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Naval Surface Forces Real-Time Reutilization Asset Management Warehouses: a cost-benefit analysis

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Naval Surface Forces Real-Time Reutilization Asset Management Warehouses: A Cost-Benefit Analysis

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December 2008

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NAVAL SURFACE FORCES REAL-TIME REUTILIZATION ASSET MANAGEMENT WAREHOUSES: A COST-BENEFIT ANALYSIS

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Submitted in partial fulfillment of the requirements for the degree of

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NAVAL SURFACE FORCES REAL-TIME REUTILIZATION ASSET MANAGEMENT WAREHOUSES: A COST-BENEFIT ANALYSIS

ABSTRACT

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LIST OF ACRONYMS AND ABBREVIATIONS

ABC	Activity Based Costing
CASREP	Casualty Report
CONUS	Continental United States
COR	Contracting Officer's Representative
COSAL	Consolidated Shipboard Allowance List
DLA	Defense Logistics Agency
DoD	Department of Defense
DRMO	Defense Reutilization and Marketing Office
DRMS	Defense Reutilization and Marketing Service
FEDLOG	Federal Logistics Record
FMS	Foreign Military Sales
GAO	Government Accountability Office
GSA	General Services Administration
ICP	Inventory Control Point
IPG	Issue Priority Group
MTIS	Material Turned Into Store
NAVFAC	Naval Facilities Engineering Command
NAVICP	Naval Inventory Control Point
NAVSEA	Naval Sea Systems Command
NAVSUP	Naval Supply Systems Command
O&M	Operations and Maintenance
RRAM	Real-Time Reutilization Asset Management
SURFOR	Commander Naval Surface Forces
TAV	Total Asset Visibility

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I. INTRODUCTION

A. GENERAL

Whether the result of a history of a lack of financial oversight by the Department of Defense (DoD) or by other government entities, or merely through budget planning that included the potential for waste, the Department of Defense has a documented track record of financial accounting inadequacy and weak inventory management practices (Chan, 2006). DoD saves billions of dollars each year through asset reutilization but it continues to struggle with capturing the costs involved with managing excess material. In FY 2006, the Defense Reutilization and Marketing Service (DRMS), part of the Defense Logistics Agency (DLA), provided $1.9 Billion of reutilized property to DoD and other federal agencies (Defense Reutilization and Marketing Service, 2006). Each service, as well as DLA through DRMS, all have their own systems of reutilization. Our research focuses on the Real-Time Reutilization Asset Management (RRAM) Warehouses owned and operated by Commander Naval Surface Forces (SURFOR). The researchers chose this topic at the request of the Comptroller's office of Naval Surface Forces.

The government has always recognized the value of using its own excess resources but it historically has taken an *ad hoc* approach to storing and reissuing these items. The methods have varied from closets full of spares to what amounted to junk yards. There has been minimal automation of inventory management and little or no calculation of the holding costs associated with holding this stock (United States General Accounting Office, 1999). These holding costs were largely ignored by DoD since the users typically did not have to pay rent or utilities for their warehouses. As we operate in a more resource-constrained environment, commands are taking a much closer look at the costs they are incurring across the board (Ratnam, 2006). The contract labor cost for SURFOR to operate its RRAM warehouses is approximately $1,200,000 per year. The Navy has a notional estimate of the cost savings these warehouses realize but it does not

have clear estimate of the costs to maintain the physical structure or for utilities (B.T. Drapp, CAPT, USN, Personal Communication, April 14, 2008).

During the early stages of this research paper, the authors could not identify how much visibility the RRAM inventories had with potential users nor was documentation found for a suitable IT solution that links demand for RRAM material with demand in the Navy and DLA stock systems.

B. PURPOSE OF THE REAL-TIME REUTILIZATION ASSET MANAGEMENT WAREHOUSES

As stated by Naval Supply Systems Command (NAVSUP),

"The purpose of the Naval Inventory Control Point (NAVICP) created Real-time Reutilization Asset Management (RRAM) program is to:

a. Provide on-line, real time, Total Asset Visibility (TAV) of residual/excess material

b. Provide on-line, real time, Total Asset Visibility (TAV) of selected material (ex. Sponsor Owned Material)

c. Efficiently capture demand data for residual material currently residing in system-wide end-use inventories

d. Increase asset visibility of material available (currently Navy and DLA) in order to:

1. Provide a mechanism for automated requisitioning of residual assets

2. Ensure proper replenishment decisions by offsetting potential buys

Naval Inventory Control Point Mechanicsburg Policy and Scope: RRAM material will be centrally processed at the NAVICP-M RRAM site. RRAM material will continue to be located in existing RRAM warehouses managed by the cognizant asset holders. For Issue Priority Groups (IPG) I, II and III requisitions with Service Codes of "N" "R" or "V" (less 207 and 224), and for all requisitions with fund codes associated with NAVSEA TOB, material will be issued from RRAM inventories first, prior to being filled by supply system stock. Part numbered items will be processed using the ANSRS (Automated Non-Standard Requisitioning System). ANSRS will equate the part number with a NSN/NICN. The NSN/NICN will then be receipted into the RRAM database." (Naval Supply Systems Command, 2008)

Essentially, the RRAM warehouse operation was established to be a central collection, storage, inventory, and redistribution point for excess repair parts. The parts become excess, for example, when the Consolidated Shipboard Allowance List (COSAL) is updated to determine which parts are required to be held on board. The COSAL is the inventory of spare parts each Naval ship maintains on board for use in maintenance and repairs. The COSAL is updated on a monthly basis. When the COSAL is updated, some parts are added to the ships inventory while others may be removed or reduced in quantity required (NAVICPINST 4441.170B, 2007). Updates to the COSAL are primarily based on demand and the utility for the parts. If some parts have little to no demand, the inventory of spares on board may be reduced or eliminated to make room for other parts. If some parts have increased demand, their allowance or total required spares on board may increase in order to meet this higher demand. Parts also become excess when older systems, such as weapons systems on ships, are replaced with new systems. The older systems are removed from the ship and the salvageable parts from the system are sent to RRAM to be made available to ships still utilizing the older weapons systems. Excess parts are also received into RRAM when a ship is decommissioned. There are several other methods that parts may become excess. The previous listing provides the reader with a general understanding of how parts become available (or excess).

When Navy customers requisition parts to repair or maintain their systems, it is common business practice throughout the Navy for the individual Supply Departments to first search the RRAM database to determine part availability and receive the part free of charge rather than paying for the part through requisition by means of the regular Navy supply system. The general goal of RRAM is to reduce wasteful spending by providing spare parts at no additional cost rather than having units purchase the parts anew (Naval Supply Systems Command, 2008).

C. OBJECTIVES OF THE RESEARCH

The overarching objective of this research paper is to provide Navy decision makers with unbiased information as to the benefits the RRAM operations provide the Navy and the costs required to achieve those benefits. In order to provide this information, the authors intend to:

1. Determine costs associated with operating, maintaining, and managing both RRAM warehouses.
2. Determine the total inventory value of all parts maintained at each warehouse.
3. Evaluate the effectiveness of the inventory maintenance currently being employed through sampling of inventory and comparing the results to electronic records.
4. Evaluate the system of procurement being offered to the customer.
5. Calculate the value of parts requisitioned over time as compared to a cost benchmark, such as monthly warehouse operating costs.
6. Provide a summary of the costs versus the benefits, according to SECNAVINST 5220 guidelines, of operating the warehouses as well as potential recommendations based on data analysis.

D. RESEARCH QUESTIONS

1. Primary Research Question

What are the costs and benefits of operating and maintaining both of the Navy's Real-Time Reutilization Asset Management warehouses?

2. Secondary Research Questions

Are the RRAM warehouses maintaining useful inventory and is there adequate visibility to maximize its efficient use?

Are there processes that are producing waste in the operation and maintenance of the Navy's Real-Time Reutilization Asset Management warehouses?

Can the operation and maintenance of the Navy's Real-Time Reutilization Asset Management warehouses be managed more efficiently?

E. SCOPE AND METHODOLOGY

This research applies cost-benefit analysis techniques to the existing cost of operations within the RRAM organization. In order to gather the cost data required, interviews with RRAM management and staff as well as with key CNSF personnel were conducted. Access to RRAM inventory database(s) was required in order to accomplish previously mentioned objectives.

F. ORGANIZATION OF THE RESEARCH

The authors organized the research in this paper to best enable the reader to follow a chronological order of events, which led to our conclusions and recommendations. The authors' provide a brief history of DoD's successes or failures regarding property and inventory management. The history should help the reader understand why the government would be interested in the findings of this research. After presenting DoD's experience with inventory and property management, the authors provide the reader an analysis of RRAM operations costs in order to determine which costs should be included or excluded in a cost-benefit analysis of the operation. When all the costs are determined, they are deducted from the savings (cost avoidance) the RRAM operations report to SURFOR, thus providing the "net savings" or "net cost avoidance." The authors then use an activity-based costing model to help address the issue of whether the activities the RRAM operations currently perform represent the most effective and efficient benefits to the government. Lastly, the authors provide their conclusions to the research questions and offer recommendations based on those conclusions.

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II. BACKGROUND

A. INTRODUCTION

In this chapter, the authors provide a general background that is relevant to recent problems facing DoD and commercial industry regarding inventory management and warehouse operations. The authors address the specific costs that are typically associated with inventory management and warehouse operations. Additionally, the authors discuss the benefits to be determined by maintaining the Naval Surface Forces RRAM warehouse operations. Finally, the authors discuss their intent to apply an activity-based costing model to provide the reader with a gauge to use to determine if the RRAM processes in place are efficient, effective and are providing the best benefit to SURFOR.

