2007-06

Worldwide husbanding process improvement: comparative analysis of multiple contracting methodologies

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NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

MBA PROFESSIONAL REPORT

Worldwide Husbanding Process Improvement: Comparative Analysis of Contracting Methodologies

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June 2007

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REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.			
1. AGENCY USE ONLY ***(Leave blank)***	**2. REPORT DATE** June 2007	**3. REPORT TYPE AND DATES COVERED** MBA Professional Report	
4. TITLE AND SUBTITLE: Worldwide Husbanding Process Improvement: Comparative Analysis of Contracting Methodologies.			**5. FUNDING NUMBERS**
6. AUTHOR(S) Mert Gundemir, Ronaldo Manalang, Paul Metzger, Joel Pitel			
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) Naval Supply Systems Command 5450 Carlisle Pike Mechanicsburg, PA 17055			**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:

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14. SUBJECT TERMS: contracting, husbanding, husbanding process improvement, husbanding policy, husbanding services.			**NUMBER OF PAGES** 111
17. SECURITY CLASSIFICATION OF REPORT Unclassified	**18. SECURITY CLASSIFICATION OF THIS PAGE** Unclassified	**19. SECURITY CLASSIFICATION OF ABSTRACT** Unclassified	**20. LIMITATION OF ABSTRACT** UL

NSN 7540-01-280-5500 Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18

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Approved for public release; distribution is unlimited

WORLDWIDE HUSBANDING PROCESS IMPROVEMENT: COMPARATIVE ANALYSIS OF MULTIPLE CONTRACTING METHODOLOGIES

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Submitted in partial fulfillment of the requirements for the degree of

MASTER OF BUSINESS ADMINISTRATION

from the

NAVAL POSTGRADUATE SCHOOL
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WORLDWIDE HUSBANDING PROCESS IMPROVEMENT: COMPARATIVE ANALYSIS OF MULTIPLE CONTRACTING METHODOLOGIES

ABSTRACT

This study is designed to support one of three major focus areas in the Naval Supply Systems Command (NAVSUP) Worldwide Husbanding Improvement Process initiative. Existing contracting methodologies were analyzed using the following methods: characteristics of existing contract vehicles within forecasting and simulation frameworks; strengths, weaknesses, opportunities, threats (SWOT) analysis, and stakeholder analysis. Conclusions are drawn and recommendations are outlined for optimum methods of contracting for husbanding services as requested by the Worldwide Husbanding Process Improvement Action Team. Historical husbanding contract data were reviewed, including constraints and desired performance criteria. Implementation of a flat-rate, low-variability, well-defined and constant set of requirements minimizes risk and price fluctuations. Conversely, adoption of a cost-reimbursable contract type is both undesirable and infeasible. A contracting methodology that represents a best-value trade-off within constraints should be *flexible* and *risk-based* while offering *performance-based incentives*.

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LIST OF ACRONYMS AND ABBREVIATIONS

AOE	Fast Combat Support Ship
AOR	Area of Responsibility
ATFP	Anti-terrorism Force Protection
BY	Budget Year
CAS	Cost Accounting Standard
CG	Cruiser
CHT	Collection and Holding Tank
CLIN	Contract Line-item Number
CNI	Commander Naval Installations
CONUS	Continental United States
CRAFT	Cost Reporting and Forecasting Tool
CVN	Aircraft Carrier
DASN	Deputy Assistant Secretary of the Navy
DDG	Destroyer
FAR	*Federal Acquisition Regulation*
FFG	Frigate
FFP	Firm-fixed-price
FISC	Fleet Industrial Supply Center
FPAF	Fixed-price Award Fee
GPC	Government Purchase Card
HCA	Head of Contracting Activity
HSC	Husbanding Services Contract
HSP	Husbanding Services Provider
IDIQ	Indefinite Delivery Indefinite Quantity
IT	Information Technology
LHD	Amphibious Helicopter Assault Carrier Dock
LOGCAP	Logistics Civil Augmentation Program
LSD	Landing Ship Dock
NAVSEA	Naval Sea Systems Command

NAVSUP	Naval Supply Systems Command
NFCC	Navy Field Contracting System
NRCC	Naval Regional Contracting Center
OCONUS	Outside Continental United States
OIC	Officer in Charge
OOTW	Operations Other than War
ROI	Return on Investment
SOO	Statement of Objectives
SOW	Statement of Work
SWOT	Strengths, Weaknesses, Opportunities, Threats

ACKNOWLEDGMENTS

The researchers would like to thank and acknowledge Captain Steve Shapro for his shared interest and support of this project. Special thanks to CDR Chris Parker, Rick Bauer, Scott Wilkins, CDR William “Scotty” Scott, CDR John Couture, and LT Jason Morgan for sharing their time, insights, and data. They proved to be an amazing group of knowledgeable professionals. Our research would not have been possible without their help. The researchers would also like to recognize FISC Norfolk, FISC San Diego, FISC Yokosuka, FISC Sigonella, NOLSC, and Patrick Defence for their participation in this study.

Special thanks to our advisors, Dr. Carey Simon and Dr. Aruna Apte, for guiding and focusing our efforts throughout the journey from concept to published product. Finally, we would like to extend our thanks and appreciation to Karey Shaffer and the Acquisition Research Program for their support and funding of our research efforts.

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I. INTRODUCTION

A. BACKGROUND

A husbanding services contract (HSC) is a requirements contract between the Navy and a husbanding services provider (HSP). It provides a commercial means of obtaining services and materials for operating forces in the conduct of both routine and contingency operations. HSCs provide services to U.S. Navy and Coast Guard ships making port calls in non-Navy ports in the absence of permanent logistics infrastructure.

The NAVSUP Contracting Management Directorate (NAVSUP 02) is responsible for providing a strategic framework for the delivery of contracted services across the Navy Field Contracting System (NFCS). NAVSUP 02 executes policy and oversight matters on behalf of the Head of Contracting Agency, who is the Commander, Naval Supply Systems Command. The overarching goal of husbanding services contracting is to meet the needs of warfighters within existing regulatory constraints while providing the best value for taxpayers (Assad, 2006). In addition, many stakeholders in the husbanding services contract process desire a more prospective pricing policy. Specific goals of field contracting include:

- Adopt a "risk-based" source selection process
- Improve cost and spending visibility
- Increase flexibility in support of changing operational requirements.
- Increase use of "performance-based" evaluation methods
- Reduce volatility in the acquisition process
- Reduce workload for operational customers (Distance Support initiative)
- Streamline contract administration procedures (Shapro, 2006, November 29b)

Naval Supply Systems Command (NAVSUP) is designated the worldwide executive agent for field contracting functions—including husbanding services. NAVSUP performs contracting functions via its seven Fleet Industrial Supply Centers (FISCs), which have recently regionalized their areas of responsibility and subsumed the

Naval Regional Contracting Centers (NRCC) that previously executed husbanding contracts. Figure 1 illustrates the geography and scope of husbanding services contracting responsibilities. In dollar terms, the Navy spends approximately $80 million per year on port costs associated with husbanding contracts (Brown, 2007).

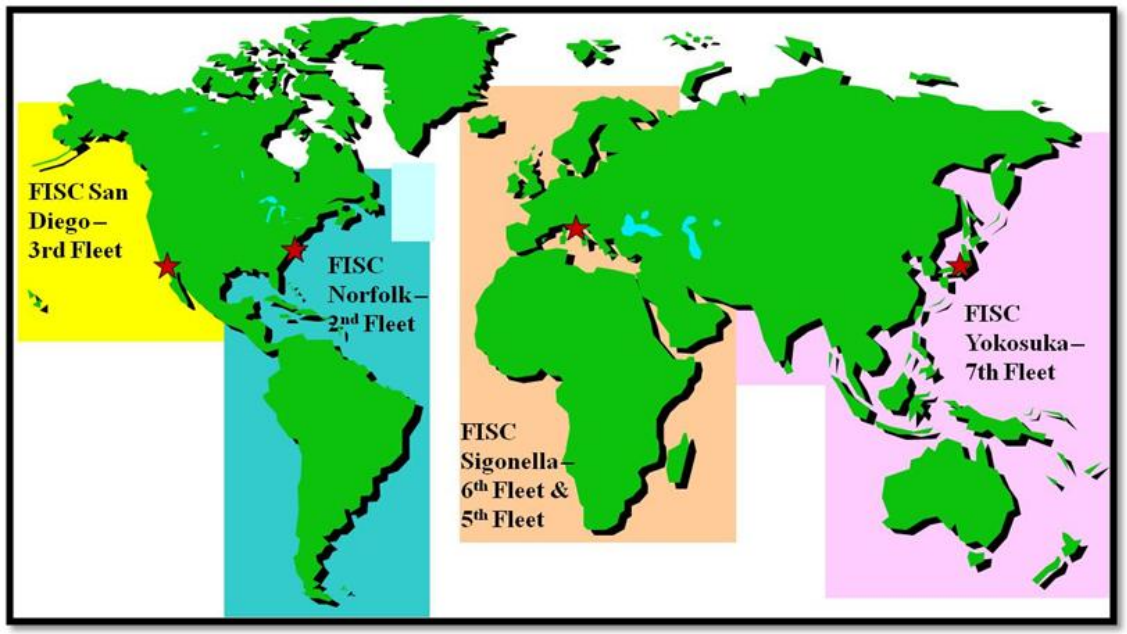

Figure 1. COMFISC Worldwide Husbanding Contract Coverage

Heretofore, the NRCCs adopted widely varying husbanding contracting methodologies. NAVSUP intends to adopt a standardized policy for use by all FISCs when evaluating and executing HSCs (Shapro, 2006, November 29c). This project examines internal and external organizational and environmental factors, current contracting methodologies, desired capabilities, and issues separating actual from desired levels of performance in HSCs. The analysis and tools provided are intended to assist NAVSUP in developing a uniform, worldwide policy governing HSCs.

One premise for the above is that NAVSUP intends to adopt a strategic and consistent policy for contracting husbanding services within existing regulatory constraints and with due consideration for relevant stakeholders, including application for

a U.S. Navy engaged in a global operating environment. Overarching questions driving contracting policy include: "What are required and expected end-states?" "What are the criteria for defining and obtaining optimal husbanding solutions, and how can alternatives be assessed for defining and obtaining best-value solutions?" Additionally, policymakers must consider an array of regulatory and environmental constraints, performance characteristics and resource allocations when answering these questions and formulating policy. For example, an operating premise is that contracting methodologies minimizing administrative workload for both acquisition and afloat personnel are favored. Distance support is becoming increasingly challenging as shipboard manning decreases and logistics functions are moved ashore, adding to the workload of field contracting personnel (i.e., FISC).

Goals, operational requirements, regulations and resource limitations determine the major boundaries of the husbanding system, including areas for improvement. For example, HSCs must be flexible—particularly in terms of schedule changes and contingency requirements. Although firm-fixed-price (FFP) contracts and bundled services may be adequate for routine operations, military forces must retain the needed capability of conducting sporadic, unanticipated and contingency operations—categorized as operations other than war (OOTW). According to Joint Pub 3-07 (*Joint Doctrine for Military Operations Other than War*), OOTW are not limited to small-scale combat operations, but also include humanitarian and disaster relief efforts, military exercises, and the small-scale, short-term deployment of U.S. forces. The local knowledge of husbanding service providers (HSPs) is a valuable and essential resource for first responders. Logic, therefore, dictates that OOTW provisions would be part and parcel of practically all husbanding services contracts. (Parker, 2006, January 25)

Other HSC constraints result from security concerns and the regulations designed to deal with threat conditions. For example, NAVSUP memo 216/6147 (Shapro, 2007, March 9) makes Antiterrorism Force Protection (ATFP) considerations a key evaluation factor of contractor proposals when it states:

> It is anticipated that submissions will be rated on an acceptable/unacceptable basis and that it will not be part of a trade-off analysis associated with best value procurements. These business practice security procedures shall be evaluated by the responsible theater Navy Component Commander/Numbered Fleet Commander anti-terrorism/force protection personnel. An unacceptable rating in this area will preclude an offerer from being awarded the contract (Shapro, 2007, March 9, page 1).

Resource limitations exert a major constraint on HSC policy and operations, particularly during wartime. Unfortunately, the current field contracting environment now routinely echoes with the refrain of, "Do more with less." Field contracting activities award a larger number of contracts at lower average dollar amounts when compared to systems contracting. Additionally, services contracts require an extensive amount of monitoring effort. Figures 2 and 3 illustrate the high-volume, low-dollar nature of NAVSUP field contracting. Figure 4 illustrates the result of field contracting trends on the acquisition workforce.

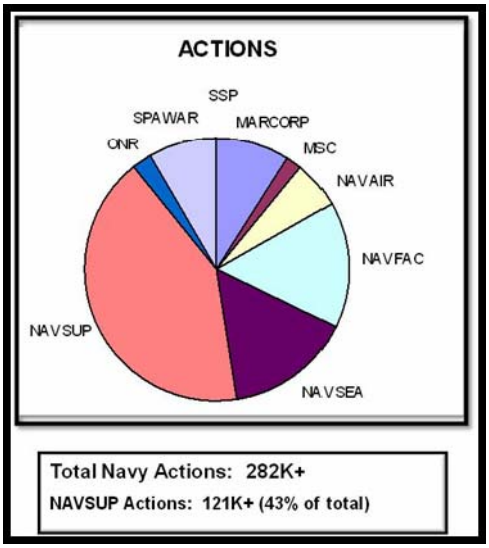

Figure 2. Navy Contract Actions 2005

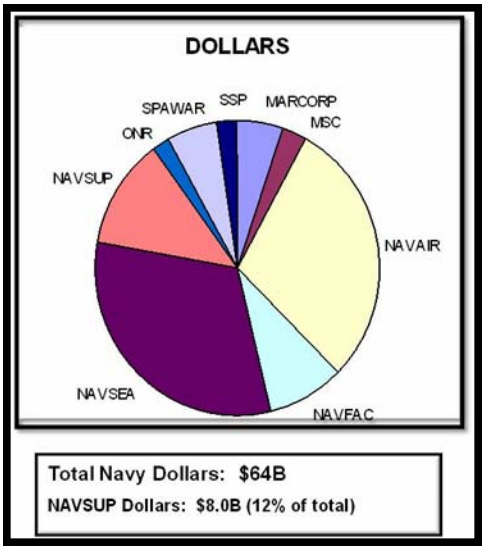

Figure 3. Navy Dollars Spent 2005

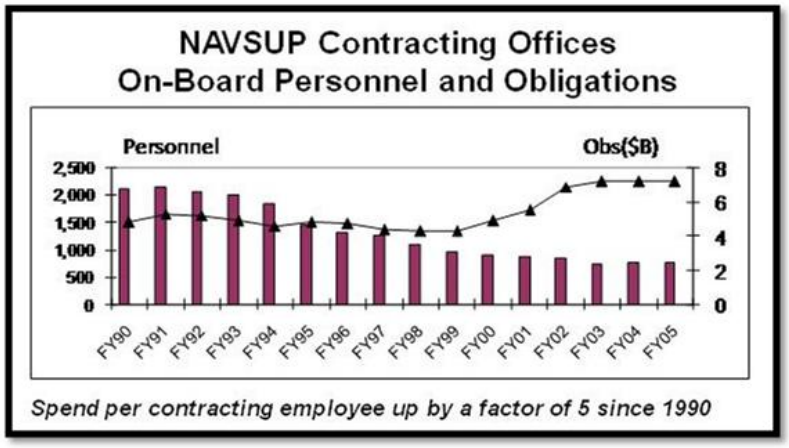

Figure 4. NAVSUP Contracting Offices On-Board Personnel and Obligations

Figures 2-4 From (Shapro, 2006, November 29a).

