,858	(900)	3,294	0	
Interest Expense	27	6,600	4,804	55,000	
Pretax Income	(20,962)	31,700	42,083	(74,000)	
Tax Expense	291	9,200	15,250	26,000	
Net Income	(21,253)	22,500	26,833	(48,000)	
Preferred Dividends	0		0	0	
Common Income	(21,253)	22,500	26,833	(48,000)	
EPS	($2.14)	$0.80	$1.85	($1.38)	$0.42
Balance Sheet					
Cash					
Advance/Loans					
Inventory	1,323		23,226	44,000	
Accts Rcvable	6,397		101,746	136,000	
Other					
Current Assets	63,157		232,868	455,000	
Long Term Assets	52,632		142,747	1,021,000	
Fixed Assets	24,477		130,056	816,000	
Depreciation	48,000		127,000	926,000	
Total Assets	115,789		375,615	1,476,000	
Accounts Payable					
Accured Expenses					
Advances/Loans					
Other					
Current Liabilities	29,912		87,644	356,000	
Long Term Liabilities	37,937		78,994	937,000	
Total Liabilities	67,849		166,638	1,293,000	
Preferred Equity	0		0	0	
Common Equity/Capital	38,301		390,129	257,000	
Treasury Stock	(9,617)		(11,856)	(2,000)	
Retained Earnings/AOR	19,256		(169,296)	(72,000)	
Total Equity	47,940		208,977	183,000	
Total Liabilities + Total Equity	115,789		375,615	1,476,000	
Number of Employees	1100	5,300	5500	16500	
Revenue per Employee	103,998	126,453	111,635	103,455	111,385
Cost per Employee	85,438	111,226	97,912	104,788	99,841

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THE FINANCIAL RATIOS (1997)

1997	Todd 97	Halter 97	Avondale 97	NNS 97	Average
Common Shares Out	9,910,180	28,100,000	14,491,000	34,741,818	
Price per share	$5.00		$25.00	$27.00	$19.00
Market Capitalization	$49,551		$362,275	$938,029	
Tax Rate	-1.4%		36.2%	-35.1%	-0.1%
Liquidity Ratios					
Current ratio	2.11		2.66	1.28	2.02
Quick ratio	2.07		2.39	1.15	1.87
Asset Mngt Ratios					
Inventory Turnover	71.04		23.19	39.30	44.51
Days Inventory	5.14		15.74	9.29	10.06
Inventory to Current Assets	2.09%		9.97%	9.67%	0.07
Days Sales Outstanding	20.13		59.66	28.68	36.16
Fixed Asset Turnover	1.58		2.39	0.98	1.65
Total Asset Turnover	0.70		1.22	0.71	0.88
Debt Mngt Ratios					
Debt ratio (TL/TA)	0.59		0.44	0.88	0.64
Debt to Equity	1.42		0.80	7.07	3.09
TIE ratio	-		9.07	(0.35)	4.36
Profitability Ratios					
Profit margin	-18.6%		4.4%	-2.8%	-5.7%
Basic Earning Power	-22.3%		11.6%	-1.3%	-4.0%
ROA	-18.4%		7.1%	-3.3%	-4.8%
ROE	-55.5%		6.9%	-18.7%	-22.4%
Market Value Ratios					
P/E ratio	(2.33)		13.50	(19.54)	(2.8)
Book value per share	$4.84		$14.42	$5.27	$8.18
Market to book ratio	1.03		1.73	5.13	2.63

APPENDIX D

THE FINANCIAL RATIOS (1997)