B. DEPARTMENT OF DEFENSE WAREHOUSING ISSUES AND COMMON ISSUES OF MODERN INDUSTRY WAREHOUSING

In both the public and private sectors, organizations maintain excess material. The issue of disposing of excess inventory rather than maintaining it for the "rainy day" that never comes has plagued the Department of Defense for years. A 1997 Government Accountability Report documented the fact that as far back as 1992, the culture of the Department of Defense maintained the belief that,

> It was better to overbuy items than to manage with just the amount of stock needed. Had DoD used effective inventory management and control techniques and modern commercial inventory management practices, it would have had lower inventory levels and would have avoided the burden and expense of storing excess inventory. (United States General Accounting Office, 1997)

The root of the problem is at least twofold. First is the problem of managing slow-moving or obsolescent inventory. The Navy, as well as all of the Services, and DLA all have varied benchmarks or guidelines regarding the disposition of slow-moving or potentially obsolescent inventory. This is evidenced by the multiple business rules in

effect within the Real-time Reutilization Asset Management System. Within the RRAM system, there are a total of 17 warehouses that manage both consumable and repairable material. Each warehouse operates under general NAVSUP guidelines, which are integrated into a local set of business rules or standard operating procedures. For example, the San Diego RRAM warehouse local business rules prescribe that the inventory to be maintained is determined from fleet wide demand for the items. If there has been no demand for inventory items in over five years, those inventory items are removed and sent to Material Turned into Shore (MTIS), Foreign Military Sales (FMS) or DRMO. Final disposition is generally determined in order to maximize credit value (resale value). Other RRAM warehouses operate under similar local business rules, tailored after the NAVSUP guidelines, but are not the same in every respect. This discontinuity in business rules is but part of DoD's larger problem of accurately forecasting inventory requirements which has led to the loss of inventory (asset) visibility. This loss of visibility has in many cases led to the repurchase of items the DoD already has in its own stock system or once had but discarded.

The second problem is the conservative inventory models, which led to the excess in the first place (United States Government Accountability Office, 2005). This problem is addressed in our recommendations.

DoD has a documented history of failing to adequately manage public funds and property. The DoD Supply System has struggled for years to accurately account for the property it owns and prevent spending to acquire similar property it already has in its inventory. A recent Government Accountability Office (GAO) report stated,

> DoD does not have management controls in place to assure that excess inventory is reutilized to the maximum extent possible. Of $18.6 billion in excess commodity disposals in fiscal years 2002 and 2003, $2.5 billion were reported to be new, unused, and in excellent condition. DoD units reutilized only $295 million (12 percent) of these items. The remaining $2.2 billion (88 percent) includes significant waste and inefficiency because new, unused and excellent condition items were transferred and donated outside of DoD, sold for pennies on the dollar, or destroyed. DoD units continued to buy many of these same items. GAO identified at least $400 million of commodity purchases when identical, new, unused, and excellent condition items were available for reutilization. GAO also

> identified hundreds of millions of dollars in reported lost, damaged, or stolen excess property, including sensitive military technology items, which contributed to reutilization program waste and inefficiency. Root causes for reutilization program waste and inefficiency included, (1) unreliable excess property inventory data; (2) inadequate oversight and physical inventory control; and (3) outdated, non-integrated excess inventory and supply management systems. (United States Government Accountability Office, 2005)

RRAM has sought to alleviate this problem by implementing the Commercial Off-The-Shelf (COTS) Lawson Software suite of applications. The Lawson/RRAM system is hosted on a L2000 platform and uses the Oracle Relation Database Management System (RDBMS) for its database. This suite includes inventory control, requisitions, and warehousing modules and is maintained by Science Applications International Corporation (SAIC).

The DoD has also historically disregarded costs associated with inventory management. According to U.S. Government Accountability Office (GAO) findings,

> DoD spends billions of dollars to sustain key business operations intended to support the warfighter. DoD's pervasive and long-standing weaknesses in its financial management and business operations adversely affect the economy, efficiency, and effectiveness of DoD's operations, and have resulted in a lack of adequate accountability across all the department's major business areas. Every dollar that DoD could save through improved economy and efficiency of its operations is important to the well-being of our nation, and ultimately can be used to support the needs of the warfighter. (United States Government Accountability Office, 2007)

The common theme throughout relevant GAO reports has been DoD's weakness of adequately maintaining reliable inventory databases and a lack of awareness of the cost to maintain the inventory. Specifically, there is a

> ..lack of reliable asset information, including cost, location, and condition, necessary to effectively (1) safeguard assets from deterioration, theft, or loss; (2) account for the acquisition or disposal of these assets; (3) ensure that the assets are available for use when needed; (4) prevent unnecessary storage and maintenance costs, or purchase of assets already on hand; and (5) determine the full costs of programs that use these assets. (United States Government Accountability Office, 2007)

Another frustration for DoD that has plagued its asset visibility has been the lack of interoperability among information technology systems or asset management databases. In accordance with the current Navy guidance, COMNAVSURFORINST 4400.1J (a naval supply instruction manual), the afloat Navy (ship Navy) is currently required to have its entire onboard inventory of spare parts on hand or on order. Afloat units determine what parts they require by performing a database function called a Reorder Review, which lists all of the parts that have been removed from the inventory and require replenishment. Based on the authors' experience, there is no simple way for the afloat customer to validate this list of parts required against the available parts in the RRAM system. The afloat customer can only conduct single line item queries of the Lawson Database, which is very time consuming considering the size of most Reorder Review files, which may contain a hundred or more line items. Thus, the afloat customer may purchase the items needed to meet requirements and forgo cost savings that could have been obtained if RRAM inventory had been used. RRAM customers tend to search the RRAM inventory only when the part(s) they are looking for is not on board or unaffordable based on the current status of the customer's budget.

In the commercial marketplace, inventory costs are one of the main cost drivers that organizations focus on reducing. They do so by attempting to forecast demand for their products using historic information in order to prevent carrying more inventory than they need. Organizations also develop better relationships and communications with their suppliers in order to reduce lag time between order and delivery and prevent customer dissatisfaction. The goal of commercial organizations is to eliminate unused inventory as much as possible so as not to have to spend administrative dollars in maintaining inventory data on this unused inventory (Mazhar, 2008).

Commercial industry has identified some of the costs associated with unused inventory to include management time (time spent validating the inventory database by counting unused items), storage space, risk costs (the costs associated with damage, obsolescence or pilferage) and the cost to insure the inventory. The common theme to

commercial industry inventory cost reduction is to first identify all the costs that pertain to the inventory and then to discover ways to reduce these costs which will ultimately increase profits (Collins, 2004).

The literature on effective inventory management recommends separating inventory into several categories based on how often the inventory is ordered. These categories would include something similar to rarely ordered items, occasionally ordered items, average ordered items, rapidly moving items, and perhaps fast moving items. Once the categories have been established, items in the slower moving categories need to be analyzed to determine if the costs of maintaining them in the inventory are worthwhile (Schreibfeder, 1997).

C. DETERMINING BENEFITS AND COSTS

This research paper is meant to provide the reader with a means to determine the benefits of continued operation of the RRAM warehouses versus the costs. The benefits identified in this research paper are tied to the cost savings to the Navy for maintaining the RRAM warehouse operations. These benefits are calculated by first determining all the applicable costs of operations previously defined and then associating these costs with the products (parts) ordered by the customers. No actual payment ever takes place between the customer and the RRAM organization. The Navy has already incurred the costs of all the parts in the inventory of the RRAM warehouses. One view of the cost savings has been the purchase price of the parts issued. Essentially, rather than the Navy customer having to procure these parts through the Navy Supply system and spending their operational funds, the parts are issued free from RRAM based on availability. The intent of the authors of this research is to determine how much the "free" RRAM parts cost after taking into account the cost of operating the RRAM warehouses.

D. APPLICATION OF ACTIVITY-BASED COSTING

This paper applies an activity-based costing model to examine where RRAM operations could increase effectiveness or savings the RRAM warehouses are providing the Navy. Activity-based costing is defined as "a costing method that is designed to

provide managers with cost information for strategic and other decisions that potentially affect capacity and therefore "fixed" as well as variable costs" (Vertovec & Wood, 2008). This method of costing is typically used in manufacturing type organizations.

The RRAM warehouse operation is strictly an inventory operation given the government has already paid for the inventory being stored and the parts are issued to customers free of charge. In order to capture the benefits being provided by operating and maintaining these warehouses, the researchers applied the activity-based costing model by examining all of the processes required to operate and maintain the warehouses and service the customer.

"The first major step in implementing an Activity-Based Costing (ABC) system is to identify the activities that will form the foundation for the system" (Vertovec & Wood, 2008). The authors intend to identify such activities involved in the RRAM warehousing operations through interviews with RRAM warehouse management and staff. A few of the activities include: processing customer orders, receiving new RRAM stock and updating the RRAM database

Once all of the activities have been identified, these activities will be separated into cost pools. For example, all the costs associated with processing a customer order such as verifying parts availability, packaging the order, shipping the order, and updating the inventory database might fall under the customer orders cost pool. The activity measure for a cost pool, otherwise known as the cost driver is the number of customer orders. For example, if the cost of processing all customer orders in a period is $500. The $500 would be expensed across each customer order for that same period. If there were 100 orders, each order would include a processing cost of $5. This processing cost is also considered the activity rate for which the cost of customer orders is traced.

Due to lack of time and travel allotted for this research, the authors were unable to identify actual dollar figures for the activity-based costing model. This level of analysis would likely require a time and motion study of select activities in each warehouse in order to accurately capture the time required to do specific activities and the costs involved. In conducting a time and motion study, the government might be better able to

evaluate or validate the contractor's estimates of the costs. Regardless, the model presented is useful for analysis of operations and determining if other less costly or more efficient alternative processes might be incorporated. This model may also help the reader or decision makers conclude that certain functions or processes could be eliminated altogether.

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III. RRAM OPERATIONS

A. INTRODUCTION

In order to accurately research or find which costs are associated with the operation of a RRAM warehouse, the reader should first understand the operation of the RRAM warehouse itself. The reader should know: (1) where the excess parts come from, (2) how/why they are sent to the RRAM warehouse, (3) what happens to them once received in the warehouse, and (4) how they are issued from the warehouse. Once an understanding of the operation is achieved, the reader can have a better idea of where costs are incurred and why they were included (or excluded) in the cost-benefit analysis.

B. RRAM BUSINESS RULES

There are a total of 17 RRAM warehouse operations throughout the Navy, with each one being funded and operated independently under NAVICP guidelines. These guidelines are simply that: guidelines. There is no single policy or uniform set of business rules that governs the Navy-wide RRAM system. Since this project examines the two RRAM warehouses managed by SURFOR, we have analyzed the key differences between the two operations.