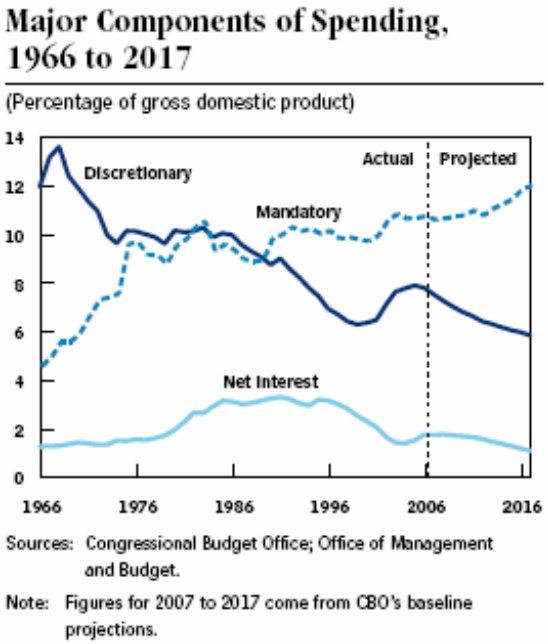

Figure 5. Major Components of Spending

Figure 5 illustrates the shrinking discretionary budget from which the DoD draws its acquisition resources. The converging trends of increasing mandatory spending and decreasing discretionary resources create increasing pressure and oversight aimed at increasing efficiency, reducing cost, and obtaining best-value services. Competitive sourcing, performance-based award criteria, and acquisition reform are the mechanisms designed to achieve better results with fewer resources.

A U.S. withdrawal from permanent, forward-basing areas and increasingly dispersed foreign conflicts has actually increased the need for forward-deployed logistic support. Although HSCs are a requirements type contract for naval forces, USCG, MSC, and U.S. Army ships have the option to place orders against HSCs through Navy contracting officers. Therefore, husbanding contracts can serve as an interim measure for all services to use until organic logistics augmentation arrives. Therefore, HSCs add a flexible response option for forward-deployed logistics support.

B. CONTEXT

Figure 6 summarizes the context and relevance of this project. NAVSUP assembled the Husbanding Process Improvement Working Group, Force Protection Working Group, and Worldwide Cost Reporting and Forecasting Tool Architecture Review Board to analyze and assist with managing the changing contracting environment while pursuing the HSC goals described earlier. This project supports the Husbanding Process Improvement Working Group and provides contracting personnel with tools for evaluating HSC options.

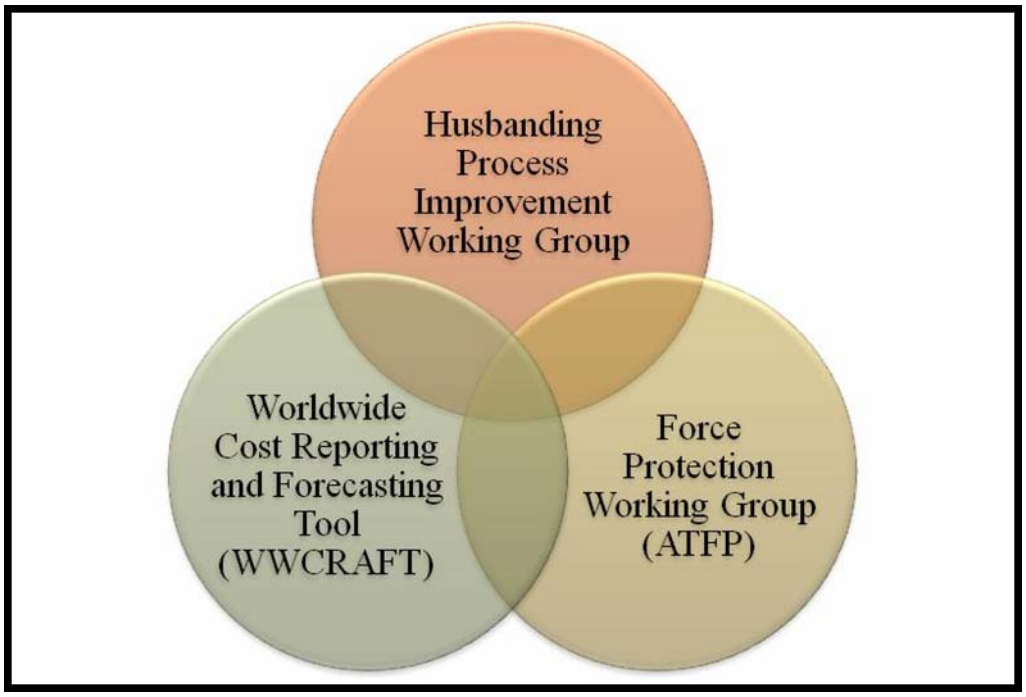

Figure 6. Husbanding Process Improvement Context

C. PROJECT DELIVERABLES

As requested by the NAVSUP Contracting Directorate, this project delivers the following:

1. A standardized policy recommendation for husbanding services contracting at Fleet Industrial Support Centers worldwide.

2. A scope for policy implementation; and

3. A services cost and frequency forecasting model.

Deliverable three is implicit to the researchers' development and support of contracting policy and scope. Evaluation and forecasting tools are critical to the reevaluation of best-value alternatives as performance requirements, external environment, and acquisition priorities change.

II. REVIEW OF LITERATURE AND HUSBANDING PRACTICE

A. HUSBANDING PRACTICE

1. U.S. Navy Husbanding Practice

NAVSUP defines a husbanding services contract (HSC) as, "A husbanding contract awarded to provide services to U.S. Navy and Coast Guard ships making port calls in non-Navy ports" (Parker, 2006, January 25). In recent years, however, this definition has expanded to include a scalable response to operations other than war (OOTW) and other contingency situations in which no permanent logistics infrastructure is present. U.S. Navy HSCs are typically indefinite quantity, indefinite delivery (IDIQ) task orders that include fixed-price contract line-item numbers (CLINs) invoked as required. IDIQ task orders are used because the exact times and/or quantities of future deliveries are unknown at the time of the award. The major cost elements of a HSC are:

- HSP daily fee (1st day + subsequent days)
- Port Tariff fees
- CLIN services
- Non-CLIN services

(Shapro, 2007, April 4)

All husbanding contracts include some degree of firm-fixed-price (FFP) and IDIQ delivery terms. The husbanding service provider (HSP) daily fee is a flat rate per day, independent of services subcontracted. Pre-negotiated CLIN services are reimbursed at the flat, negotiated rate per unit of service. Port tariff items typically vary by port, ship class, date, time, and other factors dictated by port authority policy. Port tariff items and services not specifically listed in the HSC (non-CLIN items) are cost reimbursable to the HSP. HSCs are particularly well suited to contingencies because they provide capabilities that are not defined in advance and because they take advantage of the HSP's knowledge of local market conditions and resources.

The "market basket" HSC approach refers to a division of CLIN and non-CLIN services. The "basket" of CLIN services, along with the HSP daily fees and estimated port costs, are negotiated at an estimated rate per unit of service provided. Subcontracts and items not negotiated in the HSC (i.e., non-CLIN items), yet required for specific port-visits, are reimbursable at cost as supported by the subcontractor's invoice without any additional cost or profit allowances in accordance with *FAR* 52.244-2. *FAR* 13.302-2 (Unpriced Purchase Orders) also applies when the total value of the order is under $100,000 and *DFARS* 217.74 (Unpriced Purchase Orders) also applies when the total value of the order exceeds $100,000.

2. Commercial Husbanding Practice

Although frequently used interchangeably in practice, the terms "Husbanding Service *Provider*" and "Husbanding *Agent*" are not synonymous. The term "provider" is more appropriate in military husbanding practice because "agents" are authorized to act for or in place of another. However, U.S. law prohibits contractors from entering into agreements on behalf of the U.S. government. The researchers chose Patrick Corporation, a provider of both military and commercial husbanding services, as a representative case study to compare military and commercial husbanding practice. Located in Australia, Patrick Defence Logistics (military husbanding services) and Patrick Marine Agencies (commercial husbanding agency) are subsidiaries of the Patrick Corporation and provide port services in numerous ports from Gladstone and Darwin, Australia to the Solomon Islands, East Timor, India and Micronesia. This agency is representative of commercial husbanding practice because it provides general husbanding, port services, and a complete range of land-based services to shipping lines, freight forwarding agents, customs brokers, importers and exporters. The two major shipping companies serviced by Patrick Marine Agencies are Queensland Alumina Limited (QAL), the world's largest alumina refinery, and Rio Tinto, the world's leading mining company (The Patrick Corporation, n.d.).

Patrick Marine Agencies' HSCs are structured as a "flat rate" per ship and per port call. The flat rate fee includes a bundle of services such as:

- Foreign vessel tramp service (cargo transportation)
- Service to vessels
    - Preliminary arrangements
    - Coordination of all requirements
    - Communication and interpreter services
    - Trash, sewage, waste oil removal
    - Crane and forklift service
    - Water taxi service
    - Bus service

Other services, however, are reimbursed at actual cost with supporting documentation. Reimbursable services are highly variable due to market and economic conditions outside of Patrick Corporation's control. For example, the number and size of ships entering port, personal needs of the principals (Owner, Ship Manager, Commanding Officer), and fluctuating fuel prices would cause price changes for services such as:

- Pilots, tugs and line handlers
- Stevedores
- Currency Exchange
  (Magoffin, 2007, April 4)

Patrick Marine Agencies is able to offer a fixed-price bundle of services without assuming unacceptable risk because its commercial clients require a predictable, low-variability stream of services. Patrick Marine Agencies is also able to segregate low- and high-variability costs because of superior market research and historical data. "Arranging and booking" fees are well known in advance, and ship schedules do not change on short notice. The tugs, pilot, linesman, marine oil pollution levy, and state conservancy dues are port tariff fees arranged for a fixed-price. The low-variability vessel services are dependent upon three factors:

- Length overall (LOA)
- Gross Registered Tonnage
- Net Registered Tonnage

Husbanding services depend upon the commercial vessel's type of charter. Billing is further segregated into the three types of charters described below:

- Time Charter—The ship is chartered for a set period of time. The owner still manages the vessel, but those that chartered the vessel select the destination ports and control the operation of the ship.

- Voyage Charter—The vessel is chartered for a single voyage. The ship's owner and crew manage and operate the vessel.

- Bareboat charter—The party chartering the vessel takes full control of the vessel, along with all legal and financial responsibilities, to include a fleet manning company to operate the vessel.

Patrick Marine husbanding agents provide daily working summaries to the Principal, along with digital pictures (if requested) when loading items such as alumina. Invoices include both fixed and cost-reimbursable expenses as well as cost amounts from the various sub-contractors. Both agent and principal have full visibility of itemized port-visit costs and management data (Magoffin, 2007, April 4).

3. Contingency Operations

"Operations other than war" (OOTW) refers to contingency operations as defined in *FAR* 2.101. The *FAR* definition of OOTW includes rescue and humanitarian relief missions, non-combatant evacuation operations (NEO), and unplanned deployment of troops for an indefinite period of time (Wilkins, 2007, May 14). Logistics Support includes goods and services provided for both routine and OOTW operations. Logistics Support can take place in the immediate vicinity of the operation or a great distance away—even in a different country. Since HSCs are already in place throughout the world, they are an opportune support mechanism for OOTW. In light of the joint and geographically dispersed operating environment in which U.S. forces must operate, NAVSUP Memorandum 201/6025 established the requirement for all HSCs to include OOTW provisions (Shapro, 2007, March 9). IDIQ HSCs are well-suited to contingency

operations because husbanding service providers are familiar with the locales under their cognizance and can offer greater speed of support than U.S. contracting officers who accompany contingent forces.

Port services contract line-item numbers (CLINs) provide a useful initial response because of their flexibility. They offer an *in situ* process for obtaining non-contract supplies and services. HSCs are the first tier of the Navy's scalable response to contingency events. For example, HSCs provided the initial response capabilities following hurricane Katrina. Escalating tiers of response include in-theater FISC field contracting support, LOGCAP, and establishment of joint contracting commands (Shapro, 2006, November 29a). The flexibility and capability to project forces outside the U.S. requires immediate and sustained support services—such as those established by husbanding support contracts.

In support of these demanding performance requirements, HSPs must be familiar with the manner in which the U.S. Navy operates. The service provider must have a network familiar with the different political and commercial infrastructures, cultural and linguistic backgrounds, and business practices throughout each country covered by the contract. In order to support the Navy's initial OOTW response, the HSP must furnish personnel with the following minimum qualifications:

- Ability to speak the local language in the country where OOTW are being conducted
- Capacity to travel to the forward logistics site within 24 hours of notification
- Current inoculation records
- Possession of a valid passport and appropriate licenses to conduct business

The HSP's designated point of contact must be available 24 hours a day, seven days a week, throughout the OOTW or contingency operation. The point of contact or alternative assists the on-site government representative in fulfilling logistical

requirements including, but not limited to; translation services, source identification, liaison with local political and police authorities, and any other official requirements (Wilkins, 2007, April 20).

Notably, the government Contracting Officer is not relieved of his/her duty to negotiate a "fair and reasonable" price for these items at the time of placing the order. One of the deliverables of this project is a tool to aid contracting officers in making this "fair and reasonable" determination and acquiring "best-value" products and services on behalf of the government.

Submarine rescue efforts are marked by their dependence on interagency cooperation and swift execution for success. Rescue systems, support ships, airlift, medical treatment and material handling equipment must assemble rapidly in remote locations and on short notice. The time-critical nature of submarine rescue requires rapid execution of clearly established logistics and coordination procedures among all available resources to locate a disabled submarine and commence rescue of its crew within the limits of crew survival systems. One of the lessons learned from the KURSK tragedy (and reinforced by other peacetime submarine disasters), was the need for an international liaison service to coordinate rescue efforts taking place in international waters (Wilkins, 2006, April 18).

Key actors in submarine rescue efforts include:

- Naval Sea Systems Command (NAVSEA)
- Commander Naval Submarine Forces (SUBFOR)
- International Submarine Escape and Rescue Liaison Office (ISMERLO)
- Deep Submergence Unit (DSU)
- Combatant Commanders and Operational Commanders
- U.S. Transportation Command (TRANSCOM)
- Naval Supply Systems Command (NAVSUP)

When responding to a submarine crisis, the NAVSUP supported command will generally be the nearest FISC providing direct support. Commander Fleet Industrial

Supply Center (COMFISCS) serves as the primary liaison between outside organizations and the lead FISC. In this role, COMFISC identifies HSCs that can be used in support of submarine rescue operations. Prior engagement with husbanding service providers during HSC solicitations will allow NAVSUP to leverage HSP capabilities during a submarine rescue scenario. Similar to OOTW operations, submarine rescue provisions must be included as key evaluation criteria for HSCs. Submarine rescue technical requirements and coordination issues must be well understood by the HSP to increase the likelihood of success. For example, a recent submarine rescue statement of work calls for the HSP to provide (within 12-18 hours) the following technical requirements common to submarine rescue operations:

- Material Handling Equipment (cranes, k-loaders, forklifts)
- Ground Transportation (tractors, trailers, trucks, vans, sedans)
- Support Services (customs, welders, traffic control, permits)
- Translation and Interpreter Services
- Host Country Logistics
- Cold Weather Gear
  (Wilkins, 2006, April 18)

B. CONTRACTING METHOD CHARACTERISTICS

Cost-type contracts are least desirable to the Government because they present higher risk and because the Government has minimal audit authority or capability outside the U S. The current fixed-price contract structure is driven by multiple factors including:

1. Husbanding services are acquired as a commercial service—to which the *FAR* gives preference.
2. Established fixed-prices better accommodate the logistics requirement (LOGREQ) ordering process used for U.S. Navy port-visits.
3. Vendors and subcontractors outside the U.S. frequently do not have accounting systems adequate for cost analysis or cost-type contracts.

Figure 7 summarizes the characteristics of contracting methodologies that are both allowable and practical for use in a husbanding services contract.

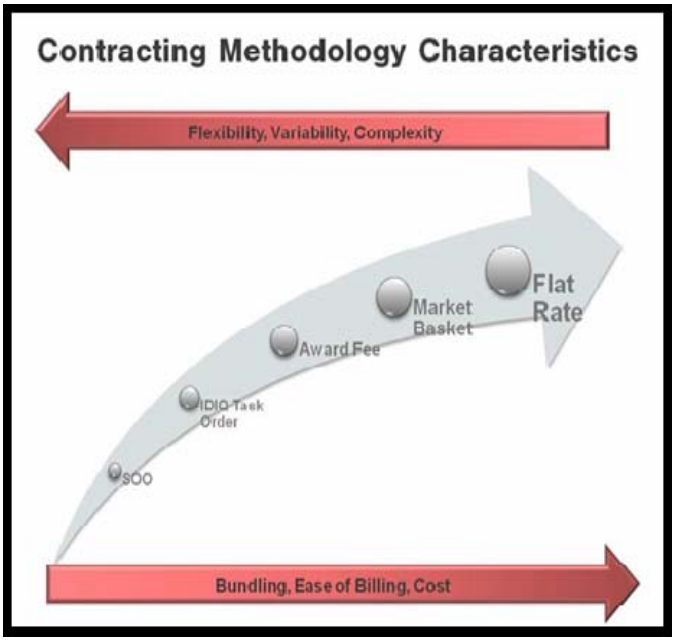

Figure 7. Contracting Methodology Characteristics

1. Statement of Objectives (SOO)

One analyst explains:

> When a contract is based on performance, all aspects of the contract are structured around the purpose of the work to be performed rather than the manner in which it is to be done. The buyer seeks to elicit the best performance the seller has to offer, at a reasonable price or cost, by stating its objectives and giving sellers both latitude in determining how to achieve them and incentives to achieve them (Brandis, 2001, February).