1997	PHNSY 97	PNSY 97	NNSY 97	PSNSY 97	Public
Income Statement	K$	K$	K$	K$	Averages
Sales	326,153	399,116	920,265	969,542	
Surcharges		0	0	134,985	
Costs of Goods/Services	244,261	179,955	675,443	711,794	
Gross Profit	81,892	219,161	244,822	257,748	
Operating Expense	53,828	150,200	143,746	78,748	
Other Income/expense					
Operating Income	28,064	68,961	101,076	179,000	
Other Income/expense	(1,793)	0	0	0	
Interest Expense	0	0	0	0	
Pretax Income	26,271	68,961	101,076	179,000	
Tax Expense	0	0	0	0	
Net Income	26,271	68,961	101,076	179,000	
Preferred Dividends	0	0	0	0	
Common Income	26,271	68,961	101,076	179,000	
EPS	-	-	-	-	
Balance Sheet					
Cash	36,523	57,116	64,250	(18,130)	
Advance/Loans	0	0	0	58	
Inventory	21,285	45,024	12,859	183,373	
Accts Rcvable	351	103,864	2,386	20,142	
Other	8,054	(49,531)	136,957	106,345	
Current Assets	66,213	156,473	216,452	291,788	
Long Term Assets	0	0	0	0	
Fixed Assets	128,400	168,655	184,255	358,878	
Depreciation	207,267	231,527	289,781	369,063	
Total Assets	194,613	325,128	400,707	650,666	
Accounts Payable	6,590	9,633	24,157	11,944	
Accured Expenses	40,575	42,735	132,323	108,381	
Advances/Loans	27,441	20,406	76,388	137,875	
Other	6,624	-	3,693	7,104	
Current Liabilities	81,230	72,774	236,561	265,304	
Long Term Liabilities	0	0	0	0	
Total Liabilities	81,230	72,774	236,561	265,304	
Preferred Equity	0	0	0	0	
Common Equity/Capital	156,424	291,956	197,409	367,423	
Treasury Stock	0	0	0	0	
Retained Earnings/AOR	(43,040)	(41,592)	(38,016)	17,940	
Total Equity	113,384	250,364	159,393	385,363	
Total Liabilities + Total Equity	194,614	323,138	395,954	650,667	
Number of Employees	2,726	3,388	6,944	9,140	
Revenue per Employee	119,645	117,803	132,527	106,077	119,013
Cost per Employee	89,604	53,115	97,270	77,877	79,467

APPENDIX D

THE FINANCIAL RATIOS (1997)

1997	PHNSY 97	PNSY 97	NNSY 97	PSNSY 97	Average
Common Shares Out	-	-	-	-	
Price per share	-	-	-	-	
Market Capitalization	-	-	-	-	
Tax Rate					
Liquidity Ratios					
Current ratio	0.82	2.15	0.91	1.10	1.25
Quick ratio	0.55	1.53	0.86	0.41	0.84
Asset Mngt Ratios					
Inventory Turnover	11.48	4.00	52.53	3.88	17.97
Days Inventory	31.81	91.32	6.95	94.03	56.03
Inventory to Current Assets	32.15%	28.77%	5.94%	62.84%	32.43%
Days Sales Outstanding	0.39	93.68	0.93	7.48	25.62
Fixed Asset Turnover	0.97	1.00	1.94	1.33	1.31
Total Asset Turnover	0.81	0.72	1.33	0.95	0.95
Debt Mngt Ratios					
Debt ratio (TL/TA)	0.42	0.22	0.59	0.41	0.41
Debt to Equity	0.72	0.29	1.48	0.69	0.79
TIE ratio	-	-	-	-	
Profitability Ratios					
Profit margin	8.1%	17.3%	11.0%	18.5%	13.7%
Basic Earning Power	14.4%	21.2%	25.2%	27.5%	22.1%
ROA	13.5%	21.2%	25.2%	27.5%	21.9%
ROE	16.8%	23.6%	51.2%	48.7%	35.1%
Market Value Ratios					
P/E ratio	-	-	-	-	
Book value per share	-	-	-	-	
Market to book ratio	-	-	-	-	

APPENDIX E

LIST OF ACRONYMS

3M	Maintenance and Material Management
ADP	Automatic Data Processing
AEL	Allowance Equipment List
AMD	Authorized Manning Document
AOR	Accumulated Operating Result
APL	Allowance Parts List
ASN (FM&C)	Assistant Secretary of the Navy (Financial Management & Comptroller)
AWC	Assist Work Center
AWR	Automated Work Request
BAIM	Baseline Advanced Industrial Management
BSC	Balanced Scorecard
CEO	Chief Executive Officer
CFO	Chief Financial Officer
CIA	Controlled Industrial Area
CNO	Chief of Naval Operations
CONOPS	Concept of Operations
COST	A financial tracking application
CPF	Commander-in-Chief Pacific Fleet
CSMP	Consolidated Ship's Maintenance Project
CSP	Commander, Submarine Forces Pacific
DBOF	Defense Business Operations Fund
DMP	Depot Modernization Period
DOD	Department of Defense
DWR	Days Worked Ratio
EB	Electric Boat
EBIT	Earnings Before Interest and Taxes
EPS	Earnings Per Share
ETE	Engineering Time Estimate
ETV	Engineering Time Value
EVA	Economic Value Added
F&O	Financial and Operating
FISC	Fleet Industrial Supply Center
FMA	Fleet Maintenance Activity
FMP	Fleet Maintenance Pilot
FMP	Fleet Modernization Program
FOA	Fitting Out Availability
FY	Fiscal Year
GAO	Government Accounting Office
GPRA	Government Performance and Results Act
GS	General Schedule