San Diego RRAM Business Rules:

- Parts should have at least 4X Average Monthly Fleet Demand for acceptance
- Accepts all DLA and Navy-owned material regardless of dollar value
- "Assumes" all material is Ready for Issue (RFI) Norfolk RRAM Business Rules:
- Accepts DLA and Navy-owned material w/$100 or greater dollar value, with all other material offered to MTIS/DRMO
- Some items valued at less than $100 are accepted with repeat demand. All others are sent to Naval Sea System Command's (NAVSEA) warehouse collocated with the SURFOR operation
- Verifies that all material is RFI through ATAC

These differences in the business rules are significant in the way each warehouse manages its inventory, the size of the inventory and ultimately determines the amount of contractor labor that is required to operate the warehouse. We will identify the costs associated with increased workload in Chapter IV.

C. RRAM CONTRACTOR FUNCTIONS

Both SURFOR RRAM warehouses are managed by a civilian service provider who specializes in logistics warehouse management or some form thereof. Each company employs a warehouse manager who is responsible for the overall warehouse operations. Each contractor also employs a database manager who ensures the Lawson database is kept current and provides all required reports to the contractor and the contractor's military customer. Each RRAM operation also employs material handlers, (i.e., stock clerks) who receive and process incoming parts, place the parts in their respective storage location, fill (pick) requisitions for parts, and prepare parts for shipping. The managers at both locations highlighted that most of their employees are trained in all aspects of material handling to maintain a steady flow of operations. This is especially true with their full-time employees and less so with part-time, temporary hires.

Both service providers are also tasked to perform material off-loads from CNSF ships. The offloads are either performed in conjunction with a periodic stock validation or as part of a ship's decommissioning. Based on the monthly invoices provided to the authors, this function actually forms up to one-third of the contractors' labor hours, depending on the offload schedules, which fluctuate from month to month.

Both contractors are performing under Cost Plus Fixed-Fee (CPFF) contracts. These are cost-reimbursement contracts that provide payment to the contractor of a negotiated fee that is fixed at the inception of the contract. The fixed fee does not vary with actual cost, but may be adjusted as a result of changes in the work to be performed under the contract. This contract type permits contracting for efforts that might otherwise present too great a risk to contractors. However this type of contract provides the contractor only a minimum incentive to control costs according to the Federal Acquisition Regulations, part 16.306.

The San Diego contract was awarded by Fleet Industrial and Supply Center (FISC) San Diego on behalf of SURFOR. The contractor is tasked to manage only SURFOR RRAM material. The Norfolk contractor performs under contract with NAVSEA. NAVSEA operates all of the RRAM warehouses in Norfolk that manage RRAM material for Naval Submarine Forces, NAVSEA, Military Sealift Command and SURFOR.

D. EXCESS PARTS

Spare parts become excess for numerous reasons. Updating consolidated shipboard allowance list (COSAL) changes may reduce the number of parts required onboard a ship and is one example in which parts may become excess. Decommissioning a ship, thus requiring the removal of all its spare parts, is yet another. Weapons upgrades to ships cause the spare parts for the old system to become obsolete for that particular ship. However, those same parts can still support other ships having the older weapons system. As previously mentioned, this list is not all inclusive regarding how parts become excess, but provides the reader with a general understanding.

The reader should be aware of the fact that the cost of these parts has already been incurred and in general can be considered a sunk cost. The Navy has purchased these parts and cannot recuperate the costs, but for pennies on the dollar in some cases, unless they can find another customer willing to purchase the same parts at the full purchase price. On some occasions, the Navy is able to make money from the resale of these parts, such as through Foreign Military Sales (FMS) or Material Turned into Store which returns the parts to the Navy Supply System.

The authors looked at the inventory's demand patterns. Sixty percent of RRAM parts have demand during the past three years. Any item which has been in the RRAM inventory for more than 5 years with no demands is currently being purged from the inventory. The five-year figure is the typical retention guideline in DoD inventory models. The warehouse recently completed a "scrub" of their aged inventory and will begin doing this more regularly in order to effectively eliminate the over-aged material. Figure 1 depicts a breakdown of the age of the inventory.

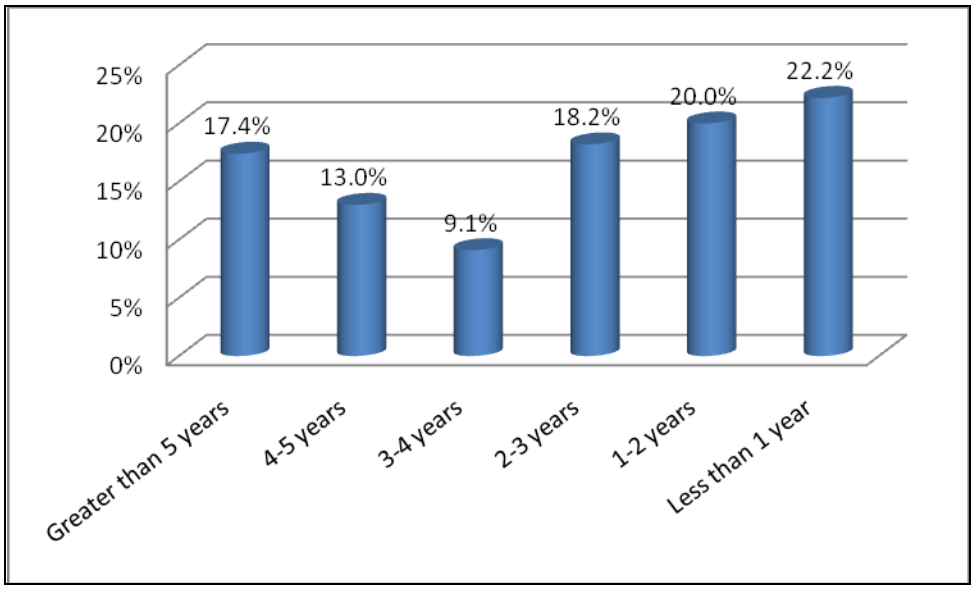

Figure 1. Inventory Age.

During the authors' site visits, they conducted spot inventory validations through location samplings within the warehouses, which resulted in 97 percent inventory accuracy. This would indicate that the parts visibility is fairly accurate. The authors also found four additional line items in various locations that were not in the warehouse's inventory.

E. RECEIVING PARTS

Once the parts have been determined to be excess onboard a military vessel, the parts must then be removed from the ship's inventory and prepared to be shipped. If the parts are for a system that is obsolete, have no demand (navy wide), are already available in RRAM, or will be of no further use to the U.S. Military, they are not inducted into the inventory upon arrival at a RRAM facility. Both RRAM site managers have adopted Standard Operating Procedures for inducting parts into their respective inventories. Both sites have stipulated that parts which are not inducted into the RRAM inventory are designated for some other destination such as FMS, MTIS, or DRMO.

The parts are not shipped to RRAM on a part by part basis. They are bundled together in tri-walls (large boxes) and then shipped to RRAM for determination of final

destination. Typically, the parts are received by RRAM from a ship while that ship is in the same port where the RRAM facility operates. For example, if a San Diego based ship has excess parts, those parts will be removed to the San Diego RRAM facility while the ship is in port San Diego. The same is true for ships operating in Norfolk. For ships home ported overseas or in other continental U.S. (CONUS) ports, the parts are shipped to the RRAM facility by one of several methods. For instance, the Navy uses opportune lifts, which involves placing the excess parts on a ship that is en route to a U.S. port with a RRAM facility. In the absence of opportune lift, there are occasions when the Navy places the parts on Air Mobility Command missions, which are accomplished with Air Force or contract civilian airlift. Also, the Navy may transport the parts through less expensive surface shipment.

The authors spent several hours observing each RRAM operation and both sets of warehouses. Although both operations are configured differently, they are operated in much the same fashion. When the parts arrive at the destination RRAM facility, they are entered into the RRAM database. After being entered into the database, the parts themselves are labeled, bar coded, and then stored in specific labeled locations within the RRAM warehouse. The RRAM warehouse operates almost identically to that of storerooms on a U.S. Naval Ship. Once the parts have been entered into the database and they are placed into their respective warehouse locations, they are now visible to customers outside of the RRAM organization as well as to the contractor maintaining the inventory. According to CNSF personnel, the RRAM database can be queried for parts availability from customers worldwide, provided they have access to the internet. Otherwise, customers have to call a Supply hub or someone else having internet access in order to determine parts availability. In any case, once parts are received into the RRAM database, they are visible worldwide.

F. REQUISITIONING PARTS

The authors spent a considerable portion of their site visits interviewing CNSF personnel who provided the customers' perspective of RRAM operations. From the customers' perspective, the single most important aspect of RRAM is the visibility of the

inventory and the ease of requisitioning of parts from that inventory. According to the CNSF Systems Analyst, the RRAM inventory is screened as part of the normal requisition process. If the part is not available in RRAM, the requisition is "passed" or forwarded to the next activity, generally a DLA depot or Navy Inventory Control Point, based on who manages that particular part. This process is transparent to the requisitioning activity.

The challenge faced by the customers is that in order to screen the RRAM inventory, they can do a single line-item query of the inventory and then place the order directly to RRAM. Beyond a single line-item, the Lawson database, the COTS software used by RRAM, cannot handle batch queries. Since the bulk of inventory queries are for multiple line items, the process becomes labor intensive and consequently slow when ships have to submit a spreadsheet of the items they want to screen. This is especially important when ships run their Reorder Review which is large requisition required to replenish their storeroom stocks. In order to use RRAM to fulfill Reorder Review requirements, the ships must utilize a multi-step process.