FAR 37 requires performance-based contracting to "the maximum extent practicable" and *FAR* 37.602 allows for use of either a statement of objectives (SOO) or a statement of work (SOW) to describe performance-based acquisition requirements. SOWs describe performance criteria to prospective offerers and the terms of the resulting performance work statement become part of the contract. Contracting officers issue a

SOO to prospective offerers, who then propose the performance work statement. The SOO does not become part of the contract. The function of a SOO is to allow contractor participation and innovation in implementing performance-based acquisition objectives. SOOs maximize the performance and flexibility characteristics of a contract.

2. Indefinite Delivery Task Orders

FAR 16.501-1 defines an indefinite delivery task order contract as, "A contract for services that does not procure or specify a firm quantity of services and that provides for the issuance of orders for the performance of tasks during the period of the contract." *FAR* 16.504 defines an indefinite-quantity contract as one that provides for an indefinite quantity of supplies or services, within stated limits and during a fixed period. Contracting officers may use an indefinite delivery indefinite quantity (IDIQ) task order when they cannot predetermine, above a specified minimum, the precise quantities of supplies or services that the government will require during the contract period. However, this contracting method may be used only when a recurring need for the service is anticipated. When using an IDIQ task order, the contracting officer is also responsible for establishing a reasonable maximum quantity of services to be provided by the HSP. Therefore, the contracting officer requires some method of forecasting this reasonable maximum quantity. The IDIQ methodology lies left of center in the spectrum of Figure 7. Its primary advantage is added flexibility in both quantity and delivery schedule. It also adds the capability to prearrange negotiated contract services for requirements that have not yet materialized.

3. Award Fee

When contracting for services, contracting officers must recognize that not all relevant evaluation criteria can be measured objectively. Therefore, consideration of both objective and subjective criteria is appropriate when selecting a contracting methodology. "Award fees" are based on subjective evaluation factors and "incentive fees" are based on objective evaluation factors. Where incentive fees motivate cost savings (often to the detriment of quality), award fees motivate performance and

quality—both imperative in HSCs. Of note, award-fee criteria are completely different from the evaluation factors used to award the contract.

The award fee methodology lies in the middle of the Figure 7 spectrum. Award fees are distinguished by the qualitative nature of the award fee criteria, a feature that adds administrative burden, but provides an incentive mechanism. This tradeoff is worthwhile when performance is more important than administrative burden. In the U.S. Navy HSC context, the administrative burden falls on the contracting activity and should be transparent to the operational user.

In an award-fee plan, the contracting parties negotiate an agreement on the amount of money to be included in an award-fee pool. Next, they agree on performance evaluation criteria and a mechanism for grading performance in this area. In some cases, the parties also negotiate a base fee, which is a fixed fee that the seller will earn no matter how its performance is evaluated. The contract performance period is then divided into award-fee periods. A part of the award-fee pool is allocated to each period proportionate to the percentage of the work scheduled to be completed. All of this information is included in the award-fee plan, which becomes a part of the contract. In some cases, the contract allows the buyer to change the award-fee plan unilaterally before the start of the new award-fee period (Brandis, 2001, February).

An award-fee plan also includes elements such as rollover terms, payment terms, award-fee board members, fee determining official, and performance advisors. The award-fee board evaluates contractor performance on a regular basis and recommends a portion of the award fee to be allocated to the contractor based upon its assessment of the contractor's performance during that period. The overall subjective assessment of performance must be converted to dollar amount of award fee in accordance with an agreed-upon conversion scheme. When combined with a firm-fixed-price contract, the resulting contract is characterized as fixed-price award fee (FPAF), but retains its designation as a FFP contract IAW *FAR* 16.201-1. This distinction is relevant when contracting for commercial services.

Most importantly, award-fee criteria may be unilaterally adjusted by the Government over the course of the contract. Since there is no requirement to explicitly define the evaluation criteria in the contract, the Government has maximum flexibility to incentivize acquisition focus areas as the contracting environment changes and new requirements emerge. This flexibility gives the Government a tool to focus on areas identified for improvement. When removing the base fee, as is appropriate when using a FFP contract where the HSP receives a daily fee, award fees isolate and tie performance objectives to key performance parameters.

Disadvantages of the award-fee tool include:

- Payments from different fee pools must be tracked
- Additional manpower is required to monitor award fee boards
- Regular performance evaluations are a drain on administrative resources

In fact, *FAR* 16.404(b)(1) specifically states that the benefits of an award fee contract must exceed the cost of implementation.

Award fees are an important incentive mechanism despite the drawbacks cited above because flexibility and performance are critical to the success of husbanding services contracts. FAR 37.601(b)(2) states that performance-based contracts for services shall include measurable performance standards and a method of assessing contractor performance against those performance standards. Furthermore, FAR 37.601(b)(3) directs that contracts shall use performance incentives where appropriate. Incentives are appropriate in the current HSC environment because performance is critical, yet HSP performance beyond minimum requirements is limited. Many "measurable" performance standards are subjective, yet key to HSC success. The added cost of administration is less than the potential benefits—particularly when used in conjunction with larger scope and volume husbanding services contracts.

4. "Market Basket" Approach

Husbanding contracts that utilize the "market basket" approach provide the customer with a bundle of basic services. The HSP is paid for maintaining the

capabilities specified in the bundle regardless of whether a particular ship requires all of the services. While this method reduces variability (and risk) for the HSP, it increases risk to the Government because services not included in the bundle must be reimbursed at cost. The reduced variability makes services in the market basket cheaper and more visible for cost estimation. The customer has a port services "template" available for each area visited and can budget within a narrow range of costs. Variations in port-visit costs result from variable volume items (i.e., sewage and potable water) and from items not negotiated as part of the market basket (i.e., non-CLIN items). A market basket approach takes advantage of known, recurring and high-usage items to lower price risk. This approach lies to the right of center in Figure 7 and relies on an accurate knowledge of both service type and frequency to be effective.

As the award term of a market-basket-type contract grows, price uncertainty grows. HSPs then have an incentive to factor in contingencies and shift services provided to cost reimbursement where possible. Conversely, when the cost of negotiated services decreases, HSPs have no incentive to seek out the best price for the Government because they do not share in any cost savings.

5. Flat Rate Plus Cost

Husbanding contracts that utilize the "flat rate plus cost" contracting methodology establish a schedule of daily charges based on ship class and port. The flat rate is inclusive of all items under the husbanding agent's control and negotiated in the contract terms. Personal services and commodities subject to market fluctuation are billed at cost. This approach maximizes the bundling of services, greatly simplifies billing, and allows the customer to precisely budget for port-visits.

The flat-rate-plus-cost approach depends on low-variability service requirements and predictable scheduling for success. The flat rate approach also has the highest potential for substandard performance resulting from cost containment measures. Therefore, it is not well suited to the unpredictable scheduling requirements and highly volatile demands of military OOTW and contingency operations. This approach is primarily used by commercial vessels.

C. LITERATURE REVIEW

1. Modeling Techniques

Forecasting is an attempt to predict future conditions based on historical data, trends, or empirical relationships. Accurate forecasts enable sound business decisions. Within the husbanding services context, forecasting can be used to predict service usage rates, port-visit frequency, and a confidence interval of port-visit services costs. For example, the forecasting model developed in this project is a quantitative, time-series model that uses historical data observations of port-visits, services, and costs from 2001 through 2006 to generate a predicted mean, standard deviation, and confidence interval for future cost and usage rates. While historical CRAFT data is available, it must be transformed into predictive information to enable prospective pricing. The primary limitation of the forecasting model used was the accuracy and completeness of available data.

Accurate forecasting of requirements allows procurement planners to support performance and schedule requirements, remain within budgeted funds, adhere to laws and regulations, and identify acceptable risks and tradeoffs. Better knowledge of probable future conditions lowers risk. When applied to husbanding services contracting, forecasting enables a targeted port-visit planning approach using a risk-based acquisition strategy.

Simulation is the process of studying the behavior of an ideal system by using a model that replicates the behavior of the system experiment (Apte, 2006, July). Simulation allows the user to conduct "what-if" experiments without tangible consequences and with considerable time compression. The value of this tool in the context of this project is the ability to develop an interval of probable costs based on experiential data and current policy. Specifically, the researchers used *Crystal Ball*™ simulation software to iteratively simulate *port-cost* and frequency probabilities. Probability of a cost outcome, in turn, allows the contracting officer to make a "fair and reasonable" price determination for a bid proposal and to negotiate high-probability requirements in future contracts.

2. Strengths, Weaknesses, Opportunities, Threats (SWOT) Analysis

SWOT analysis is a simple framework for generating strategic alternatives from a situation analysis. It is a tool for auditing an organization in light of changing environmental forces, factors and trends. SWOT analysis can help decision makers formulate strategic alternatives to emerging issues by building on current organizational strengths and mitigating weaknesses. Specifically, the role of SWOT analysis is to develop rational and systematic options for dealing with critical issues facing decision-makers. Issues can derive both from internal and external environmental factors with the commonality that senior executives routinely prioritize which issues must be dealt with, including how and when. SWOT analysis typically results in an issue agenda and alternatives for resolution or mitigation in consonance with an organization's goals and objectives.

SWOT analysis begins with a situation analysis that objectively describes internal and external environmental factors in terms of strategic fit between external opportunities and internal strengths, acknowledging current weaknesses and future threats. Internal analysis includes descriptions of relevant organizational variables, e.g., workforce characteristics, technology concerns, and decision-making, rewards, and communication structures and processes. External analysis includes descriptions of environmental factors and trends, including organizational stakeholders supportive or non-supportive of the organization concerning important issues (Keeley, n.d.). Organizational strengths can be prime sources of capabilities that can be used for developing and sustaining competitive advantage, e.g., reputation and brand image, resources and assets, experience, knowledge, marketing quality, location, accreditations, qualifications, certifications, logistic prowess and data systems. Weaknesses are internal forces that could serve as barriers to attaining and sustaining competitive advantage, e.g., lack of key skills, aging or retiring workforce, flawed reputation, financial difficulties, scheduling constraints, and cultural resistance to change.

External analysis identifies future opportunities, e.g., favorable market developments, competitor vulnerabilities, favorable demographic trends, geography, and

partnerships. Threats are future external forces that typically inhibit competitive advantage, e.g., restrictive or complicated government regulations, political and legislative party changes, adverse environmental trends, disruptive technological developments, economic variability and demographic shifts (Internet Center for Management and Business Administration, n.d.).

3. Stakeholder Analysis

R. Edward Freeman defines a stakeholder as, "any group or individual who can affect or is affected by the achievement of the organization's objective" (Freeman, 1984). Stakeholder analysis is the process of identifying stakeholders, their interest areas, and their potential to influence an organization's actions. The objective of stakeholder analysis is to identify potential supporters and nonsupporters concerning organizational policy and activity changes, and strategies for influencing different stakeholders. Identifying influential stakeholders and interpreting their needs and expectations is crucial for organizational performance, particularly in the public sector where pluralism is the norm.

Relevant attributes of individual and group stakeholders range from historical relationships to control of assets, to the amount of power a stakeholder can bring to bear on a particular issue. Stakeholder power broadly refers to the ability to cause or prevent change, typically by influencing values, strategy, decision-making, policy, and implementation. Activating power or tactics range from competitive to collective means. Stakeholder legitimacy refers to a claim based on contractual, legal, moral, or at-risk interests. Stakeholder urgency refers to the time and perception dimension, in that urgency becomes a practical necessity when attempting to move a bureaucratic institution (Mitchell, 1997, October).

Stakeholder attributes can be grouped accordingly:

1. Dormant—possess power, but no legitimacy or urgency (power only)
2. Discretionary—possess legitimacy, but no power or urgency
3. Demanding—possess urgency, but no power or legitimacy

4. Dominant—possess both power and legitimacy (claim and means to influence)
5. Dependent—possess both legitimacy and urgency, but no power
6. Dangerous—possess both urgency and power, but no legitimate claim
7. Definitive—possess power, legitimacy, and urgency (priority and immediate action)

(Mitchell, 1997, October)

Although stakeholders have varying degrees of potential to affect outcomes, dominant and definitive classes in particular require higher management attention and priority. Finally, after identifying and prioritizing stakeholders, an organization can attempt to identify and align stakeholder needs and expectations with organizational objectives. Stakeholder interests may be evident from their historical mission, or may radically change in uncertain and turbulent political environments.

III. CURRENT HUSBANDING PROCESS ISSUES

A November 2006 husbanding services project report cited 10 key "facts" from which husbanding services contractual issues derive:

1. Firm-fixed-price (FFP) contract type is most desirable.
2. Some services are standard: CHT, water, tugs, trash, oily waste, pilotage.
3. Fixed-price services contracting for a 3-5 year period is a risk for contractors due to:
    a. Escalating costs and unknown premiums for short notice port-visits
    b. Leads to contingency pricing
    c. No incentive to get the best price
    d. Gaming in proposed pricing
    e. No evaluation of the subcontractor pricing structure
4. Risk results in an emphasis on "profit" versus "quality" of services
5. During port-visits, services are in a constant state of flux—without modifications reflecting all changes. No monitoring of process.
6. Reconciliation of the total order does not take place until payment.
7. Cost-type contracts are least desirable due to:
    a. More risk for the Government
    b. Contractors do not have approved cost accounting systems (CAS) & Government has minimal audit capability OCONUS
    c. *FAR* allows burdens on subcontract costs
8. The majority of husbanding services are subcontracted
9. [Inadequate] assurance that subcontracting price arrangements are fair and reasonable
10. *FAR* 42.204(a)(1)(iii) – anticipates the use of a firm fixed-price contract that exceeds the SAT under which unpriced contract actions (including unpriced modifications and delivery orders) may be executed

    (Husbanding Process Improvement Team, 2006)

A. FIRM-FIXED-PRICING STRUCTURE

FAR 37.102 lists the precedence for services acquisition and is the source for fact #1 above. Although FFP contracts are desirable because they reduce risk and uncertainty for the government, FFP contracts that span several years expose the contractor to unacceptable risk. Low profit margins and high cost risk for the contractor incentivizes unbalanced pricing using reimbursable, non-CLIN services. FFP contracts also incentivize contingency pricing in the contract negotiation phase and fail to incentivize cost containment beyond the negotiated price during the contract execution phase. In contrast, cost-reimbursement contracts are least desirable because risk shifts to the government and because most overseas contractors lack adequate accounting systems to document cost data.

B. REQUIRED TRADE-OFFS

Wide variability in port location, ship type, and ship schedules also makes a one-size-fits-all HSC solution problematic. Several of the field contracting goals described above conflict with one another, creating a need for compromise. The magnitude and direction of the compromise is ultimately a matter of subjective weighting. One area of trade-off exists between performance and administrative burden. Increased monitoring and oversight increase the likelihood of acceptable contract performance, but increase the administrative burden on acquisition personnel.

Another trade-off exists between award-period length and contractor incentives. A longer length contract may allow a husbanding service provider to develop more stable supplier and subcontractor relationships, realize returns on capital investments, and reduce contract administration. The trade-offs for longer contract award periods are reduced contractor incentive after award and reduced levels of competition.

Finally, a trade-off exists between ease of use and economy. Discrete billing and services arrangements maximize flexibility at the expense of added complexity and tracking requirements. Ordering, budgeting, and accounting are easier for the buyer

using a bundled approach. Conversely, a discrete, itemized approach requires a higher level of monitoring and oversight by field contracting personnel—increasingly from remote locations.