GWI	Guarantee Work Index
I&D	Intermediate and Depot level of maintenance
ICP	Internal Control Practice
IMA	Intermediate Maintenance Activity
IMA	Intermediate Maintenance Activity
ISIC	Immediate Superior In Command
JCN	Job Control Number
JFMM	Joint Fleet Maintenance Manual
JIT	Just-In-Time
JML	Job Material List
JO	Job Order
JON	Job Order Number
LWC	Lead Work Center
MAT	Material ordering And Tracking
MCE	Manufacturing Cycle Effectiveness
MDS	Maintenance Data System
MIDPAC	Commander, Naval Surface Group Mid-Pacific
MIMS	Miscellaneous Industrial Management System
MIS	Management Information System
MOE	Measure of Effectiveness
MOU	Memorandum of Understanding
MR	Material Requirement
MRMS	Maintenance Reporting Management System
MVA	Market Value Added
NAS	Naval Audit Service
NASSCO	National Steel & Shipbuilding Company
NAVSEA	Naval Sea Systems Command
NC	Navy Comptroller
NIFRS	Naval Industrial Fund Reporting System
NIMF	Naval Intermediate Maintenance Facility
NNS	Newport News Shipbuilding
NNSY	Norfolk Naval Shipyard
NOR	Net Operating Result
NPR	National Performance Review
NSMP	Naval Ship Maintenance Program
NSSF	Naval Submarine Support Facility
NSY	Naval Shipyard
NWCF	Navy Working Capital Fund
OMB	Office of Management and Budget
OMN	Operations and Maintenance, Navy
OSD	Office of the Secretary of Defense
OSH	Occupational Safety and Health
OUSD	Office of the Under Secretary of Defense
PAM	Productive Man-hours
PAYROLL	A personnel and pay schedule database

PBD	Program Budget Decision
PCWLF	Project Control Work Load Forecast
PH	Pearl Harbor
PHNSY & IMFAC	Pearl Harbor Naval Shipyard & Intermediate Maintenance Facility
PHNSY	Pearl Harbor Naval Shipyard
PMA	Phased Maintenance Availability
PMC	Performance, Monitoring, and Control
PMS	Performance Measurement System
PMS	Planned Maintenance system
PNSY	Portsmouth Naval Shipyard
PPE	Property, Plant, and Equipment
PPJ	Pre-planned Jobs
PRI	Priority
PSA	Post Shakedown Availability
PSNSY	Puget Sound Naval Shipyard
PSS	Project Scheduling and Sequencing
PTT	Pilot Transition Team
QA	Quality Assurance
QDR	Quadrennial Defense Review
QMB	Quality Management Board
RAV	Restricted Availability
RIF	Reduction-In-Force
RMP	Regional Maintenance Plan
RO	Repair Officer
RSC	Resources
SABRS	A budget execution and overhead accounting application
SCN	Ship Conversion, Navy
SDM	Ship Depot Maintenance
SHAPEC	Ship Availability Planning and Engineering Center
SIMA	Shore Intermediate Maintenance Activity
SRA	Selected Restricted Availability
SRA	Selected Restricted Availability
STARS-FL	Standard Accounting and Reporting System-Fleet Level
SUBASE	Submarine Base
SUPDESK	Supervisor Desk
SYMIS	Shipyard Management Information System
T/A	Type Availability
TAV	Technical Availability
TGI	Task Group Instruction
TQL	Total Quality Leadership
TRF	Trident Refit Facility
TYCOM	Type Commander
USD(C)	Under Secretary of Defense (Comptroller)
VR	Voyage Repair

WCF	Working Capital Fund
WD	Wage grade Worker
WDC	Work Definition Conference
WG	Wage grade Worker
WL	Wage grade Worker
WN	Wage grade Worker
WS	Wage grade Supervisor
WT	Wage grade Worker

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