The first step is to generate the Reorder Review in R-Supply, the Navy's afloat supply management system. Then, the ship must convert the Reorder Review report into a spreadsheet, which is sent to the RRAM warehouse. The RRAM systems analyst then has to query each line item and then provide the results back to the ship. According to San Diego's analyst, this process can take anywhere from a few minutes to a few hours, depending on the size of the query and his daily workload. Once the ship receives the report, they then must generate individual requisitions, which are then submitted as off-line requisitions directly to RRAM. These requisitions must be treated as labor-intensive, off-line orders because in order to process any requisition through R-Supply, the funds are obligated when the requisition is made. Once the R-Supply requisition is fulfilled, a financial transaction is submitted to either capture the funds or return them to the requisitioner in the form of a credit. Since all RRAM parts are free-issue, the ships have to wait several days to several weeks, depending on the financial cycle, to receive the credit to their OPTAR. In this process, if the size of the requisition is large enough, the ship risks over-obligating its OPTAR.

G. ISSUING PARTS

Parts are requisitioned from RRAM through the Navy Supply system on a daily basis. The RRAM facility contractor workday begins with printing all of the outstanding requisitions that are waiting to be filled that have been received and not completed since the previous day. It is important to note here that the RRAM facilities have established operating hours from 0630 to 1630 Monday through Friday. The facilities do not conduct operations on the weekends or holidays unless there is an emergency requirement which is handled by on-call staff. Once the requisitions have been printed, the contractor's workforce begins locating the required parts within the warehouse and pulling the parts from their assigned storage locations where they are then brought to an outgoing (shipping) material location. The outgoing parts are placed on shipping counters, with their respective requisition paperwork, awaiting shipping preparation and processing. The contractor's workforce continues this process until all the required material (parts) have been located and brought to the outgoing material location.

Once all of the parts associated with the requisitions have been placed in the outgoing material location, they are then prepared for shipping based on their requisition precedence. Some parts have a higher requisition precedence than others, for example Casualty Report (CASREP) material are usually coded an issue priority group (IPG) of one through three and are usually sent via FEDEX, UPS, or some other form of shipping that delivers overnight or fastest possible means. Material with lower priority may be shipped via United States Postal Service or some other slower/less expensive means. Following preparation for shipment, the parts are affixed with an appropriate shipping label based on the shipper requirements the requisitions are then processed in the RRAM database as completed which provides the customers (requisitioning activity) with feedback via the Naval Supply system database that their parts have been shipped. According to the respective warehouse Operations Managers, the contractor is not required to deliver the part to the shipping company; each shipping company makes daily pick-ups at the RRAM facilities to collect all outgoing material. All locally delivered material is picked up by either the servicing Defense Distribution Depot or the FISC Logistics Support Center for distribution to the home-ported ships.

IV. DATA COLLECTION AND ANALYSIS

A. INTRODUCTION

The reader should now have a grasp of the process of how parts become excess, to how they enter the RRAM system and how they are eventually issued to a customer. In following the chain of events that made up the RRAM operations, the authors were able to identify costs of the operation. With the costs identified, the authors could then analyze the costs and determine if they qualify for being included in a cost versus benefit analysis. With all the costs identified, quantified and qualified, the authors could then present the reader with a model for determining whether the benefits exceed the costs of managing and maintaining the RRAM operations. In this chapter, the authors define the costs identified as well as quantify those costs. The authors then balance those costs against the benefits obtained from incurring those costs.

B. DEFINING COSTS

Based on the RRAM operations chain of events, the authors determined the following costs required identification and quantification.

1. Transportation Cost

Transportation cost is defined as the cost to ship excess material from the units where they are considered excess to the destination RRAM facility as well as shipping excess material from the RRAM facility to the customer. There are two different transportation costs. The first transportation cost would be the receipt transportation cost where the part is shipped as excess to a RRAM facility. The second transportation cost would be the issue transportation cost where the part is shipped to the end user or customer.

2. Contract Cost

The contract cost is defined to be the cost incurred for paying a private sector service provider to manage RRAM warehouse operations as described in Chapter III part B under the RRAM contractor functions.

3. Facilities Cost

The facilities cost is defined to be the cost incurred for renting, leasing, or purchasing the warehouse facility in which the excess material (parts) is stored and all associated utilities costs (e.g., electricity, water).

4. Government Oversight Cost

Government oversight cost is defined as the cost incurred for having military and civilian government employees monitor the RRAM contract and ensure the contractors are performing to the requirements of the contract. Military and civil service personnel perform liaison duties between the customers and warehouses. Some of these personnel also perform Contracting Officer's Representative (COR) functions as a collateral or secondary duty.

5. Operation and Maintenance Cost

Operation and Maintenance cost is defined as the cost to the government for providing administrative support and supplies to the customer. For example, this cost includes any packaging material requirements for preparing excess material for shipment to a customer or end user.

C. QUANTIFYING COSTS

Having identified the cost categories, the authors then set about quantifying those costs. Quantification of costs required the authors to visit the RRAM facilities in Norfolk and in San Diego. During these visits, the authors were able to view the facilities, identify what utility usage occurred, and see what facilities maintenance might be

necessary. The authors were able to gather data from the RRAM database managers at the respective RRAM facilities. While visiting the facilities, the authors also interviewed the government employees (both military and civil service) obtaining contract cost data as well as numerous other data pertaining to the overall RRAM operations.

1. Transportation Cost

The authors were not able to quantify the receipt transportation cost or the cost incurred when excess material is shipped to a RRAM facility via a carrier other than opportune (free) lift. This data was not obtainable due to the fact that shipping costs applied to the SURFOR Transportation Activity Code, or TAC, are not tracked by destination, only the origin. The reader will have to be aware that a receipt transportation cost is not included in the net cost avoidance figures that are presented later in this paper. The reader should also be aware that based on discussions with both the contractor and the government COR, transportation costs of this nature are rarely incurred and would minimally subtract from the net cost avoidance. The COR for the San Diego RRAM operation stated he could only identify one instance in FY08 that required RRAM material shipped via other than opportune lift where a cost was incurred (Francisco Salazar, LT, USN, personal communication, October 8, 2005).

The authors determined that the issue transportation cost or the cost incurred to ship material from the RRAM facilities to the customer did not require quantification because no matter where the part originated, it would incur some transportation charge. In other words, a shipping charge would be incurred whether it comes from RRAM or whether it comes from somewhere else (i.e., one ship to another).

2. Contract Cost

The contract costs were obtained through the RRAM facilities respective CORs and CNSF Budget Analysts. The cost data received was in the form of total annual costs and did not provide line items identifying employee salaries, contract award fees or profit percentages so as to avoid publishing contractor proprietary information.

3. Facilities Cost

Facilities costs were obtained through the Naval Facilities Engineering Command (NAVFAC) who pays the utilities bills for Navy installations. Both the warehouses are considered Government-owned Contractor Operated (GOCO) facilities. In a GOCO, the service providers perform the RRAM mission in Navy-owned warehouses. There are no mortgage or lease payments involved. The facilities costs were limited to utilities costs (e.g., electricity, water, and internet).

4. Government Oversight Cost

Government oversight costs were obtained through interviews with the actual military and civil service government employees who either work full time with the RRAM facilities or provide oversight as a collateral (part-time) duty. The actual cost for these individuals was determined by either their actual salary, as a civilian government employee, or the Annual DoD Composite Rate calculated using the DoD Financial Management Regulation 7000.14R, which is used when determining the cost of military personnel for budget/management studies.

5. Operation and Maintenance Cost

The operation and maintenance (O&M) costs were provided by the COR for RRAM, San Diego. The San Diego facility is provided an O&M budget in order to purchase packaging and shipping supplies. There were no O&M costs for the Norfolk RRAM facility as the contractor is tasked to furnish packaging and shipping materials under the terms of their contract.

D. DETERMINING COST RELEVANCE

Having quantified the costs involved in the RRAM operations, the authors then determined whether these costs should be included in a cost-benefit analysis of the RRAM operation.

1. Transportation Cost

The authors determined that the receipt transportation costs are incurred depending on how the material is shipped and when it is shipped. The authors determined that this cost should be included in the cost-benefit analysis because it is a cost that would not otherwise have been incurred without the existence of the RRAM operation.

The authors determined that the issue transportation cost or the cost incurred to ship material from the RRAM facilities to the customer would be incurred to the Navy whether the parts were being sent from one customer to another or from RRAM to the customer. Basically, this cost is determined to be a "wash", and should not be included in the total cost to operate the RRAM facility or this cost-benefit analysis as it would be incurred with or without the existence of RRAM.

2. Contract Cost

The authors determined the contract cost to be a direct cost of the RRAM operations. The contract cost should be considered part of the cost-benefit analysis. This cost would not have occurred without the RRAM operations.

3. Facilities Cost

The authors determined the facilities cost to be a direct cost to the RRAM operations. The facilities cost would not have otherwise been incurred in the absence of RRAM. Although these costs are not incurred by SURFOR, they are an enterprise cost funded by the Naval Facilities Command (NAVFAC) and should be included in this cost-benefit analysis.

4. Government Oversight Cost

The authors determined the government oversight cost to be a direct cost of the RRAM operation. Although the government employees, both civil service and military, work part-time with the RRAM operations, the salaries they earn while working with

RRAM are traceable to the RRAM operation. The authors determined this cost should therefore be included in the cost-benefit analysis.

5. Operation and Maintenance Cost

The authors determined the operation and maintenance cost to be a direct cost to the RRAM Operations. This cost would not have been incurred in the absence of RRAM and should be included in the cost-benefit analysis. Just as with the Facilities Cost, maintenance is funded by NAVFAC and will be included as an enterprise cost.

6. Summary of Qualifying Costs

Having examined the RRAM operations and determined the relevant costs, the following list of costs is provided to assist the reader in understanding which costs should be included in this cost-benefit analysis.

- Receipt Transportation
- Contract Cost
- Facilities Cost
- Government Oversight
- Operations and Maintenance

E. DATA COLLECTION

In order to quantify the monetary and readiness benefits of the RRAM program, the research team had to gather several years of data. NAVICP-Mechanicsburg, Naval Supply Systems Command's Inventory Control Point, which manages the RRAM program for the Navy, provided the research team 36 months of issue data, covering October 2005 through September 2008, for the entire RRAM system which consisted of more than 172,000 issues with a list value of $206,368,657. SURFOR's East and West Coast warehouses accounted for $146,975,108 of the list value.