C. MONITORING REQUIREMENTS

Monitoring issues manifest themselves in several areas of husbanding services contracts. The volume of contract actions alluded to above is a function of geographic contract scope, contractor management skill, contract length, and acquisition policy. A smaller acquisition workforce responsible for administering a growing number of contracts presents challenges to conducting adequate oversight. Incentivizing HSPs to collect and share cost data and utilizing software to analyze trends are a few examples of tools that can mitigate the risk of inadequate oversight without unacceptably increasing administrative workload. However, the utility of these databases is limited to the quality of user inputs. Fleet customers have even less time in their operational schedule for data input than their shore-based counterparts. Local subcontractors often face language and technology barriers in submitting accurate cost data. In short, the acquisition workforce relies on external parties (with minimal incentive) to remotely monitor contract performance. The result is a cost-reporting database with incomplete and non-standardized information. A significant corollary to this deficiency is an inability to accurately predict port-visit costs.

D. INADEQUATE COMPETITION

The same government regulations and oversight that increase the workload of the acquisition workforce increase the cost of competing for contracts. The average solicitation document for a single husbanding services contract exceeds 100 pages. When combined with the legal language of the clauses and language barriers of differing host countries, the difficulty in forming proposals and understanding performance based objectives acts as a deterrent to prospective bidders (Verrastro, 1996). Bidding for government contracts is time-consuming and expensive. Furthermore, risks to the bidder are considerable even if a contract is awarded. Most contracts are of the FFP variety with

the added uncertainty inherent in IDIQ contracts. Since any reimbursable costs are based on invoice price, there is little room for contractor profit beyond the fixed daily rate. High administrative costs, uncertainty, and a lack of performance incentives discourage competitive bidding. More often than not, agents with extensive commercial experience and supplier contacts in ports frequented by Navy ships lack the resources and motivation to bid for Government husbanding contracts because there are inadequate monetary incentives. According to one port agent:

> Preparing Government proposals takes a significant amount of time, manpower and money. We prepared a proposal for one Government command at an expense to our company of about $12,000.00 over an eight-week period. Several months later, the Government activity canceled the solicitation. If all proposals cost us this much, we would not be able to stay in business (Verrastro, 1996).

Hence, the cost and length of the solicitation process are inversely related to the level of competition.

E. INADEQUATE MARKET RESEARCH INFORMATION

1. Fair and Reasonable Determinations

Contracting officers are required to conduct "fair and reasonable determinations" as part of the proposal evaluation process. However, they often lack the information and/or resources to perform these determinations adequately. Consequences of regionalization and fewer acquisition personnel dispersed throughout areas of fleet operations are decreased local market awareness and increased reliance on external data sources. High personnel turnover and high transaction volume, particularly in forward-deployed areas exacerbate this issue. The model and analysis provided in this project are intended to assist acquisition personnel in forecasting port-visit frequency and expenses, making fair and reasonable determinations based on cost data, and negotiating follow-on HSCs based on adequate market research.

To illustrate the magnitude of this issue, consider 5th fleet estimated annual husbanding services costs of approximately $10 million for budget year 2006—

contrasted to over $22 million in actual costs incurred over the same period (Couture, 2007, March 24). When contracting activities do not accurately forecast and manage HSC costs, they may unnecessarily obligate funds that could be used for other purposes or (in this case) fail to set aside sufficient funding and later pull funding from other budget areas.

2. Accuracy of Cost Data

Current market research data on port costs are available from the Cost Reporting and Forecast Tool (CRAFT) database. CRAFT is a "commercially developed application designed to provide decision makers with detailed cost information that in formats that permit detailed advanced planning for port-visits and accurately capture costs to monitor contract performance" (Casey, 2006). WWCRAFT is a proposed update to the legacy CRAFT database that offers significant improvement of husbanding cost capture, forecasting and identification of excessive charges. The improved formatting, detail, and segregation of cost data can provide a significant return on investment by offering a more current, accurate, and complete picture of port-cost data. The WWCRAFT update addresses many deficiencies in the legacy CRAFT database, but is not yet functional or populated with data. Inconsistencies in current data result from a lack of immediate and direct incentives to maintain accurate data. Legacy CRAFT depends on port-visit cost report inputs from fleet users who have limited access to detailed cost data and who have minimal time available within their operating schedules to submit detailed port-visit reports. The adage, "garbage in—garbage out" applies to port-visit data collection and analysis. Other shortcomings of legacy CRAFT include limited standardization of input format and limited ability to tailor management information reports.

3. Lack of Visibility and Oversight

Although NAVSUP requires OOTW provisions in all husbanding services contracts, the researchers were unable to identify any system for segregating and tracking OOTW expenditure data. Perhaps the inadequacy of legacy CRAFT data described above is the cause. Other expenditure data raise issues of suspect billing practice. For

example, 5th Fleet expense data for budget years 2006 and 2007 (included as Appendices 1 and 2) segregate CLIN and non-CLIN services and further break down services by description. However, numerous non-CLIN descriptions (billed at cost) seem to match CLIN descriptions (billed at fixed-price) for services provided during the same accounting period (Morgan, 2007). While regional husbanding service providers *can* track, manipulate, and extract useful management data using their cost analysis software, contracting officers cannot, given their current software tool set. This gap in capability puts HSPs at a distinct advantage when making business decisions based on cost and price analysis—particularly during evaluation of bidder proposals and negotiation of follow-on contract rates.

F. PORT TARIFF FEE STRUCTURE

Port tariff fee structures are often viewed as immutable rates dictated by host nation port authorities. Although time-consuming to negotiate, rate decreases *are* possible. Furthermore, if rate decreases are targeted at high-usage ports and focused on high-volume services, the savings can be significant. In this sense, port tariff fees are often overlooked and represent a missed opportunity (Bauer, 2007, March 24). Adequate knowledge of significant volume, metered services, however, is necessary to identify and negotiate discounted fees. Consider the following example extracted from actual BY 2006 *port-cost* data (Appendix 1). The metered services shore electrical, bilge water removal, CHT removal, and potable water account for 42.7% ($4,026,376.75) of total expenses. If a modest, 3% reduction in port tariff fees could be negotiated for these services, estimated cost savings would exceed $120,000 per year in the port of Bahrain alone.

The practice of discounting port tariff rates is not unprecedented. The "Green Flag Incentive Program" in Long Beach, CA, offers "most-favored" port tariff rates, including a 15% discount on docking fees, for vessels that demonstrate environmentally friendly steaming practices in and around port (Port Authority of Long Beach, 2007, March 2). Examination of the BY 2006 port-visit costs in Appendix 1 reveals focus areas

for port tariff rate negotiations. The ports of Mina Sulman and Jebel Ali combined to account for over 80% of days in port during budget year 2006 (Morgan, 2007).

G. INADEQUATE TRACKING OF NON-CLIN SERVICES

Extraction of market research data currently requires a manual review of individual remarks fields within the legacy CRAFT database to identify OOTW and non-CLIN expenditures. While manual review of transactions is time-consuming, the market research is required, and its return on investment is high. A high frequency of non-CLIN purchases in similar service areas indicates a focus area for items to include in future contract negotiations. Contracting officers have no cue to include these items in future HSCs or to incentivize their performance if there is no tracking of frequency and cost impact. Furthermore, a high percentage of non-CLIN expenditures represents a significant shift in risk from the contractor to the government because non-CLIN services are reimbursable while CLIN services are FFP. Hence, a high number of non-CLIN expenditures offer potential for significant cost avoidance.

H. HIGH REQUIREMENTS VARIABILITY

In the eyes of some contracting officers, the greatest challenge in husbanding services contracting is, "contracting for a service where frequently changing port-visit patterns and uncertainty drive contractors to incorporate contingencies into their pricing" (Parker, 2006, January 25). Whereas the commercial husbanding model is based on predictability and long-standing agency relationships, U.S. Navy HSCs are subject to high schedule volatility and the additional constraints of Federal Acquisition Regulations. Port schedules of Navy ships are classified, and HSPs generally have three to seven days' advance notice of a port visit.

In accounting for this volatility and its associated risk, it is important to distinguish between controllable and uncontrollable sources of variability. While contracting officers may have no control or knowledge of short-notice schedule changes or contingencies that will cause spikes in demand for services, they can affect variability in the types of services included in a husbanding services contract and in the volume of

billing transactions. For example, contractor contingency pricing can be minimized by segregating services with higher volatility into separate contracts. Commonly used service items with relatively constant demand represent a lower risk to the contractor under a fixed-price arrangement. Conversely, highly variable service capabilities such as OOTW require HSPs to hold capabilities or assets in reserve in anticipation of demand spikes. HSPs can be expected to factor both opportunity cost and uncertainty into their pricing.

I. LACK OF CONTRACTOR PERFORMANCE INCENTIVES

A working premise of this study is that because performance is paramount to operational customers, incentives are a critical element of HSCs. Not only does FAR 37.102 require the use of performance-based acquisition, numerous key evaluation factors such as ATFP considerations and schedule constraints call for maximum incentives linking HSP performance to acquisition objectives.

Highly variable and demanding performance requirements present cost risk to contractors under a fixed-price arrangement. Current HSC practice, which allows for cost reimbursement of non-CLIN items, incentivizes contractors to allow contracting officers to continue in ignorance when negotiating contracts that do not include all required and/or reasonably anticipated CLIN items. The contractor can then engage in unbalanced pricing when ships require the non-CLIN items and must pay for them at "cost". A common tactic involves modifying a service (e.g., by "tailoring" it to a specific user) until it no longer meets the definition of the negotiated CLIN. The service then becomes cost-reimbursable. This practice shifts risk off the HSP by changing the contract structure for non-CLIN items from the intended firm-fixed-price to cost-plus-fixed fee (CPFF)—non-CLIN service at cost, plus the HSP daily fee. Contracting officers need both accurate forecasting tools and contracting incentives to combat this practice.

IV. RESEARCH METHODOLOGY

A. PROJECT LOGIC FLOW

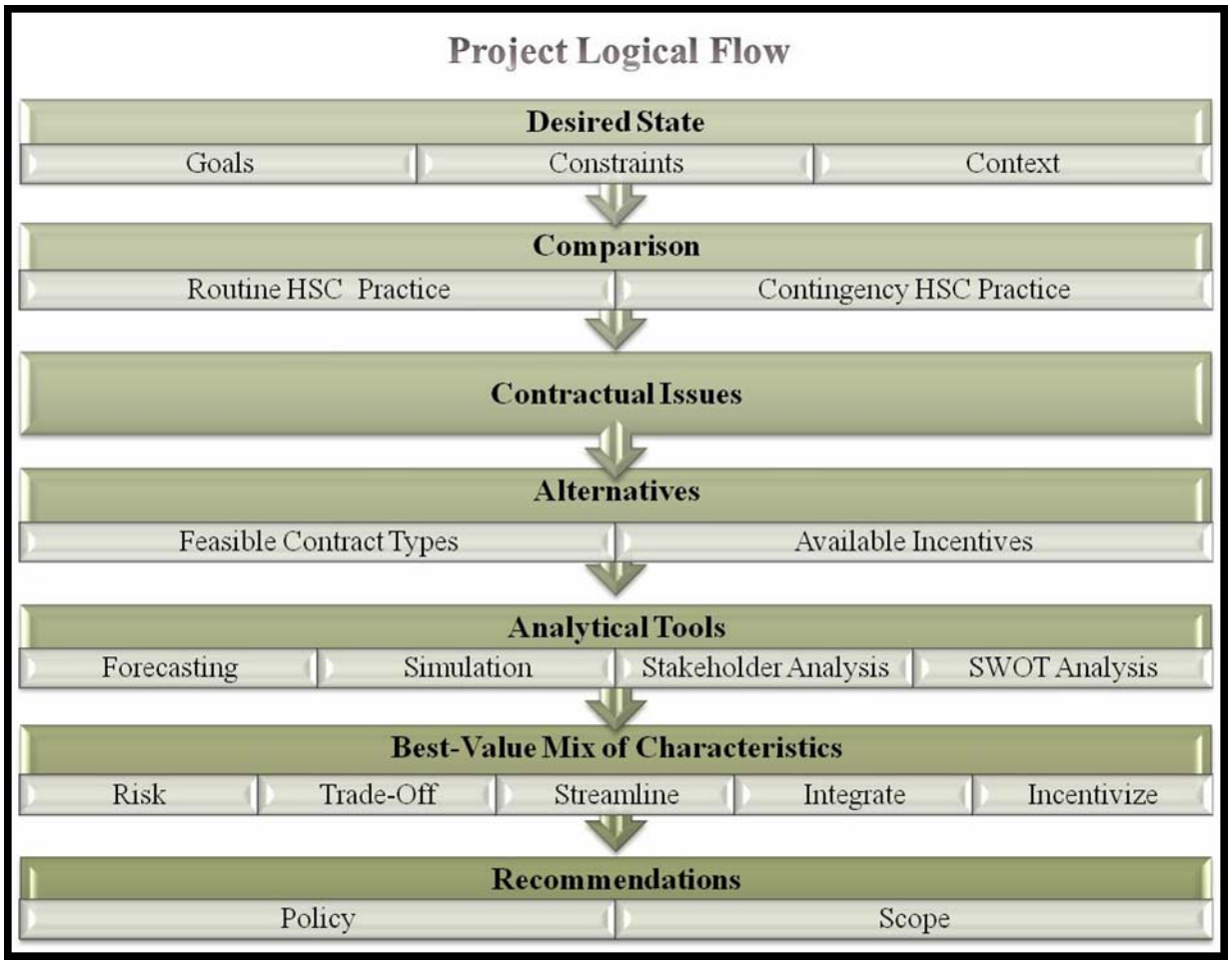

Figure 8. Logical Flow of Contracting Methodology Evaluation

Figure 8 summarizes the project's methodological flow. The overarching goal of husbanding services contracting is to satisfy user needs within existing constraints. The husbanding services acquisition environment includes a spectrum of contracting practices that vary with user requirements and context. When the "as-is" state of HSC practice is compared to the desired state, numerous contracting issues arise from the differing states.

The researchers relied heavily on the use of interviews with acquisition personnel and review of actual husbanding services contracts to perform this comparison, as literature on the topic of husbanding services contracting is minimal.

Next in approach was a review of the contracting vehicles that were allowable, feasible, and appropriate tools to address existing HSC issues. The forecasting and simulation model described below is a tool that management personnel may use when making best-value decisions or evaluating contracting methodologies. The model analyzes historical port-visit cost and frequency data.

Application of SWOT analysis to the FISC contracting organization focuses management and helps to develop a standardized HSC policy. Model stochastics combine with SWOT analysis focal areas and stakeholder priorities to form the basis of a recommended mix of policy characteristics. The goal of these analyses was to develop a targeted, risk-based HSC policy. Accordingly, the project output is structured into a notional HSC policy and scope for implementation.

B. MODELING DESCRIPTION

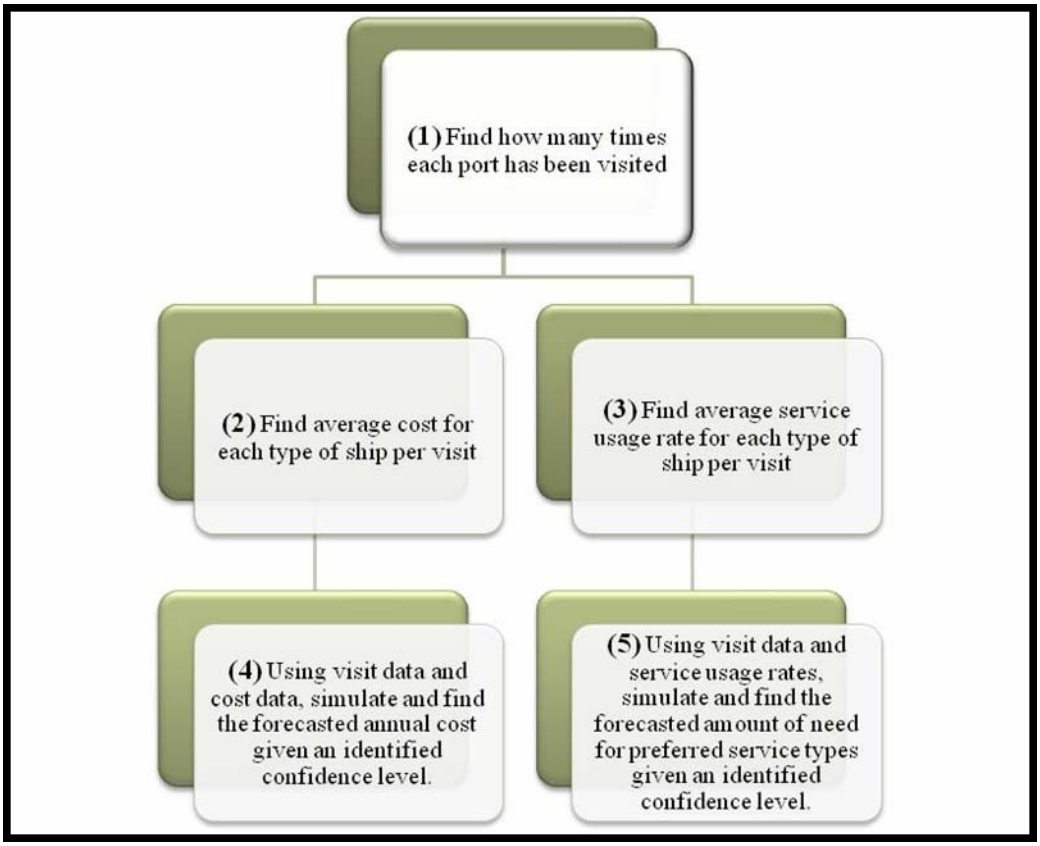

Figure 9. Modeling Algorithm

Module 1 — The frequency of port-visits is found using the following steps:

a. The raw data, including the frequency of visits for each port, was downloaded from "WEBCRAFT" official website by using "Port-visit Listing" link.

b. The downloaded data was imported to a Microsoft Excel™ file.

c. "DAVERAGE" and "DSTDEV" functions were used to figure out the average and standard deviation of port visits for each class of ship type.

d. The ports selected as representative samples are:

i. Dubai
ii. Jebel Ali
iii. Manama
iv. Aksaz
v. Valletta
vi. Souda Bay
vii. Augusta Bay
viii. Palma de Mallorca

Statistics for these ports are listed in Appendix 3.

Modules 2 & 3 — The average cost per ship class and per visit is determined by:

a. The raw data, including the costs per visit for each port, was downloaded from "WEBCRAFT" official website by using "Detailed Services" link.
b. The downloaded data was imported to a Microsoft Excel™ file.
c. "DAVERAGE" and "DSTDEV" functions were used to figure out the average cost, standard deviation of cost, average service-usage rate, and standard deviation of service usage rate for each class of ship type at each port.
d. The ship types sampled as representative of the U.S. fleet are:

i. FFG
ii. DDG
iii. CG
iv. CVN
v. LSD
vi. LHD
vii. AOE

e. Common services chosen as representative are:

i. CHT
ii. Potable Water
iii. Trash Removal
iv. Vehicles/Car Rental
v. Bus Service
vi. Cell Phones
vii. FP, Barrier
viii. FP, Picket Boats

ix. Fenders
x. Tugs
xi. Pilots
xii. Husbanding Service Fees

Average service-usage rates and standard deviations are listed in Appendix 4.

Modules 4 & 5 — Annual cost and service usage are simulated using Crystal Ball™. Each iteration of the simulation proceeds as follows:

a. According to the central limit theorem, the decision variables below are assumed to be normally distributed. Therefore, when defining these variables in *Crystal Ball*™, each is designated as normal:

   i. Average cost and standard deviation of cost per port-visit.
   ii. Average service usage rate and standard deviation of service usage rate per port-visit.
   iii. Average port-visit and standard deviation of port-visit.

b. After identifying all decision variables, reliability is maximized by iterating the simulation 10,000 times using a 95% confidence interval.

c. The mathematical functions used in the simulation are as follows:

   Annual Total Cost = VDij * CDklm

   Annual Service Usage = VDij * QDtsz

   VDij = Total number of visit of port i for ship type j

   CDklm = Service type m`s cost of port l for ship type k

   QDtsz = Service z`s usage rate of port s for ship type t

   j,k,t = The same ship types mentioned in module 2&3

   l,i,s = The same ports mentioned in module 1

   z,m = The same service types mentioned in module 2&3

Advantages of Simulation

a. Modules 4 & 5 use Crystal Ball™ simulation program. This software allows the user to simulate the annual port-visits of ships and service usage of these ships at the ports by using the data between 2001 and 2006.

b. All simulation is based on historical data from 2001 to 2006. This assures a high confidence in the result of the simulation.

c. At the end of the simulation, the user is presented results in user-defined format:

    1. Annual expected total cost
    2. Annual expected cost per port
    3. Annual expected usage rate of any given service type
    4. Annual expected usage rate of any given service type in any port

d. *Crystal Ball*™ provides many tools, such as statistical analysis, sensitivity analysis, and graphical distribution charts for the user to analyze simulation results.

e. *Crystal Ball*™ allows up to 10,000 iterations as part of the simulation. Therefore, it offers a confidence factor in the results several orders of magnitude higher than traditional, single-iteration software.

Output—Phase 1 outputs provide the user with the following information:

a. Market research information to be used as a basis for negotiating future husbanding contracts.

b. Historical cost data to be used in “fair and reasonable” determinations.

V. ANALYSIS

A. SIGNIFICANT DATA POINTS

Historical port-visit cost and frequency data included in Appendices 1 and 2, along with the forecasting and simulation results included in Appendices 3 and 4, reveal numerous focus areas for management attention.

1. Forecasted Port-visit Frequency

A high frequency of visits to a given port, coupled with a high volume of metered services, indicates a potential opportunity for port tariff negotiations. In these situations, even a small negotiated price reduction can yield considerable returns for the effort. Historical data in Appendix 2 indicate such a focus area within the 5th Fleet AOR. The ports of Mina Sulman and Jebel Ali combine to account for 62% of port-visits and 76% of port-visit costs in BY 2006.

Scheduling port-visits, where possible, to a narrow range of ports allows planners to narrow the range of requirements and reduce the number of services unique to a given port. Reduced variability and a higher frequency of visits to a given port allow more accurate cost forecasting. In general, the data in Appendix 3 illustrate the extremely high variability in port-visit frequency that results from unpredictable schedules. Recall that, while variability resulting from unpredictable operational schedules is an unknown when negotiating a HSC, variability in the range of services required can be influenced and managed.

2. Forecasted Port-visit Cost

Forecasted port-visit costs provide management information such as:

- Information to support port-visit location decisions. In comparing the port-visit costs of Mina Sulman and Jebel Ali (Appendix 2), for example, we see that port costs in Jebel Ali were $3,890,452.04 for

345 days in port, while port costs in Mina Sulman were $3,971,943.41 for 1371 days in port. At $2897.11/day, the average daily cost for a visit to Mina Sulman is 25.7% of the $11,276.67/day cost of visiting Jebel Ali.

- Financial forecasting information. The confidence interval results in Appendix 4 enable budgeting and management of cost risk based on probability. Levels of confidence can be adjusted to management preferences.

- Baseline ranges for negotiation of follow-on contracts. Port-cost information can be factored with the port-visit frequency information above to arrive at a target range to be used when entering negotiations for follow-on HSCs.

3. Cost by Service

- Detailed services cost data provide management information such as:

- Reference prices for services. The services cost breakdown included in Appendix 1 is an example of management information that can be used for comparison by a contracting officer when making a fair-and-reasonable determination.

- Sensitivity analysis for requirements versus cost decisions. For example, based on the services cost data in Appendix 4, a policy adding ATFP requirements for force protection barriers can be expected to add approximately $4400/day to the port-visit costs.

- Focus areas for port tariff rate negotiations. For example, the services data in Appendix 1 show that the top 4 metered services of shore power, CHT, bilge water removal, and potable water accounted for 42.7% of Bahrain port expenses.

- Management of cost risk. High frequency usage of a particular non-CLIN service serves as a cue to include that service in follow-on HSCs.

4. Estimated vs. Actual Port-visit Cost

A large difference between estimated and actual port-visit costs indicates a need for increased management attention. For example, the BY 2006 actual expenses of $22,944,131.87 described in Appendix 1 are 229% of the $10,000,000 forecast amount for the 5th Fleet HSC (Couture, 2007, March 24). The magnitude of the forecast error reveals a need for both improved forecasting and cost-analysis data.

5. CLIN vs. Non-CLIN Services

As described above, a high percentage of non-CLIN services increases both variability and risk to the government. A high number of non-CLIN services required by end-users may also be indicative of inadequate requirements definition and/or low level of standardization. The data in Appendix 1 show that non-CLIN services of $12,150,612.66 made up 53.2% of $22,837,064.98 in total port costs for BY 2006. For this data set, 53.2% of port costs were reimbursed at cost using a HSC characterized as "fixed-price."

B. SWOT ANALYSIS

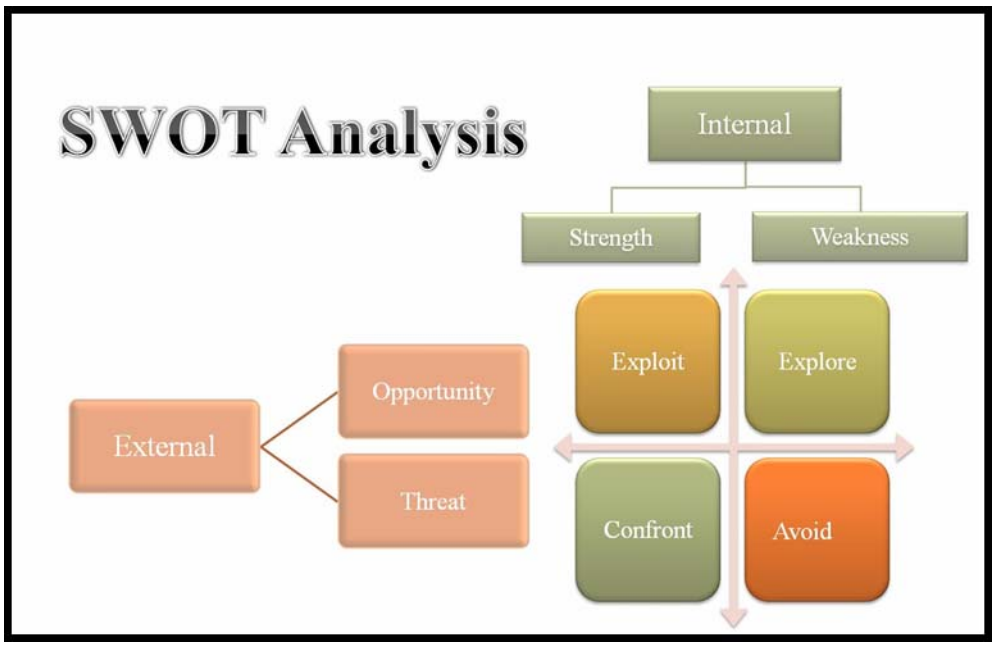

Figure 10. SWOT Analysis Framework

Using the SWOT analysis framework in Figure 10 and the NAVSUP field contracting organization as a point of reference, several potential focus areas have been identified as relevant when formulating a husbanding services contracting developmental approach. Developing organizational performance often begins with policy changes derived from objective assessments, resulting in incremental improvements.

1. Current

- Strengths
  - Bargaining power in contract negotiations
  - Ability to both positively and negatively incentivize performance
  - Audit and reject capabilities of unreasonable items
  - Mature infrastructure capable of offering support to other services in the event of a contingency
  - Leverage of maintaining forward logistics capability without permanent presence

- Weaknesses
    - Lack of market research data to support decisions
    - Security requirements and constraints
    - Requirement to maintain standing OOTW response capability
    - HSPs have superior spend analysis data and commercial software applications
    - Highly volatile schedule requirements
    - Relatively inefficient billing and payment processes
    - High government regulatory and oversight requirements
    - Widely varying stakeholder practices/processes

2. Future

- Opportunities
    - High competition among HSPs creates leverage
    - Regionalization of HSCs leads to higher contract values that attract HSPs from the commercial sector
    - A single, worldwide field contracting directorate offers an opportunity to standardize contracting policy and streamline processes
    - Centralized storage of port-cost data enables a targeted port-visit approach based on forecast port-visit costs
- Threats
    - Inability to track and anticipate non-CLIN services increases cost risk
    - Schedule delays while resolving disputed item charges
    - Lack of cost visibility by operational units leads to poor purchasing decisions
    - Lower variability and higher profit margin commercial contracts draw HSP resources away from Government contracts.
    - Wide geography and port-cost variation raises both cost and performance risk
    - Current HSC structure inadequately incentivizes HSP performance (e.g., unknown levels of service required and unknown OOTW requirements)

3. Strategic Focus Areas

Having explored both current and desired states of husbanding services contracting, SWOT analysis draws attention to the *means* or options for bridging gaps. Based on the logic of this framework, NAVSUP would seek to exploit opportunities using its strengths and to avoid or prepare for potential threats. Preference would likely be given to incentivizing the paramount goals of performance and flexibility—while considering tradeoffs in other areas as required. When considering NAVSUP goals within the SWOT framework, the following strategic focus areas are identified:

a. Since better information leads to better business decisions, NAVSUP can leverage its ability to incentivize performance (strength) to overcome its lack of market data to support decisions (weakness) and to counter the threat of inadequate HSP incentives in the current contracting environment.

b. NAVSUP can use its strength in bargaining power to exploit the opportunity of increased market competition and to negotiate contracts with higher HSP performance incentives.

c. Formation of a worldwide field contracting directorate presents an opportunity to standardize policy and processes. Standardization, in turn, facilitates integration and reinforces the ability to offer contingency support to other services. Integration also increases visibility of knowledge and resources (see above). The opportunity of centralization might also be used to overcome widely varying stakeholder practices (weakness).

d. Many of NAVSUP's weaknesses include areas where they have little to no control (e.g., security constraints, OOTW constraints, and volatile schedule requirements). Therefore, they can take advantage of regionalization opportunities and explore ways to streamline

processes. Streamlining can focus on reducing variability (both a threat and a weakness) and increasing flexibility (a key performance goal).

e. NAVSUP ability to incentivize (strength) can be used to confront the threats of increased cost risk posed by non-CLIN services and poor purchasing decisions—both resulting from lack of cost visibility. The incentive would be tied to the performance metric of increased visibility.

f. Although risk cannot be eliminated, it can be assessed and managed. The risk of port-cost variation (threat) can be confronted using a targeted, risk-based approach to scheduling port-visits. Centralized port-cost data and increased visibility of port-cost data enable risk-based contracting approaches based on probabilities and historical data.

C. STAKEHOLDER ANALYSIS

Decision-making authority in the U.S. acquisition system is diffuse—emphasizing the need for stakeholder analysis. Stakeholder analysis adds to strategic focus by prioritizing stakeholders, identifying their interests, and attempting to garner their support. Aligning stakeholder claims with acquisition goals where possible makes business sense, whereas lack of alignment means some needs and expectations are not being met. Potential barriers to implementing policy can be incorporated into the SWOT analysis weaknesses or threats. While SWOT analysis identifies strategic focus areas, stakeholder analysis attempts to align and prioritize focus areas of powerful groups and individuals. Specifically, interest areas of definitive and dominant stakeholders would need to be identified, prioritized, and addressed or the organization faces irrelevance—the equivalent of bankruptcy in the private sector. Flexibility, empathy, and political savvy are required to understand the needs and expectations of a plurality of stakeholders—particularly in changing global environments.

Stakeholder attributes determine their class and potential impact on the focal organization. Figure 11 summarizes stakeholders and their corresponding attributes, classes, and interests in the husbanding services contracting process.

Figure 11. HSC Stakeholders

Based on identified attributes and classes, NAVSUP, the combatant commanders, and the fleet forces commands are definitive stakeholders having substantial potential to impact HSC policy. NAVSUP's stated mission is to provide supply support to U.S. Navy forces worldwide. As the HCA for field contracting, NAVSUP has the power to implement HSC policy, legitimate claims on all husbanding contract issues, and to play a critical management role in HSC. Combatant commanders possess legitimate power and urgency apparently commensurate with their responsibility for operations. The operational commander's bottom line includes economics and personnel accountability,

but performance is often viewed through the eyes of all stakeholders. This definitive stakeholder is willing to trade off all interest areas (within constraints) for schedule and performance factors. Commander Fleet Forces Command possesses power, legitimacy, and urgency by virtue of its mission to man, train, and equip the operational commanders. The Command's primary interest area is to perform its support role within budget and security constraints. The definitive stakeholders share the interest areas of cost tracking, ATFP, and financial forecasting.