The team identified potential cost elements of contract labor and management, facilities, government oversight, transportation, and operations and maintenance for this study. Although some of these costs elements are funded at various levels of the Navy

hierarchy or by commands other than Naval Surface Forces, to accurately account for all costs, the authors chose to examine costs from an enterprise or Navy-wide perspective rather than just the Type Commander (Commander Naval Surface Forces) perspective.

There are three types of benefits included in this study. The first is the monetary savings to SURFOR for free material being issued and reutilized from the RRAM warehouses. The second is the readiness benefit of filling high priority material requirements of the end users. The third type of benefit is the value of the credits generated by the sale of excess material. This may be a critical element in determining whether RRAM generates sufficient income to fund its operation.

The first type of benefit, the monetary savings of the RRAM issues, is the easiest to measure in that they are a cost avoidance, which is realized by not having to re-purchase the material from the stock system and decrement the activity's operations and maintenance (O&M) budget.

The readiness aspect is the second, non-monetary albeit quantifiable benefit of the RRAM warehouses. We gathered issue (requisition) data from FY 2006 to the present and grouped those issues into the three Issue Priority Groups (IPG) I, II and III. IPG I requisitions are those which fulfill high-priority, mission degrading requirements outlined below:

- NORS (Not Operationally Ready Supply) Requisitions - submitted for a casualty report (CASREP) requirement, as defined in Navy Warfare Publication (NWP) 10-1-10 or,
- Anticipated CASREP requirement (ANORS), as authorized in OPNAVINST 4614.1 (series).
- NMCS (Not Mission Capable Supply) Requisitions - any requisition submitted for aviation material required to correct an aircraft NMCS condition, an anticipated NMCS condition (ANMCS), or a partial mission capable - supply (PMCS) condition as defined in OPNAVINST 5442.4 (series).
- Also any requisition for a test bench item qualified to be designated as a BROAD ARROW.

The authors focus on the IPG I issues from RRAM as they have the most impact on fleet readiness.

The third benefit is the money SURFOR receives through sales of excess material to activities such as FMS, MTIS, or DLA.

F. COST AVOIDANCE

Cost avoidance, as reported by the RRAM contractors operating the RRAM facilities, is defined as the savings to the government received through obtaining (requisitioning) free material from RRAM. This figure is based on the price the government, Navy in this case, initially paid for the material, determined to be the Federal Logistics Record (FEDLOG) price. There is no simple method or calculation to determine the true cost avoidance realized by issuing material from the RRAM warehouse other than using the item price listed in FEDLOG, the database of supply system information for the Federal government. Calculating the opportunity cost of not turning excess material into Material Turned-In to Shore (MTIS) and/or Defense Reutilization and Marketing Office (DRMO), both of which repurchase material from the Navy, is not practical because both programs base their credit reimbursements on complex and varied formulas based on the agencies' needs, demand history of the item, Cost Recovery Rates, scrap or resale value, etc. For instance, an item may receive full, or nearly full credit if it has consistent, recurring demand or can be sold through Foreign Military Sales. An item with minimal demand (<1 per 3-5 years) or which is readily available may receive partial or no credit at all. However, once these parts are requisitioned again, they will be re-issued to the end user at *full FEDLOG value* essentially resulting in the item being paid for twice by SURFOR. The full price (i.e., FEDLOG) includes costs such as inventory holding costs, transportation, the ICP's Cost Recovery Rate and any other applicable costs.

The authors are calculating and categorizing cost avoidance/benefit in accordance with SECNAVINST 5220.13, which standardizes the Navy's approach to capturing, reporting and generating sound financial decisions on benefits derived from Lean Six Sigma and Continuous Process Improvement. Our analysis will identify and quantify the costs incurred by SURFOR and then categorize the benefit as both Type 1 for the hard

monetary savings and Type 3 for the readiness benefit. A complete explanation of the SECNAVINST 5220.13 can be found in the Appendix.

G. COST ANALYSIS

1. Contract Cost

The majority of the costs involved with maintaining the RRAM warehouses lie with the contract costs. In both Norfolk and San Diego, the contractors are required to perform receipt, stocking and issue functions of RRAM material. They are also tasked to offload the material from SURFOR ships and process excess RRAM material for transfer to FMS, MTIS and/or DRMO. Table 1 breaks down the contract costs for FYs 2006 through 2008.

Fiscal Year	San Diego	Norfolk	Total
2006	$ 557,000	$ 736,635	$ 1,293,635
2007	$ 562,570	$ 603,753	$ 1,166,323
2008	$ 926,844	$ 520,415	$ 1,447,259

Table 1. Contract Costs by SURFOR RAM Location.

2. Contract Oversight Cost

Contract oversight costs are relatively minor in comparison to the contract costs as much of the oversight is performed as a collateral duty for a mix of government personnel constituting both military and civil service. Table 2 estimates the annual costs for each person involved in the SURFOR RRAM operations for FY08. The authors used only 2008 data for this cost-benefit analysis. The reason for this decision is partly based on the fact that these costs represent the most current costs and were easily obtainable. Due to turn-over of military and civil service personnel, prior fiscal year data was not obtainable.

Norfolk Warehouse						
RANK	**DoD RATE**	**HOURLY FACTOR**	**HRS/WEEK**	**TOTAL/WEEK**	**TOTAL/MONTH**	**ANNUAL TOTAL**
LCDR	$151,674.00	0.00055	6	$500.52	$2,002.10	$24,025.16
Civilian			20	$1,000.00	$4,000.00	$48,000.00
San Diego Warehouse						
LCDR	$151,674.00	0.00055	2	$166.84	$667.37	$8,008.39
LT	$132,261.00	0.00055	4	$290.97	$1,163.90	$13,966.76
SKCS	$106,224.00	0.00055	10	$584.23	$2,336.93	$28,043.14
				TOTAL:	**$10,170.29**	**$122,043.45**

Table 2. Contract Oversight Costs by Location.

3. Facilities Cost

Facilities costs are mission funded by the regional NAVFAC. Since metering at both sites is for the entire building and not for the individual tenants located within, costs are estimated using cost drivers such as personnel occupancy loads, scheduled lighting usage, equipment usage, and average climate control usage. Prior fiscal year cost figures were not available so the authors used the 2008 costs. The estimated 10-15 percent utilities variance between FY 2006 and FY 2008 will not appreciably impact our total cost computation. Facilities costs by location are depicted in Table 3.

	San Diego	**Norfolk**	**Totals**
Maintenance	$ 9,880.08	$ 10,000.00	$ 19,880.08
Utilities	$ 13,475.49	$ 15,000.00	$ 28,475.49
		Total	$ 48,355.57

Table 3. Facilities Costs by Location.

4. Operations and Maintenance Cost

Operations costs for the San Diego RRAM facility were provided by SURFOR. Maintenance costs were paid for by NAVFAC and were included in the facilities cost. There were no operations cost for the Norfolk facility due to the fact that this cost was included as part of the RRAM contract whereas SURFOR uses a separate budget for San Diego. The maintenance costs for Norfolk were paid for by NAVFAC and included in

the facilities cost. Only 2008 operations costs were available from SURFOR. There were no records readily available to provide prior years data. Operations cost figures for 2008 are presented in Table 4.

	San Diego	Norfolk	Total
Operations	$ 5,049.00	$ 0.00	$ 5,049.00

Table 4. Operations and Maintenance Costs by Location.

5. Transportation Cost

Transportation costs were not available. As previously noted, the only transportation costs that should be included in this study are the receipt transportation costs. The transportation cost data could not be acquired. The reader should keep in mind that not including this cost will make the overall benefits determined by this study appear larger than they actually are. However, as discussed previously, our data indicates that the normal mode of transportation is opportune shipping.

H. COST ANALYSIS SUMMARY

The pie chart in Figure 2 provides a graphical depiction of the costs included in the cost-benefit analysis.

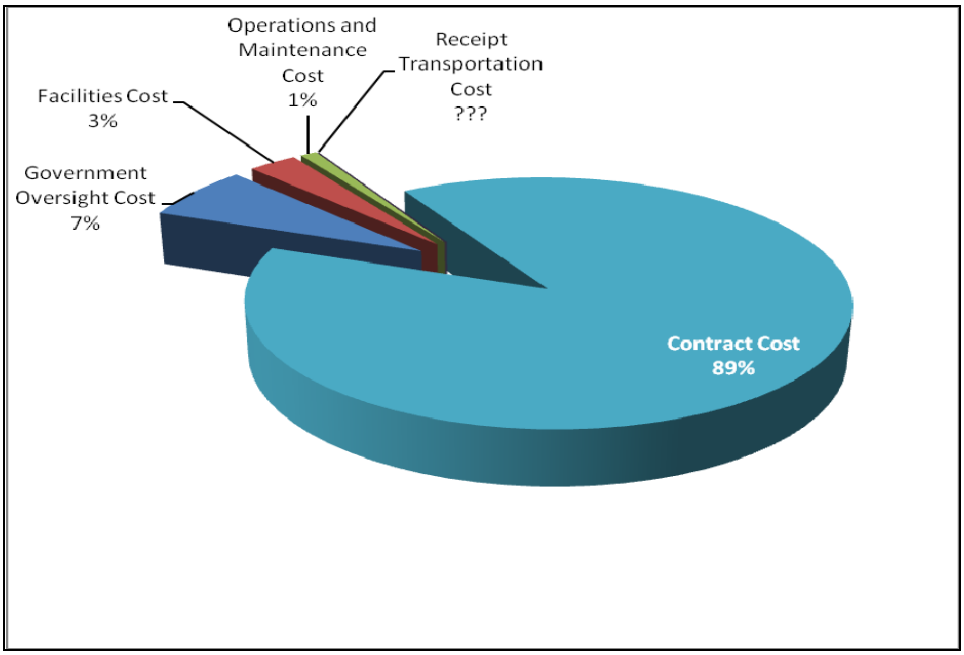

Figure 2. Summary of RRAM Costs.