The common interest areas of service quality and payment issues emerge when the subset of dominant stakeholders is added. CNI exercises utilitarian power and legitimacy when performing its stated mission: "Overall shore installation management and authority as budget submitting office for installation support and the Navy point of contact for installation policy and program execution oversight." FISC field contracting offices possess both legitimacy and urgency commensurate with their responsibility to solicit, award, and administer husbanding services contracts.

The following interest areas are common to all definitive and dominant stakeholders and can be incorporated into performance parameters, constraints, or incentivized items in a HSC methodology:

a. Anti-terrorism Force Protection (ATFP) mandates
b. Improved port-cost tracking
c. Improved financial forecasting
d. Service quality
e. Reduced number of payment issues

High-priority interest areas should be appropriately weighted in incentive arrangements. For example, a low-frequency, high-variability service such as contingency CLINs will require a higher incentive to induce the required level of effort from a HSP.

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VI. CONCLUSIONS

A. BASE CONTRACT TYPE ON REALISTIC RISK ASSESSMENTS

Contract type is determined by the certainty of requirements and the level of cost risk. Clear and definitive requirements allow the government to assign the contract risk to the contractor using a firm-fixed-price arrangement for specific levels of performance. Competition drives prices to a level commensurate with risk. Hence, there are trade-offs among risk, cost, and appropriate contract type. To eliminate risk would be cost-prohibitive. It must, instead, be managed by gaining a higher probability estimate of future requirements. Greater uncertainty requires the government to either assume greater risk or to pay a premium for the contractor to assume risk. In the case of husbanding services contracts, variability is high, and performance requirements are numerable. Therefore, contractor risk may be unacceptable under a FFP agreement—forcing the government to manage risk by shifting contract type to either an incentive- or cost-type contract. Since cost-type contracts are least preferable to the government, and high levels of performance risk are unacceptable, incentive- or award-fee contract types are appropriate contract types for the situation.

B. TRADE OFF CHARACTERISTICS WITHIN CONSTRAINTS

Trade-offs are required when performance goals are contradictory (e.g. higher performance levels and lower costs). Not only do some contracting goals represent trade-offs, but the priorities for each goal may represent trade-offs among stakeholders. Trade-off criteria may be subjective, but are a pressing reality within the existing environment. Return on investment (ROI) can be measured in dollars and in subjective terms such as "performance," "quality," and "opportunity cost." In any dynamic environment, particularly cross-cultural, values, constraints, and priorities change with time—giving rise to a central axiom termed flexibility. Greater variability and shorter reaction times require even more flexibility. Furthermore, performance in the provision of large-scale services suffers from the generalized difficulty of judging good service. The award-fee

contracting tool is a flexible incentive mechanism awarded based on subjective value criteria. The trade-off for increased flexibility and incentive is increased administrative cost. In terms of husbanding services contracting ROI, the award-fee costs in time and money are compared to future reduction in negotiated contract rates, reduced variability, or enhanced schedule performance (all depend on the incentive evaluation criteria assigned). In accordance with *FAR* 16.202-1, the contract award type remains firm-fixed-price when used with award fee incentives. Figure 12 illustrates the trade-offs of an award-fee incentive arrangement.

Figure 12. FPAF Characteristic Trade-offs

C. STREAMLINE EXISTING PRACTICE

Process improvement can garner efficiencies such as reduced workload and reduced variability. For example, simplified billing procedures reduce errors and the consequent man-hours required to track and correct the errors. John Couture, OIC FISC Sigonella Detachment Bahrain, estimates that each government purchase card (GPC)

transaction submitted in lieu of DD Form 1155 saves over three hours in administrative processing effort (Couture, 2007, March 24). Another method of avoiding administrative tracking effort caused by incomplete or inaccurate billing is to delay payment until final port-cost totals are known. Figure 13 demonstrates the complexity and potential sources of delay in payment processing.

Use of the government purchase card would bypass much of the complex billing process and support distance support initiatives that reduce workload for operational units—particularly those without a disbursing office on board. Finally, if GPC use were standardized and mandated, the commercial tracking and visibility of the GPC administrator's software system could be leveraged to gather and track port-cost expenditures. Much like using a credit card statement to track business expenses, port-visit costs and categories could be tracked and become available for forecasting future expenses. A potentially higher volume of Government business with the GPC administrator would incentivize him/her to add additional classification data fields, such as CLIN and OOTW information, to billing reports. The two percent surcharge is a worthwhile trade-off for improved spending visibility and reduced administrative effort. Government purchase card statistics from a recent DASN Acquisition Management presentation show only 780 infractions out of 1.4 million GPC transactions during the latter half of fiscal year 2005 (Brown, 2007, April 5). These data, along with a significant downward trend in GPC infractions show that the risk of adopting this payment method is minuscule when compared to the potential benefits.

Grouping similar CLINs is another billing practice that would reduce the *volume* of transactions. While the total amount due would not change, the number of invoices and vouchers would decrease—along with the probability of errors and administrative efforts required to correct the errors. Grouping similar CLINs (e.g., by similar fund codes) would simplify the gathering of management data and facilitate the assignment of expenses to appropriate fund appropriations.

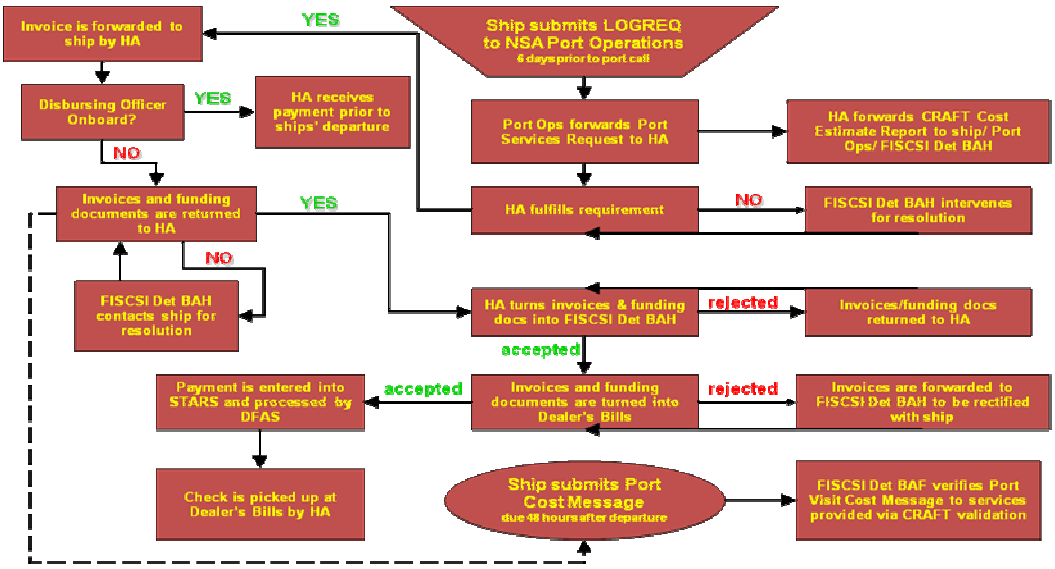

Figure 13. FISCSI Detachment Bahrain Billing Flowchart
From (Morgan, 2007, March 24)

D. STANDARDIZE, INTEGRATE, AND INCREASE VISIBILITY

Major benefits of standardization include the ability to process and filter cost data and the ability to share cost data among organizations. Integration and increased visibility are corollaries of standardization. For example, standardization of data entry might include a specific data field for CLIN number. ADP equipment could then determine the frequency of that CLIN's usage. Furthermore, searching a database for non-CLIN items would reveal spend data for items required, but not included in the HSC at a negotiated, fixed-price. The current CRAFT database has no way of identifying non-CLIN items other than manual review of the remarks field.

CLINs could also be assigned to standardized groups of high-use items. The standardized group of items or services would limit variability and enable volume efficiencies when purchasing. For example, ATFP packages standardized to ship type, plus upgrade modules for escalating threat conditions would reduce volume, variability, and ease of ordering for operational units. (Parker, 2006)

Finally, standardized data fields are amenable to information technology (IT) applications that reduce workload for operational customers. IT applications also increase the ability of acquisition personnel to conduct market research. Demand data included with spend analysis data also aid supply-chain personnel.

E. INCENTIVIZE HSP'S TO MEET PERFORMANCE OBJECTIVES

A risk-based contracting approach is necessary given the ubiquitous scarcity of resources. Reduced requirements variability minimizes cost and performance risk. Improved tracking and spend analysis of services allows higher accuracy in requirements prediction. Detailed spend analysis is prevalent in commercial contracting—and should be achievable in military HSCs if properly incentivized. Performance is paramount for all of the reasons cited above. Therefore, HSCs should incentivize performance areas such as:

- Data collection, visibility, and accuracy (e.g., HSP provides spend analysis segregated by CLIN, non-CLIN, OOTW, etc. in return for an award fee).
- *Demonstrated* cost avoidance (e.g., HSP negotiates a port tariff reduction for USN and is awarded X% of the savings realized by the new, negotiated rate).
- Price variability and risk reduction (e.g., HSP reduces the percentage of non-CLIN expenditures and/or percentage of cost-reimbursable services provided)

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VII. RECOMMENDATIONS

A. RECOMMENDED HUSBANDING CONTRACT POLICY

1. Characteristics

Implementation of a flat-rate, low-variability, well-defined and constant set of requirements minimizes risk and price fluctuations. Conversely, adoption of a cost reimbursable contract type is both undesirable and infeasible. A contracting methodology that represents a best value trade-off within constraints should have the following characteristics:

a. Flexible

i. Recommended tool for implementation: IDIQ task order

ii. Recommended tool for implementation: Award-fee criteria

b. Risk-based

i. Recommended tool for implementation: Risk-based, "targeted port approach" based on probability and port-cost data

ii. Recommended tool for implementation: Market research modeling to inform business decisions

iii. Recommended tool for implementation: Focus risk management and oversight on high-ROI process improvements

iv. Recommended tool for implementation: Isolate high-variability services where practicable

c. Performance-based Incentives

i. Recommended tool for implementation: FPAF contract type

ii. Recommended tool for implementation: Sharing cost savings achieved through contractor demonstrated cost avoidance efforts.

iii. Recommended tool for implementation: Award fee plan that can be modified as environment, goals, priorities change. A notional *award fee plan* and *award fee evaluation scale* are outlined below as Figures 14 and 15 respectively.

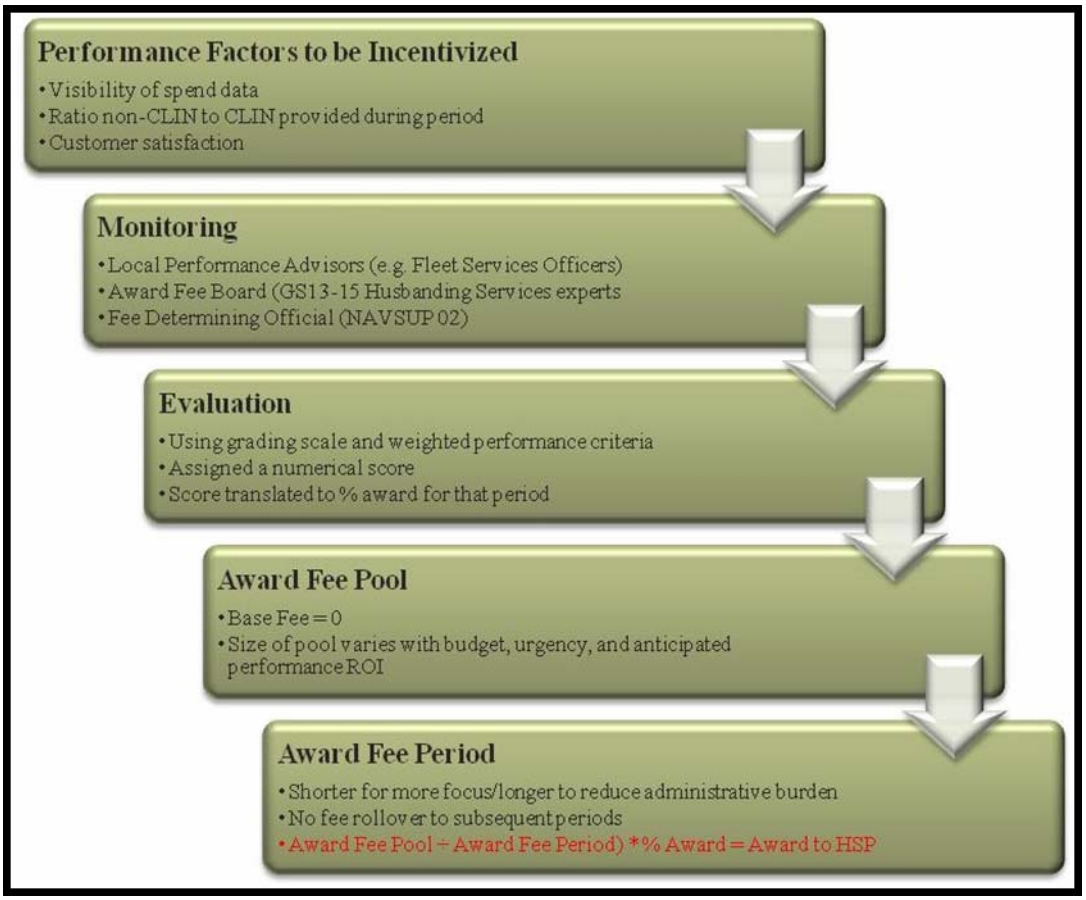

Figure 14. Notional Award Fee Plan

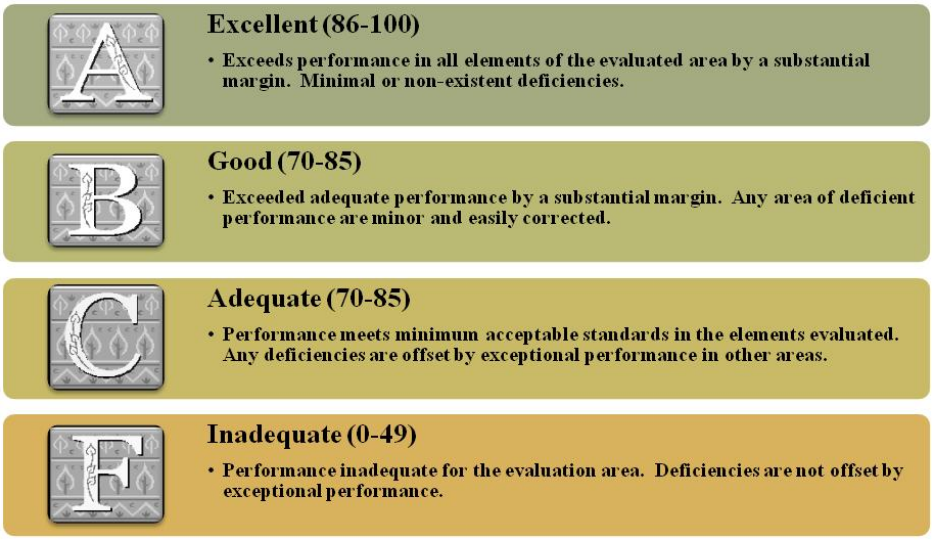

Figure 15. .Notional Award Fee Evaluation Scale

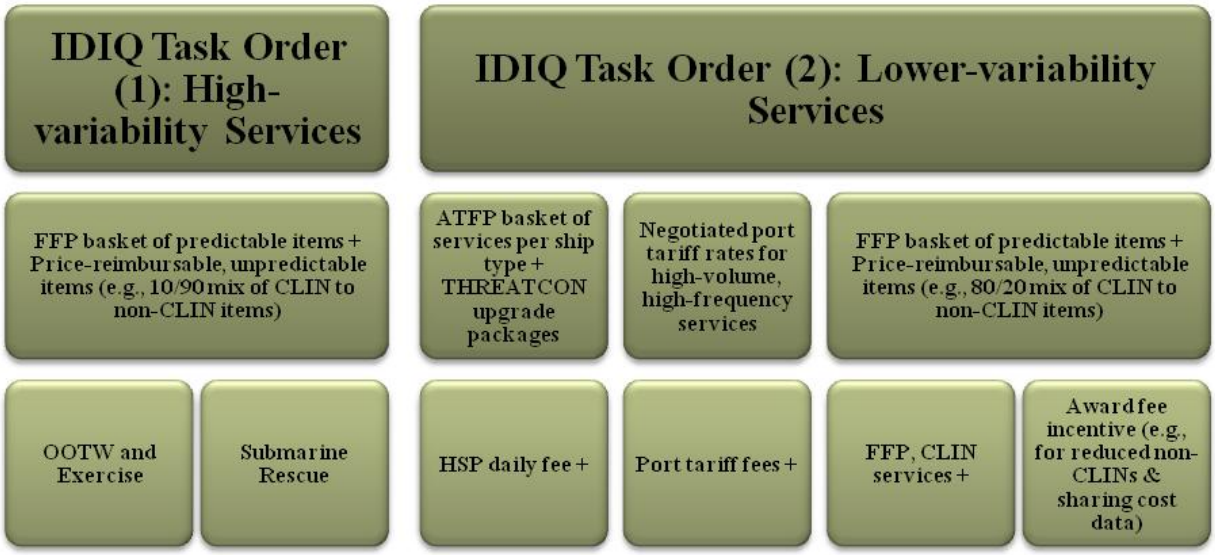

Figure 16. Recommended HSC Policy Structure

Splitting HSCs into separate IDIQ task orders is part of an overarching, risk-based approach intended to isolate uncontrollable sources of volatility. While it may be intuitive to apply the award-fee incentive to the highly-variable IDIQ task order, it is important to focus incentives on the higher-volume performance areas that can be more extensively influenced by policy. Incentive application to a larger proportion of overall service requirements mitigates the negative effects of volatility, uncertainty, and risk. Figure 16 outlines the structure and elements of a recommended husbanding services contracting policy. Major elements are described below:

2. Elements

a. IDIQ Task Order (1)

i. Low-frequency, high-variability services
ii. FFP CLINs for predictable requirements common to most OOTW, submarine rescue, and exercises
iii. Price reimbursable non-CLIN services + daily fee (due to unknown level of service requirements)
iv. Annual contract term with government option to extend (lowers contractor exposure to risk + maintains immediate performance incentive)
v. Highly unpredictable services isolated into a separate contract
vi. Anticipate a high percentage of non-CLIN services

b. IDIQ Task Order (2)

i. High-frequency, lower-variability services
ii. Standardized bundle of ATFP services negotiated as a single CLIN per ship type + CLIN module upgrades for escalating THREATCON + location-specific services

iii. Negotiated “favored” port tariff rates for high volume and/or frequency port locations. Performance incentive = sharing of demonstrated cost avoidance.

iv. FFP per unit of service arrangement for negotiated CLIN items

v. Price reimbursement for non-standard and required non-CLIN services.

   a. HSP must provide (semiannually) an itemized breakdown and statistical summary of all non-CLIN items provided.

   b. If no price data are available to support the vendor’s quoted price, prior approval is required by the purchasing activity’s unit commander.

   c. GPC is the required payment method for non-CLIN items under the micro-purchase threshold (may require policy coordination with other GPC issuing authorities).

vi. Maximizes the “market basket” approach, but offers an award-fee incentive to increase visibility and sharing of cost data, and minimization of non-CLIN service requirements

vii. Yearly award term with yearly renewal options.

B. SCOPE FOR IMPLEMENTATION

A critical consideration for the policy scope is the trade-off between performance and administrative burden. The larger in scope a contract becomes, the more meaningful management skill becomes to successful performance. Since local knowledge, licenses, and business contacts are critical to successful performance, husbanding service providers must increasingly rely on subcontractors as contract scope increases. As contract scope increases, the number of subcontracting levels tends to increase while the

visibility of lower level subcontractor actions decreases. With a regional contract scope, the core competencies of the primary contractor become integration, coordination, and stakeholder management.

Benefits of increased contract scope include shared resource reserves, centralized management data, and administrative efficiency improvements. Contractors awarded large-scope husbanding contracts must have effective financing, infrastructure, and coordination capabilities to meet large-scope performance objectives. Extensive coordination and infrastructure assets make these contractors more likely to succeed at contingency tasking. A larger scope of contract also allows contractors to more evenly distribute the high variability of service levels required among specific locations. Reserve assets and the ability to manage variability, in turn, lower contractor risk and the need for contingency pricing. Finally, the management data and spend analysis required for contractors to coordinate large-scope contracts is a potential resource for the Government. Strengths identified in the SWOT analysis above, such as the ability to incentivize performance can be used to persuade contractors to share this market research data with government acquisition officials as part of the negotiated contract terms.

Based on these considerations, a regional scope of contract award is recommended. A worldwide contract scope would unacceptably limit competition and the range of responsible bidders. Numerous local contracts would unacceptably increase the volume of contract administration. A regional contract scope aligns with current FISC regional structure. Geographic regions also provide a logical grouping of port-visit locations. A smaller number of regional scope contracts also reduces the potential burden of administering numerous incentive and award fee programs. A regional contract scope consolidates administrative effort and cost sufficiently to satisfy the *FAR* 16.404(b) (1) stipulation that award-fee arrangements shall not be used unless, “The administrative cost of conducting award-fee evaluations are not expected to exceed the expected benefits.”

VIII. AREAS FOR FURTHER RESEARCH

A. DETAILED SPEND ANALYSIS OF OOTW AND NON-CLIN SERVICES

B. COST-BENEFIT ANALYSIS OF PORT TARIFF RATE NEGOTIATIONS FOR HIGH-USAGE PORTS

C. INTEGRATION OF IT SOLUTIONS FOR LOGISTICS AND CONTRACTING FUNCTIONS

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APPENDIX A. SERVICES EXPENSE DATA

	BY 06 Expense Data			
		DOLLARS	PERCENTAGE	Service
BY06 TOTAL SPEND		$22,837,064.98	100.00%	
BYO6 NON CLIN SPEND		$12,150,612.66	53.21%	
Non Clin Breakdown		$2,195,170.65	9.61%	Miscellaneous
		$1,094,096.89	4.79%	Shore Electrical (consists mostly of 300 and 400 amp)
		$1,024,106.84	4.48%	Port Charges Other (Consists mostly of Garbage Can cleaning in Mina Sulman)
		$895,397.58	3.92%	Fuel - MGO
		$607,230.40	2.66%	Car Rental - Passenger Van
		$589,572.53	2.58%	FP Other
		$570,150.00	2.50%	Bilge Water Removal
		$446,910.22	1.96%	Crew Repatriation
		$438,557.30	1.92%	Crane Service - Shore
		$350,835.10	1.54%	Boat Other
		$274,693.00	1.20%	CHT Removal Pierside
		$255,339.16	1.12%	Tugs Stand Bye
		$224,730.00	0.98%	Crane Service - Manlift
		$186,180.38	0.82%	Potable Water
		$166,689.00	0.73%	Bus Service
		$115,856.00	0.51%	Barge - Other and Landing
		$108,800.00	0.48%	Camels
		$108,674.16	0.48%	Tugs In
		$86,071.50	0.38%	Tugs Out
		$79,524.00	0.35%	Crane Service - Floating
		$68,866.67	0.30%	Tugs
	Subtotal	$9,887,451.38	43.30%	

Clin Breakdown				
	X111AD	$246,126.50	1.08%	CAR RENTAL - PASSENGER VAN
	X211AB	$175,220.00	0.77%	CAR RENTAL - PASSENGER VAN
	X111AC	$158,792.50	0.70%	CAR RENTAL - SEDAN
	X211AC	$174,676.00	0.76%	CAR RENTAL - SEDAN
	X104AA	$532,143.86	2.33%	CHT REMOVAL - PIERSIDE
	X204AB	$592,870.00	2.60%	CHT REMOVAL - PIERSIDE
	X204AE	$117,499.50	0.51%	CHT REMOVAL - PIERSIDE
	X232AB	$108,717.50	0.48%	CRANE SERVICE - MANLIFT
	X134AC	$87,498.88	0.38%	CRANE SERVICE - SHORE
	X105AB	$82,028.00	0.36%	FENDERS
	X205AA	$247,296.00	1.08%	FENDERS
	X205AB	$102,504.00	0.45%	FENDERS
	X133AA	$146,651.66	0.64%	FORKLIFT SERVICE
	X146:	$302,570.00	1.32%	FP, PIER LIGHTING
	X202AA	$136,045.00	0.60%	HUSBANDING SVCS SUBSEQ DAY
	X130AF	$329,671.25	1.44%	PORT CHARGES - OTHER
	X130BA	$156,976.59	0.69%	PORT CHARGES - OTHER
	X138AA	$200,425.00	0.88%	PORTABLE TOILETS
	X235AD	$388,090.00	1.70%	SHORE/ELECTRICAL POWER
	X235AE	$600,127.00	2.63%	SHORE/ELECTRICAL POWER
	X130AJ	$338,439.38	1.48%	TRASH REMOVAL - PIERSIDE
	X203AA	$89,422.40	0.39%	TRASH REMOVAL - PIERSIDE
	X108AA	$188,268.46	0.82%	TUGS - IN
	X108AE	$173,418.97	0.76%	TUGS - IN
	X208AA	$70,755.00	0.31%	TUGS - IN
	X108AA	$182,465.01	0.80%	TUGS - OUT
	X108AE	$164,645.66	0.72%	TUGS - OUT
	X208AA	$70,755.00	0.31%	TUGS - OUT
	X208AB	$328,331.57	1.44%	TUGS - STAND-BY
	X130AH	$53,656.21	0.23%	WATER, POTABLE - PIERSIDE
	X206AA	$107,250.99	0.47%	WATER, POTABLE - PIERSIDE
	X206AB	$293,324.00	1.28%	WATER, POTABLE - PIERSIDE
	Subtotal	$6,946,661.89	30.42%	

APPENDIX B. PORT-VISIT EXPENSE DATA

Port	Dollar Value	Visits	Days in Port	Percentage%
MINA SULMAN	$9,427,558.87	267	2,750	41.09%
JEBEL ALI	$8,038,959.93	137	650	35.04%
FUJAIRAH	$2,197,238.88	74	98	9.58%
AQABA	$912,024.08	8	24	3.97%
RAS AL JULIAH	$634,440.50	49	55	2.77%
SEYCHELLES	$512,373.93	11	51	2.23%
PORT SULTAN QABOOS, MUSCAT	$257,264.76	7	43	1.12%
DJIBOUTI	$211,225.38	11	22	0.92%
KARACHI	$189,995.84	4	6	0.83%
DUBAI	$133,113.90	6	306	0.58%
SITRA ANCHORAGE	$112,481.22	3	6	0.49%
SAO TOME	$89,908.12	3	9	0.39%
MANAMA	$63,043.45	1	5	0.27%
PORT SUEZ	$60,872.55	57	92	0.27%
TAKORADI	$55,065.00	1	2	0.24%
DOHA	$31,910.00	2	42	0.14%
SALALAH PORT, SALALAH	$12,139.20	4	8	0.05%
SHUAIBA	$3,497.23	1	1	0.02%
PALMEIRA BAY	$1,019.03	1	1	0.00%
*Total ***	$22,944,131.87	647	4,171	

Service	Total Spent ($)	Percentage%
SHORE/ELECTRICAL POWER	$2,277,970.38	24.16%
MISCELLANEOUS	$900,592.33	9.55%
CHT REMOVAL - PIERSIDE	$764,810.38	8.11%
CAR RENTAL - PASSENGER VAN	$633,001.00	6.71%
BILGE WATER REMOVAL	$570,150.00	6.05%
TUGS - STAND-BY	$562,040.76	5.96%
PORT CHARGES - OTHER	$421,991.16	4.48%
WATER, POTABLE - PIERSIDE	$413,445.99	4.39%
FENDERS	$371,136.00	3.94%
BOAT, OTHER	$341,948.10	3.63%
CRANE SERVICE - SHORE	$263,886.08	2.80%
CAR RENTAL - SEDAN	$185,156.00	1.96%
HUSBANDING SVCS SUBSEQ DAY	$165,175.00	1.75%
CRANE SERVICE - MANLIFT	$134,590.50	1.43%
TUGS - OUT	$107,325.00	1.14%
TUGS - IN	$106,927.50	1.13%
CRANE SERVICE - FLOATING	$105,547.00	1.12%
TRASH REMOVAL - PIERSIDE	$92,230.40	0.98%
WATER, POTABLE - ANCHORAGE	$91,207.21	0.97%
TUGS	$81,859.47	0.87%
CHT REMOVAL - ANCHORAGE	$75,450.00	0.80%
FORKLIFT SERVICE	$60,248.00	0.64%
BROWS	$56,715.00	0.60%
BARGE, LANDING	$49,824.00	0.53%
PAINT FLOAT	$43,700.00	0.46%
WASTE OIL - ANCHORAGE	$43,680.00	0.46%
TELEPHONE - CELLULAR USAGE	$40,847.50	0.43%
WASTE OIL - PIERSIDE	$38,693.59	0.41%
PILOTS - OUT	$31,376.00	0.33%
HUSBANDING SVC 1ST DAY	$31,100.00	0.33%

PILOTS - IN	$30,952.00	0.33%
STEVEDORING	$30,689.50	0.33%
TELEPHONE - CELLULAR	$29,659.63	0.31%
TRASH REMOVAL - ANCHORAGE	$25,344.00	0.27%
CAR RENTAL - TRUCK	$24,665.02	0.26%
FENDERS, YOKOHAMA	$23,968.00	0.25%
PORTABLE TOILETS	$23,175.00	0.25%
BARGE, OTHER	$21,900.00	0.23%
TUGS - BERTHING SHIFTS	$18,895.00	0.20%
WATER TAXI SERVICE	$16,400.00	0.17%
WATER, FEED - PIERSIDE	$16,303.50	0.17%
LAUNDRY & DRY CLEANING SVCS	$16,291.15	0.17%
WATER TAXI SVC - OUTER HARBOR	$10,800.00	0.11%
FP, GUARD SHACK, WEATHER RESISTANT	$10,175.00	0.11%
ANCHORAGE FEE	$8,981.71	0.10%
FLEET LANDING EXPENSES	$8,590.00	0.09%
CREW SUPPORT - OTHER	$7,695.00	0.08%
CREW REPATRIATION	$7,452.50	0.08%
FP, SECURITY GUARDS, ARMED	$6,160.00	0.07%
WATER, FEED - ANCHORAGE	$5,927.50	0.06%
PILOTS	$4,028.00	0.04%
BARGE, STERN	$3,350.00	0.04%
CAMELS	$2,650.00	0.03%
CAR RENTAL - DRIVER ONLY	$2,000.00	0.02%
LINEHANDLERS - IN	$2,000.00	0.02%
LINEHANDLERS - OUT	$2,000.00	0.02%
OIL SPILL PREVENTION SERVICE	$1,587.34	0.02%
CREW TARIFF	$1,116.00	0.01%
TRASH REMOVAL (COMPACTED) - PIERSIDE	$966.00	0.01%
PILOTS - BERTHING SHIFTS	$636.00	0.01%
Total **	**$9,427,558.87**	

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APPENDIX C. FORECAST PORT-VISIT FREQUENCY DATA

Year	Visit	Port	Type	Year	Visit	Port	Type	Year	Visit	Port	Type	Year	Visit	Ship Type	Average (2001-2006)	St.Dev. (2001-2006)
02_03	24	MANAMA	DDG	03_04	11	MANAMA	DDG	04_05	3	MANAMA	DDG	05_06	0	DDG	11	9.87
02_03	8	MANAMA	FFG	03_04	1	MANAMA	FFG	04_05	3	MANAMA	FFG	05_06	0	FFG	3.6	3.36
02_03	18	MANAMA	CG	03_04	16	MANAMA	CG	04_05	6	MANAMA	CG	05_06	1	CG	11.8	7.82
02_03	4	MANAMA	CVN	03_04	5	MANAMA	CVN	04_05	6	MANAMA	CVN	05_06	0	CVN	3.4	2.41
02_03	18	MANAMA	LSD	03_04	6	MANAMA	LSD	04_05	4	MANAMA	LSD	05_06	0	LSD	6.6	6.77
02_03	5	MANAMA	LHD	03_04	1	MANAMA	LHD	04_05	3	MANAMA	LHD	05_06	0	LHD	2.2	1.92
02_03	8	MANAMA	AOE	03_04	4	MANAMA	AOE	04_05	2	MANAMA	AOE	05_06	0	AOE	3.8	3.03