I. BENEFIT ANALYSIS

The cost-benefit relationship is being calculated in this research. Two forms of cost benefit are being calculated first in terms of dollars saved by reissuing the parts free of charge through RRAM (cost avoidance), and then in the dollars recouped by SURFOR for credits processed through RRAM by turning items into MTIS, DRMO and/or Foreign Military Sales. The readiness benefit is being measured by the number of high-priority (IPG I) requisitions being issued to SURFOR units.

1. Cost Avoidance

A shown in Table 5, cost avoidance is critical in that it represents over $146 million of OM&N funds that did not have to be re-obligated to fill 46,000 material requisitions throughout the Navy and Military Sealift Command between FY 2006 and June 2008. When we estimate the full FY 2008 value at $57,411,948, we arrive at an average, annual gross cost avoidance of 49,290,755 for an average net avoidance of $49 million.

FY	Norfolk	San Diego	Total
2006	$ 21,370,225	$ 29,325,092	$ 50,695,318
2007	$ 25,003,025	$ 14,762,008	$ 39,765,033
2008	$ 29,617,900	$ 26,896,857	$ 56,514,757
		TOTAL 06-08	$ 146,975,108

Table 5. Annual Cost Avoidance.

Figure 3 provides cost avoidance versus percentage of material issued from specific inventory dollar-value categories for fiscal year 2007. The dollar-value categories are broken down to include the percentage of issues from that specific dollar-value category. For example, material having a value greater than $1000 produced 83.38 percent of the savings and accounted for only 13.51 percent of the total issues (bottom right corner of Figure 3). Ninety-eight percent of RRAM's cost avoidance lies with parts valued at $100 or more, but only accounts for 35 percent of RRAM's volume.

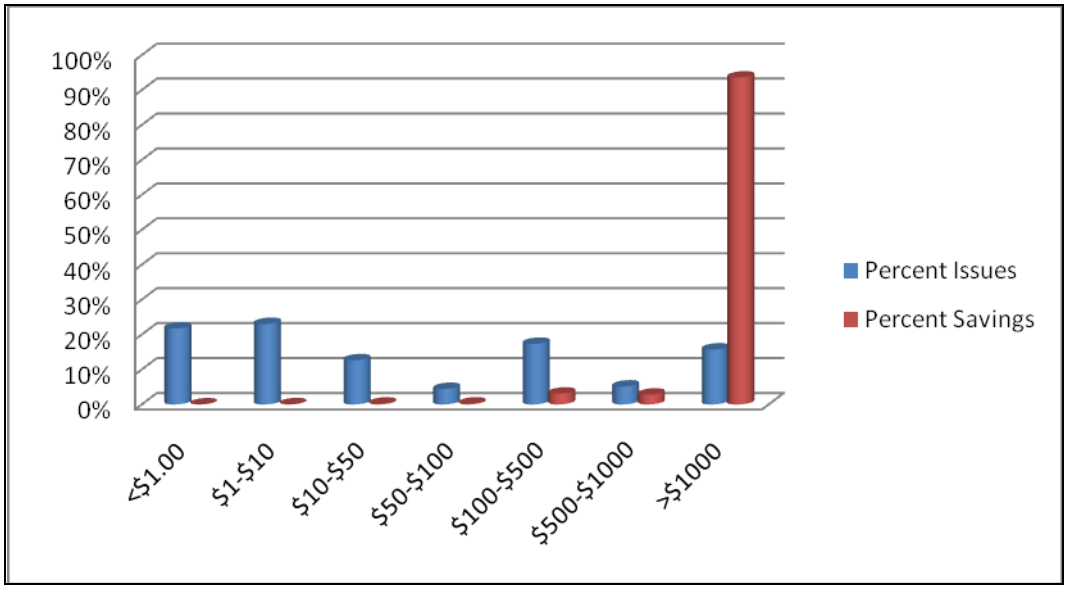

Figure 3. 2007 Average Monthly Cost Avoidance Versus Percentage of Material Issued from Specific Inventory Dollar-value Categories.

In July of 2007, the San Diego warehouse modified its business rules to accept all parts regardless of dollar value and demand history. The East Coast warehouse accepts a very limited number of parts valued at less than $100, accepting only those with stable

demand. Figure 4 shows the average monthly distribution of parts issued by dollar value and how the difference in business rules has changed the distribution. In 2006, parts valued less than $100 accounted for only 5 percent of the parts issued from RRAM. By 2008, that number grew to 62 percent. This trend has a direct impact on the number of labor hours being billed to CNSF under the RRAM contracts discussed previously in this chapter.

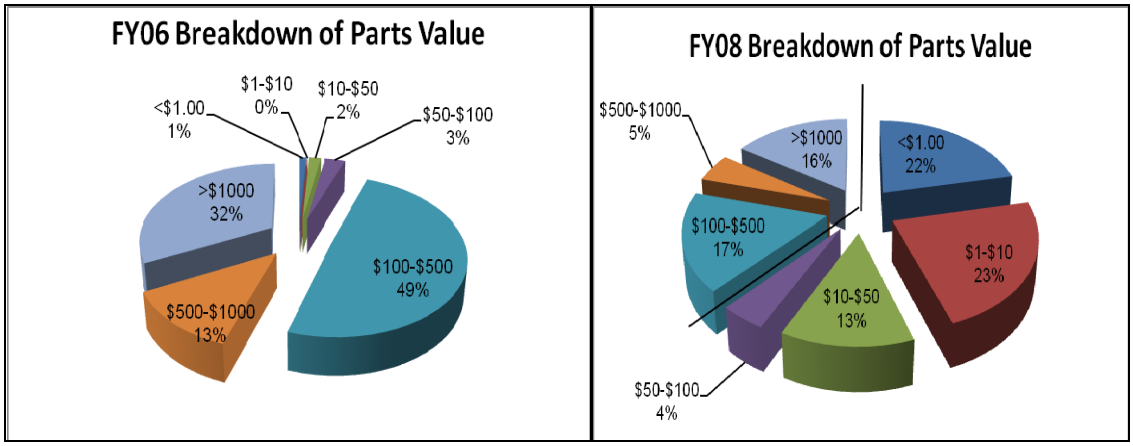

Figure 4. Average Monthly Distribution of Parts Issued by Dollar Value.

2. Credits

Credits represent direct income or "hard cash" for SURFOR. Based on discussions with both warehouse managers, RRAM offers hundreds of parts each year from the RRAM inventory are offered for return to the cognizant Item Manager at the major Inventory Control Points (ICP). The ICPs are either Navy commands or Defense Logistics Agency field activities who manage a range of stock numbered items. Whenever the ICP has a requirement for the material, they will request it from the RRAM warehouses and then reimburse the Type Commander for the item(s). The credit amount may not always be for the full FEDLOG value. As previously discussed, each individual Item Manager calculates the credit value of the part based on several factors which include but are not limited to, demand history, potential demand, the item's working condition, and/or Foreign Military Sale value. There is no set formula for determining a

part's credit value so measuring the potential resale value of the RRAM inventory will at best generate an estimate based on a number of potentially invalid assumptions. Total credits for the period of 2006 through 2008 are indicated in Table 6.

FY	LANT	PAC	TOTAL
2006	$ 3,458,348	$ 4,534,157	$ 7,992,505
2007	$ 1,939,656	$ 594,206	$ 2,533,863
2008	$ 3,012,538	$ 1,483,348	$ 4,495,887
		TOTAL 06-08	$ 15,022,255

Table 6. Total Credits.

Table 6 above shows an average annual credit total of $4.7 million so with an average Cost of Operations of $1.9 million, the cash ROI of the RRAM operation is 2.5:1.

3. Readiness

With a premium being placed on readiness, especially during times of dwindling Operating Target (OPTAR) budget grants and increased Operational Tempos (OPTEMPO), any locally-available source of high-priority spare parts to keep units fully capable is highly desirable. Since the authors are calculating the readiness benefit, the research focuses on IPG I requisitions which have the most significant impact on fleet readiness. On any given month, an average of 237 CASREPs are issued to surface ships and submarines, and another 13 NMCS/PMCS parts to aviation units, removing the units from a degraded status. Another 1525 RRAM parts are issued to all units preventing them from going into a degraded status. FY 2008 data on Priority requisitions filled from RRAM warehouses is outlined in Table 7.

	Priority requisitions filled by month					
	CASREP Requisitions		NMCS-PMCS		All IPG-I	
	#	$	#	$	#	$
October	275	$ 1,829,925.98	5	$ 2,194.64	1,278	$ 5,187,499.99
November	252	$ 1,099,651.31	11	$ 6,017.67	1,271	$ 3,789,604.51
December	198	$ 733,400.18	7	$ 2,435.40	971	$ 2,812,156.33
January	199	$ 1,052,806.57	5	$ 2,545.14	2,062	$ 5,313,081.17
February	215	$ 1,045,087.46	6	$ 3,137.26	1,251	$ 4,078,400.74
March	268	$ 1,517,958.82	24	$ 225,170.32	1,375	$ 5,274,081.00
April	279	$ 1,215,335.15	40	$ 73,660.03	1,392	$ 5,879,197.61
May	197	$ 792,295.82	13	$107,979.16	1,316	$ 5,588,466.99
June	222	$ 1,102,849.92	14	$ 17,278.17	1,626	$ 6,288,718.80
July	247	$ 1,297,279.51	17	$ 9,810.17	2,837	$ 5,699,960.69
August	245	$ 1,187,578.22	11	$ 26,187.22	1,274	$ 4,645,773.81
September	248	$ 1,103,502.62	5	$ 4,167.05	1,652	$ 4,884,415.15
FYTD Total	2,845	$13,977,671.56	158	$480,582.23	18,305	$59,441,356.79
Monthly Avg	237	$ 1,164,805.96	13	$ 40,048.52	1,525	$ 4,953,446.40

Table 7. Fiscal Year 2008 Priority Requisitions.

The 2,845 CASREP (Submarine/Surface) and 158 NMCS/PMCS (Aviation) requisitions filled by RRAM are a contribution to maintaining fleet readiness. There is a dollar value attributed to the parts issued. The RRAM parts facilitated the deployability of a ship or aircraft thereby enhancing readiness while saving limited OPTAR resources.

4. Net Cost Avoidance

The authors have calculated the average annual cost avoidance to be $48,667,755. This figure is based on the annual operating cost of $2 million and an average combined value of all RRAM parts issued of $50,667,755. This also represents a Cost-Benefit Ratio (ROI) of 24.3:1 (annual net cost avoidance divided by the annual operating cost).

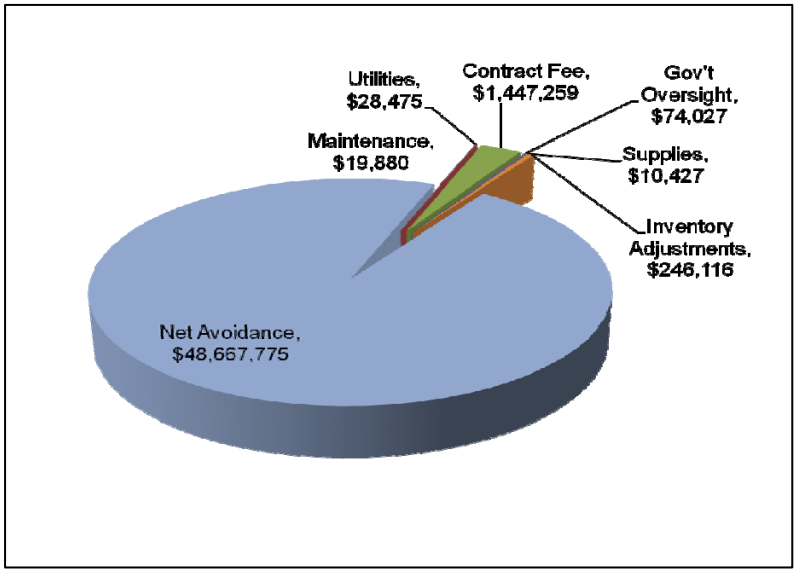

Figure 5. Net Cost Avoidance.

V. ACTIVITY-BASED COSTING MODEL

A. INTRODUCTION

As mentioned in the introduction and background of this research paper, the authors' intent for the application of an activity-based costing (ABC) model is to provide the reader with insight into the current operating processes of the RRAM facilities. This chapter leads the reader through the development of an activity-based costing model for the RRAM operations.

B. ACTIVITY IDENTIFICATION

1. Activities/Cost Pools

The overall activities involved in the RRAM process of operations were defined under the RRAM contractor functions (Chapter III, part B). These activities also represent cost pools that would be assigned all the costs of resources that are consumed during the process of conducting such activities. Those activities included:

a. Receiving Parts

Although this function or activity was previously described, not all of the processes involved in receiving parts were discussed. There are several processes that make up this activity. The first process involves the contractors potentially traveling from the RRAM warehouse to a ship on the waterfront and offloading parts from storerooms in that particular ship. At the ship, the contractors must first meet with Supply Department personnel and then wait for departmental representatives to assist the contractors. Once the offload begins, contractor personnel remove the items from the ship's storerooms and bring the parts to the pier for transfer to the RRAM facility. Navy Supply Department personnel process the offload of material in their own database. After the parts are transported to the RRAM facility, they are separated into material that will be inducted into the RRAM inventory and material that will be sent elsewhere.

Following separation, material identified for induction into the RRAM inventory is then received into the Lawson database system (master RRAM database). The material is then placed in its designated storage location in the RRAM warehouse. Before being placed into locations within RRAM, the material receives a label containing a bar code and a location indicator. Material is transferred part by part to designated locations within the warehouse.

b. Issuing Parts

As previously discussed, the beginning of the workday at each RRAM facility starts with printing requisitions (customer orders) that are queued to be filled. Following printing all the requisitions for that day, there are several processes that are involved in issuing the parts associated with the requisitions. The first process is picking the parts. Picking the parts involves finding the parts in their respective storage location in the RRAM facility and bringing them to a shipping area within the warehouse along with their respective requisition documents. This process continues until all the parts have been picked and placed in the shipping area with their requisition documents. Upon completion of picking all the requisitioned parts, shipping preparation begins. Shipping preparation involves segregating the parts in order of priority and then preparing and affixing shipping labels to each part depending upon mode of shipment (e.g., FEDEX, UPS, USPS). After completion of shipping preparation, the requisitions are processed in the Lawson database as shipped enabling the customer to obtain and track the status of their requisitions until they arrive.

2. Activity Measures

Activity measures are a way to track costs from cost pools to specific cost objects. They are also known as cost drivers because the activity measure should “drive” the cost being allocated (40 Vertovec, Tim 2008}.

a. Receiving Parts

The authors determined the cost driver for receiving parts should be the number of parts received. The authors made this determination based on the fact that the contractor incurs costs for which it bills the government through labor hours worked. The receipt of each part generates a labor requirement thereby driving costs. For example, a ship requiring the offload of 1,000 parts may require four contract personnel working eight hours each to offload all 1,000 parts. If each contractor receives an hourly rate of $15, this would equate to a total of $480 worth of labor. If applied to the offload of the parts, this would equate to $480 worth of labor divided by 1,000 parts or 48 cents per part. This example does not take into account any possible stoppage time due to set up, or lost time waiting for the ship's Supply Department to prepare to accommodate contractors. This example also does not take into account the time it takes the contractor to travel to the ship or transport the parts to the RRAM facility. It is important to note that the contractor is paying its employees' hourly wages during the down-time mentioned above and should be included in the cost pool. Finally, the receiving-parts activity measure must account for actually inducting the 1000 parts mentioned above into the RRAM database and warehouse. If it were to take the same number of people, receiving the same hourly rate for an additional eight hours to receive the parts into the Lawson database and then place the parts into their respective storage locations in the warehouse, this would amount to an additional charge of 48 cents per part for a total 96 cent charge to receive each part. Granted, not all the parts coming from the ship might be accepted into the RRAM inventory. Some may be sent to alternate locations, such as FMS, DRMO, or MTIS as previously discussed.

b. Issuing Parts

The authors determined the cost driver for issuing parts should be the number of requisitions required to be processed. The authors made this determination based on the fact that the contractor incurs costs for which it bills the government through labor hours. Each requisition generates a labor requirement thereby driving costs. Although there may be more than one part associated with a requisition, data was not

available to the authors regarding the average number of parts associated with each requisition. If an activity-based costing model were implemented, the number of parts per requisition could increase the accuracy of the model. Given the available data, the authors chose to use the requisition data as the cost driver. For example, at the beginning of the workday there are 160 requisitions to be completed. The contractor determines it will take 10 employees, being paid an hourly rate of $15 per hour, one and a half hours to pick all the parts required from their respective storage locations and deliver them to the shipping area in the warehouse. This would equate to a total of $225 worth of labor (10 employees times $15 per hour times one and a half hours). If applied to the activity, this equates to $1.41 per requisition ($225 worth of labor divided by 160 requisitions). To continue the issuing process requires another two employees working an additional six hours to prepare the parts for shipping, affix shipping labels, and close out the requisition in the Lawson database. If each of these employees is receiving an hourly rate of $15, this equates to a total of $180 worth of labor. If applied to the requisitions, this equates to a total of $1.13 per requisition ($180 divided by 160). This brings the total cost per requisition to $2.54 ($1.41 per requisition for picking parts and delivering to shipping area plus $1.13 per requisition for shipping preparation and closing out the requisition).

C. OVERHEAD COSTS

In order to capture all the costs associated with RRAM and include them in the activity-based costing model, overhead costs must be calculated and then assigned to the predetermined activity cost pools. Overhead costs are defined to be the costs incurred to maintain the warehouse operations. They are costs that are not part of the receiving parts process or issuing parts process as described previously in activity measures. The authors have determined the overhead costs to include:

- Contractor Management Salary – defined as the salary the RRAM contract civilian warehouse manager receives
- Contractor Lawson Database Manager Salary – defined as the salary the RRAM contract civilian database manager receives

- Facilities cost – previously defined in this research paper
- Government oversight cost – previously defined in this research paper
- Operation and Maintenance cost – previously defined in this research paper
- Receipt transportation cost – previously defined in this research paper and determined to be unobtainable

For the purpose of this ABC model, the authors are examining the data from the perspective of a single RRAM. In order to protect proprietary data, the figures used in this ABC model are not taken from either the San Diego RRAM facility or the Norfolk RRAM facility but represent approximations of actual costs for such operations. Table 8 represents the total annual overhead costs that must be allocated to the activity pools.

Overhead Category	**Annual Cost**	**Monthly Cost (Annual / 12)**
Contractor Management Salary	$ 50,000	$ 4,167
Database Manager Salary	$ 40,000	$ 3,333
Facilities Cost	$ 25,000	$ 2,083
Government Oversight Cost	$ 59,000	$ 4,917
Operations and Maintenance Cost	$ 5,000	$ 417
Receipt Transportation Cost	???????	???????
Total	$ 179,000	$14,917

Table 8. Total Annual Overhead Costs.

D. ACTIVITY RATES

Activity rates must be determined for assigning overhead costs to activity cost pools. In this case, the authors determined there to be two activity cost pools; the receiving parts cost pool and the issuing parts cost pool. It is important for the reader to note that these are the cost pools derived by the authors under a first pass ABC model. A

further refined ABC model could determine additional cost drivers producing more accurate overhead tracing techniques. In any case, the two cost pools determined by the authors indicates that two activity rates are required in order to trace overhead to the two different pools. The authors chose to trace 70 percent of the overhead costs to the receiving parts pool and 30 percent to the issuing parts pool for simplicity in building this model. The authors chose this ratio under the assumption that a single requisition may have one part or may have multiple parts associated with it. The reader should be aware that this ratio may not be reflective of the actual contractor time required to process requisitions or receive parts. The contractor may spend 80 percent of the time receiving parts and 20 percent of the time processing requisitions, which would change the overhead tracing. To form a basis for the two activity rates required, the authors examined historic RRAM reports to find out: 1) how many parts on average were received in a month; and 2) how many requisitions on average were completed in a month. The results are shown in Table 9.

	Monthly Average
Parts Received	8400
Requisitions Completed	960

Table 9. Average Monthly Parts Received and Requisitions Processed.

Given that average monthly parts received and requisitions have been determined, these figures can be used to determine the activity rates required to trace the overhead. The calculated activity rates are shown in Table 10.

Activity Cost Pools	**(a) Overhead Cost to be Tracked**	**(b) Average Monthly Activity**		**(a) ÷ (b) Activity Rate**	
Receiving Parts	$ 10,443	8400	Parts Received	$ 1.24	per part
Issuing Parts	$ 4,475	960	Requisitions Completed	$ 4.66	per issue

Table 10. Activity Rates.

Based on the calculations in Table 10, there is a $1.24 overhead charge for receiving each part and a $4.66 overhead charge for completing each requisition. It is important for the reader to understand that these costs produce little variability with each action. The reason the costs will not vary much is because the overhead costs are fixed in the short term. No matter how much or how little business is conducted, the cost of paying the contractor management's salary, database manager's salary, and the facilities costs must be paid. Additionally, some of the overhead costs such as facilities can be argued to be solely a function of receipts. The facilities are needed as long as parts are received, regardless of any issuing of parts. As another example, the operations and maintenance cost may be more a function of parts issues than receipts given the support provided by the government for shipments.

E. ABC MODEL IN SUMMARY

Based on the simplified ABC model presented using only a portion of the costs, it will cost a total of $2.20 to receive each part (96 cents worth of labor plus $1.24 worth of overhead). It will cost a total of $7.20 to complete each requisition ($2.54 worth of labor plus $4.66 worth of overhead). The actual total cost per requisition is $9.40 or the combination of both costs above. This is due to the fact that before any requisition can be completed, the part(s) required to fill that requisition must first be received into the RRAM inventory.

It is important for the reader to be aware that this model represents a very conservative cost estimate of the activities presented. This model does not include the receipt transportation costs, which were previously defined and unable to be determined. This model also does not include any contractor overhead the contractor claims in the government contract (e.g., contractor provided equipment, general and administrative expenses). The reader should be aware that inclusion of these costs would increase the total cost per requisition. The activity-based costing model most certainly can be refined. What is presented here is a first attempt to identify process costs.

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VI. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

The goal of this project was to quantify the value of the benefits provided by SURFOR's RRAM warehouses. The authors compiled and analyzed all of the data which was currently available on existing enterprise applications. The resulting analysis supported SURFOR's position to maintain RRAM warehouses. For an average annual cost of just over $2 million to operate both warehouses, the enterprise achieves annual monetary benefits averaging $48 million and fills 18,000 high-priority requisitions. This represents a cost-benefit ratio of 24.3:1 and a credits or "hard cash" cost-benefit ratio of 2.5:1. With a positive cost flow, RRAM is self-sustaining and requires no additional funding from CNSF. In accordance with SECNAVINST 5220.13, the monetary value of RRAM represents substantial Type 1 benefits in the form of "hard savings" and the readiness contribution represents Type 3 or "soft savings" to the enterprise.

RRAM warehouses maintain a mix of both useful and "dead" inventory. Currently, there is an effort to optimize the inventory based on demand history. SURFOR personnel on both coasts are actively engaged in educating ships on the best way to maximize use of the RRAM inventory.

Based on the percentage (62%) of RRAM items being issued with individual values of less than $100, SURFOR is paying more than $310,000 each year (approximately 62 percent of the $500,000 warehouse labor) to achieve less than one percent of its annual $49 million in cost avoidance. Since this is a Cost-Plus contract, as much as $310,000 that SURFOR is being billed for each year could be eliminated and utilized elsewhere in the enterprise with a potentially greater benefit. A basic ABC model of the as-is process, suggests that an absolute minimum dollar cost for RRAM part acceptance is approximately $9.40, but this simply provides a break-even point for handling parts and does not contribute to a significant cost-benefit for CNSF.

B. RECOMMENDATIONS FOR FURTHER STUDY

Based on the Cost-Plus contracts being utilized to operate RRAM, the authors recommend standardizing the business rules to, at a minimum, limit the number of low-dollar value parts being handled in RRAM. Based on the revised San Diego business rules, the workload to handle parts valued at less than $100 has increased from 5 percent in 2006 to 55 percent in 2008. Reducing or eliminating this requirement in the San Diego operation could reduce the contract labor hours by as much as $310,000 annually, making more funds available elsewhere in the enterprise without significantly impacting the monetary cost savings. In order to more accurately determine the optimal dollar threshold for parts being supported in RRAM, the authors recommend conducting a time-motion study on select activities to incorporate better labor estimates for the Activity-Based Costing model introduced in Chapter IV. This analysis will provide CNSF with a potential break-even point that best determines the dollar threshold for parts acceptance. Additional consideration must be given to parts that are not readily available in the Supply System when making the final determination. The decision ultimately resides with CNSF as to their desired cost-benefit ratio.

With nearly $600 million in inventory in the two warehouses, the authors suggest analyzing the inventory depth to identify which line items are being retained in excess of their historical demand. These line items may be candidates for MTIS, FMS and/or DRMO in order to recoup some of their value in credits. One of the main premises behind maintaining RRAM inventory is to avoid repurchasing parts which have already been paid for. However, if the demand history reveals there to be a high likelihood that some of these parts may never be required, SURFOR should attempt to resell the parts at the earliest opportunity while the parts still have some value to the item managers. This may be an excellent avenue for SURFOR to generate some hard revenue to offset short-term budget reductions.

In conducting the research, it became clear that there is potential for increased utilization of RRAM if a few steps are taken to aid the end users. The first step is to enable the Navy's afloat supply management system called Relational Supply or simply,

R-Supply, to run Reorder Reviews with the orders going directly to the local RRAM as a "Fill or Kill" requisition. Normal requisitions are submitted into the stock system through a Point of Entry at which time, the ordering activity obligates the funds. Once the requisition enters the system, the order follows a pre-determined logic path where the order is either filled or if not available, passed on to the next activity in the flow until the order can be issued or sent to the cognizant ICP for procurement. A Fill or Kill requisition is a request for parts which, if cannot be fulfilled by the activity receiving the order, that requisition is cancelled rather than passed to another activity for fulfillment. The authors recommend functionality be programmed into R-Supply so that orders can be sent directly to the RRAM system without obligating the funds. A relatively simple cost benefit analysis of the reprogramming costs versus the cost savings would justify the expense. In the meantime, CNSF might establish a procedure to account for the over-obligation status and the time required to process credits through the financial systems. A potential second option is to enable the Lawson database to perform batch queries of the inventory, which will enable users to submit lists of items needed on their Reorder Reviews and order only those parts which are available in RRAM.

The authors also identified potential problem areas in efficient inventory management. Lawson treats any location changes within the warehouse as an issue thereby placing an artificial demand on the item. These artificial demands prevent effective demand validations that mask dead stock and create an artificially large inventory. This problem is especially relevant in the San Diego warehouse since personnel there indicated that a large percentage of the inventory was relocated for efficiency purposes when the contract was re-awarded in 2006.

The authors recommend that NAVSEA analyze its initial outfitting inventory models that are resulting in the fleet generating extensive excess material throughout each ship's lifecycle. With $600,000,000 worth of inventory in just two of the seventeen RRAM locations, NAVSEA might investigate the possibility of establishing a strike group parts allowance rather than an individual platform allowance. NAVSEA might

also consider pre-positioning the stocks at DLA's forward Defense Distribution Centers so that the parts are easily accessible when units are deployed and reduce the inventory burdens on the end-users.

APPENDIX

★MILITARY COMPOSITE STANDARD PAY AND REIMBURSEMENT RATES DEPARTMENT OF THE NAVY
FOR FISCAL YEAR 2008 [1/]

MILITARY PAY GRADE	AVERAGE BASIC PAY	ANNUAL DOD COMPOSITE RATE [2/]	ANNUAL RATE BILLABLE TO OTHER FEDERAL AGENCIES [3/4]
O-10	$168,000[5/]	$254,312	$256,689
O-9	158,312	248,093	250,470
O-8	144,920	233,081	235,458
O-7	126,738	210,084	212,462
O-6	106,543	194,692	197,070
O-5	85,732	166,782	169,159
O-4	72,649	151,674	154,051
O-3	59,340	132,261	134,638
O-2	46,827	103,275	105,652
O-1	34,737	82,970	85,347
WO-5	$84,035	$155,586	$157,963
WO-4	74,213	142,246	144,623
WO-3	62,478	124,885	127,262
WO-2	52,659	114,712	117,089
WO-1	—	----	—
E-9	$64,455	$124,735	$127,112
E-8	51,263	106,224	108,602
E-7	43,946	95,719	98,097
E-6	35,854	83,622	85,999
E-5	28,712	71,146	73,523
E-4	23,189	59,344	61,721
E-3	19,610	50,408	52,786
E-2	17,936	45,114	47,491
E-1	15,413	40,770	43,147
CADETS	$10,604	$14,652	Not applicable

★Notes:

1/ Effective fiscal year 2005, military personnel services for Foreign Military Sales shall be priced using the Composite Rates that already include permanent change of station (PCS) expense and shall no longer use the actual PCS expense for PCS moves to support a FMS case. The next update of the DoD FMR Vol. 15 Section 070203 will reflect this change.

2/ The annual DoD composite rate includes the following military personnel appropriation costs: average basic pay plus retired pay accrual, Medicare-eligible retiree health care (MERHC) accrual, basic allowance for housing, basic allowance for subsistence, incentive and special pay, permanent change of station expenses, and miscellaneous pay. **Includes** a per capita normal cost of $5,988 for MERHC accrual — **see Tab** K-1. ***http://www.defenselink.mil/comptroller/rates/.***

3/The annual rate billable to Other Federal Agencies recovers additional military related health care costs financed by the Defense Health Program. The annual billable rate includes an acceleration factor of $8,365 for all personnel. **Excludes** per capita normal cost of $5,988 for MERHC accrual — **see Tab** K-1. ***http://www.defenselink.mil/comptroller/rates/.***

4/ To compute a Daily Rate, apply a factor of .00439. To compute an Hourly Rate, apply a factor of .00055.

5/ Basic pay for these officers is limited to the rate of basic pay for Level II of the Executive Schedule, which currently is $168,000 per year.

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