Year	Visit	Port	Type	Year	Visit	Port	Type	Year	Visit	Port	Type	Year	Visit	Ship Type	Average (2001-2006)	St.Dev. (2001-2006)
02_03	3	JEBEL ALI	DDG	03_04	11	JEBEL ALI	DDG	04_05	13	JEBEL ALI	DDG	05_06	13	DDG	8.2	5.76
02_03	2	JEBEL ALI	FFG	03_04	0	JEBEL ALI	FFG	04_05	2	JEBEL ALI	FFG	05_06	2	FFG	1.4	0.89
02_03	4	JEBEL ALI	CG	03_04	9	JEBEL ALI	CG	04_05	6	JEBEL ALI	CG	05_06	10	CG	5.8	4.02
02_03	3	JEBEL ALI	CVN	03_04	6	JEBEL ALI	CVN	04_05	5	JEBEL ALI	CVN	05_06	7	CVN	4.4	2.41
02_03	1	JEBEL ALI	LSD	03_04	4	JEBEL ALI	LSD	04_05	4	JEBEL ALI	LSD	05_06	5	LSD	3	1.87
02_03	2	JEBEL ALI	LHD	03_04	2	JEBEL ALI	LHD	04_05	5	JEBEL ALI	LHD	05_06	1	LHD	2.2	1.64
02_03	34	JEBEL ALI	AOE	03_04	21	JEBEL ALI	AOE	04_05	24	JEBEL ALI	AOE	05_06	14	AOE	20.6	9.32

Year	Visit	Port	Type	Year	Visit	Port	Type	Year	Visit	Port	Type	Year	Visit	Ship Type	Average (2001-2006)	St.Dev. (2001-2006)
02_03	0	DUBAI	DDG	03_04	2	DUBAI	DDG	04_05	0	DUBAI	DDG	05_06	0	DDG	0.4	0.89
02_03	0	DUBAI	FFG	03_04	0	DUBAI	FFG	04_05	0	DUBAI	FFG	05_06	0	FFG	0	0.00
02_03	0	DUBAI	CG	03_04	2	DUBAI	CG	04_05	0	DUBAI	CG	05_06	0	CG	0.4	0.89
02_03	0	DUBAI	CVN	03_04	0	DUBAI	CVN	04_05	0	DUBAI	CVN	05_06	0	CVN	0	0.00
02_03	0	DUBAI	LSD	03_04	0	DUBAI	LSD	04_05	0	DUBAI	LSD	05_06	0	LSD	0	0.00
02_03	0	DUBAI	LHD	03_04	1	DUBAI	LHD	04_05	0	DUBAI	LHD	05_06	0	LHD	0.2	0.45
02_03	0	DUBAI	AOE	03_04	0	DUBAI	AOE	04_05	0	DUBAI	AOE	05_06	0	AOE	0	0.00

Year	Visit	Port	Type	Year	Visit	Port	Type	Year	Visit	Port	Type	Year	Visit	Ship Type	Average (2001-2006)	St.Dev. (2001-2006)
02_03	5	AKSAZ	DDG	03_04	1	AKSAZ	DDG	04_05	1	AKSAZ	DDG	05_06	2	DDG	3	2.35
02_03	9	AKSAZ	FFG	03_04	8	AKSAZ	FFG	04_05	1	AKSAZ	FFG	05_06	0	FFG	5	4.18
02_03	3	AKSAZ	CG	03_04	0	AKSAZ	CG	04_05	0	AKSAZ	CG	05_06	1	CG	1.4	1.52
02_03	0	AKSAZ	CVN	03_04	0	AKSAZ	CVN	04_05	0	AKSAZ	CVN	05_06	0	CVN	0	0.00
02_03	0	AKSAZ	LSD	03_04	0	AKSAZ	LSD	04_05	0	AKSAZ	LSD	05_06	0	LSD	0.2	0.45
02_03	0	AKSAZ	LHD	03_04	0	AKSAZ	LHD	04_05	0	AKSAZ	LHD	05_06	0	LHD	0.2	0.45
02_03	0	AKSAZ	AOE	03_04	0	AKSAZ	AOE	04_05	0	AKSAZ	AOE	05_06	0	AOE	0	0.00

Year	Visit	Port	Type	Year	Visit	Port	Type	Year	Visit	Port	Type	Year	Visit	Ship Type	Average (2001-2006)	St.Dev. (2001-2006)
02_03	8	SOUDA BA port	DDG	03_04	8	SOUDA BAY port	DDG	04_05	15	SOUDA BAY port	DDG	05_06	19	DDG	13.2	4.97
02_03	12	SOUDA BA port	FFG	03_04	9	SOUDA BAY port	FFG	04_05	10	SOUDA BAY port	FFG	05_06	9	FFG	10	1.22
02_03	2	SOUDA BA port	CG	03_04	2	SOUDA BAY port	CG	04_05	4	SOUDA BAY port	CG	05_06	1	CG	2.2	1.10
02_03	4	SOUDA BA port	CVN	03_04	1	SOUDA BAY port	CVN	04_05	2	SOUDA BAY port	CVN	05_06	2	CVN	2.2	1.10
02_03	2	SOUDA BA port	LSD	03_04	0	SOUDA BAY port	LSD	04_05	2	SOUDA BAY port	LSD	05_06	2	LSD	1.4	0.89
02_03	3	SOUDA BA port	LHD	03_04	1	SOUDA BAY port	LHD	04_05	0	SOUDA BAY port	LHD	05_06	0	LHD	1.2	1.30
02_03	5	SOUDA BA	AOE	03_04	1	SOUDA BAY	AOE	04_05	0	SOUDA BAY	AOE	05_06	1	AOE	2	2.00

Year	Visit	Port	Type	Year	Visit	Port	Type	Year	Visit	Port	Type	Year	Visit	Ship Type	Average (2001-2006)	St.Dev. (2001-2006)
02_03	5	AUGUSTA	DDG	03_04	5	AUGUSTA B	DDG	04_05	7	AUGUSTA BA`	DDG	05_06	14	DDG	7.4	3.78
02_03	5	AUGUSTA	FFG	03_04	7	AUGUSTA B	FFG	04_05	6	AUGUSTA BA`	FFG	05_06	0	FFG	4.8	2.77
02_03	2	AUGUSTA	CG	03_04	0	AUGUSTA B	CG	04_05	2	AUGUSTA BA`	CG	05_06	2	CG	1.8	1.10
02_03	1	AUGUSTA	CVN	03_04	0	AUGUSTA B	CVN	04_05	0	AUGUSTA BA`	CVN	05_06	0	CVN	0.2	0.45
02_03	0	AUGUSTA	LSD	03_04	0	AUGUSTA B	LSD	04_05	1	AUGUSTA BA`	LSD	05_06	1	LSD	0.4	0.55
02_03	0	AUGUSTA	LHD	03_04	1	AUGUSTA B	LHD	04_05	0	AUGUSTA BA`	LHD	05_06	0	LHD	0.6	0.89
02_03	14	AUGUSTA	AOE	03_04	4	AUGUSTA B	AOE	04_05	4	AUGUSTA BA`	AOE	05_06	1	AOE	5.6	4.93

Year	Visit	Port	Type	Year	Visit	Port	Type	Year	Visit	Port	Type	Year	Visit	Ship Type	Average (2001-2006)	St.Dev. (2001-2006)
02_03	3	PALMA DE	DDG	03_04	4	PALMA DE I	DDG	04_05	2	PALMA DE M	DDG	05_06	2	DDG	2.2	1.48
02_03	3	PALMA DE	FFG	03_04	1	PALMA DE I	FFG	04_05	2	PALMA DE M	FFG	05_06	0	FFG	1.2	1.30
02_03	2	PALMA DE	CG	03_04	1	PALMA DE I	CG	04_05	0	PALMA DE M	CG	05_06	0	CG	0.6	0.89
02_03	0	PALMA DE	CVN	03_04	2	PALMA DE I	CVN	04_05	4	PALMA DE M	CVN	05_06	0	CVN	1.2	1.79
02_03	0	PALMA DE	LSD	03_04	0	PALMA DE I	LSD	04_05	0	PALMA DE M	LSD	05_06	0	LSD	0	0.00
02_03	1	PALMA DE	LHD	03_04	0	PALMA DE I	LHD	04_05	1	PALMA DE M	LHD	05_06	0	LHD	0.4	0.55
02_03	0	PALMA DE	AOE	03_04	0	PALMA DE I	AOE	04_05	0	PALMA DE M	AOE	05_06	0	AOE	0	0.00

Year	Visit	Port	Type	Year	Visit	Port	Type	Year	Visit	Port	Type	Year	Visit	Ship Type	Average (2001-2006)	St.Dev. (2001-2006)
02_03	2	VALLETTA	DDG	03_04	7	VALLETTA	DDG	04_05	0	VALLETTA	DDG	05_06	2	DDG	3	2.65
02_03	3	VALLETTA	FFG	03_04	0	VALLETTA	FFG	04_05	3	VALLETTA	FFG	05_06	1	FFG	1.4	1.52
02_03	3	VALLETTA	CG	03_04	3	VALLETTA	CG	04_05	2	VALLETTA	CG	05_06	0	CG	1.6	1.52
02_03	0	VALLETTA	CVN	03_04	0	VALLETTA	CVN	04_05	0	VALLETTA	CVN	05_06	0	CVN	0	0.00
02_03	1	VALLETTA	LSD	03_04	0	VALLETTA	LSD	04_05	1	VALLETTA	LSD	05_06	0	LSD	0.4	0.55
02_03	1	VALLETTA	LHD	03_04	3	VALLETTA	LHD	04_05	0	VALLETTA	LHD	05_06	0	LHD	1	1.22
02_03	0	VALLETTA	T-AOE	03_04	0	VALLETTA	T-AOE	04_05	0	VALLETTA	T-AOE	05_06	0	AOE	0	0.00

APPENDIX D. SERVICES SIMULATION REPORT STATISTICS

Crystal Ball Report
Simulation started on 5/16/07 at 15:47:45
Simulation stopped on 5/16/07 at 15:54:29

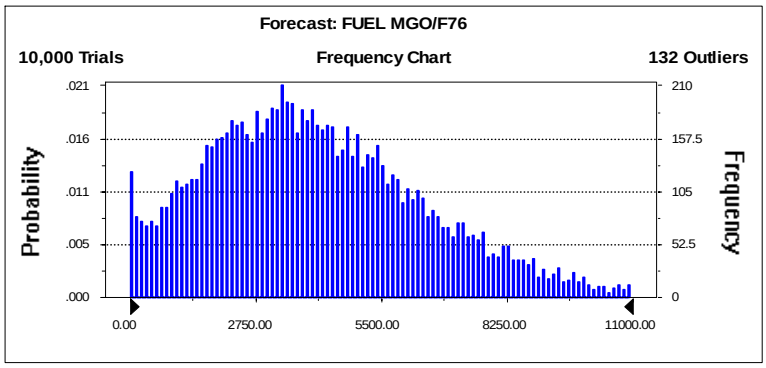
Forecast: FUEL MGO/F76

Summary:

Display Range is from 0.00 to 11000.00
Entire Range is from 0.00 to 17310.56
After 10,000 Trials, the Std. Error of the Mean is 25.00

Statistics:

	Value
Trials	10000
Mean	4195.43 MT
Median	3877.64 MT
Mode	---
Standard Deviation	2499.77 MT
Variance	6248837.05
Skewness	0.78
Kurtosis	3.80
Coeff. of Variability	0.60
Range Minimum	0.00
Range Maximum	17310.56
Range Width	17310.56
Mean Std. Error	25.00

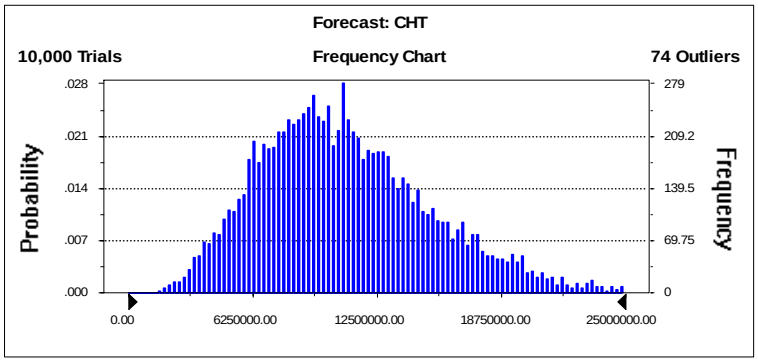


Forecast: CHT

Summary:

Display Range is from 0.00 to 25000000.00
Entire Range is from 920575.73 to 35533050.85
After 10,000 Trials, the Std. Error of the Mean is 44952.65

Statistics:	Value	
Trials	10000	
Mean	11052747.86	GL
Median	10496215.60	GL
Mode	---	
Standard Deviation	4495264.97	GL
Variance	2.02E+13	
Skewness	0.80	
Kurtosis	4.03	
Coeff. of Variability	0.41	
Range Minimum	920575.73	
Range Maximum	35533050.85	
Range Width	34612475.13	
Mean Std. Error	44952.65	



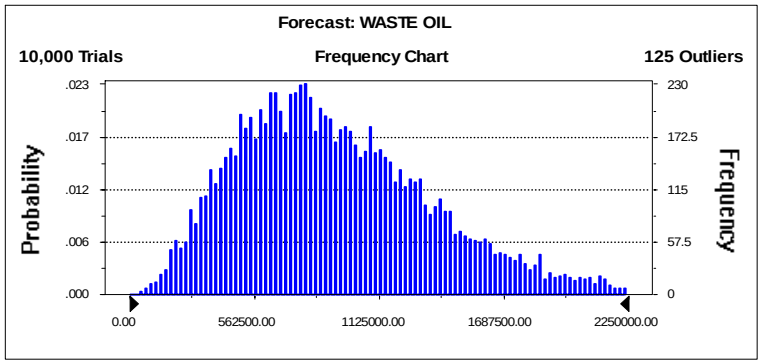
Forecast: WASTE OIL

Summary:

Display Range is from 0.00 to 2250000.00
Entire Range is from 42661.69 to 4186610.52
After 10,000 Trials, the Std. Error of the Mean is 4665.20

Statistics:

	Value	
Trials	10000	
Mean	948183.89	GL
Median	876707.20	GL
Mode	---	
Standard Deviation	466520.00	GL
Variance	2.18E+11	
Skewness	0.94	
Kurtosis	4.53	
Coeff. of Variability	0.49	
Range Minimum	42661.69	
Range Maximum	4186610.52	
Range Width	4143948.83	
Mean Std. Error	4665.20	



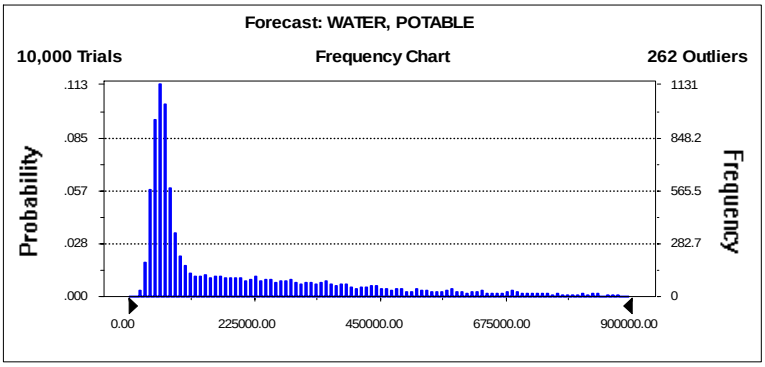
Forecast: WATER, POTABLE

Summary:

Display Range is from 0.00 to 900000.00
Entire Range is from 17787.69 to 2271113.44
After 10,000 Trials, the Std. Error of the Mean is 2491.35

Statistics:

	Value
Trials	10000
Mean	223852.57 MT
Median	96476.97 MT
Mode	---
Standard Deviation	249135.00 MT
Variance	62068248544.82
Skewness	2.11
Kurtosis	8.68
Coeff. of Variability	1.11
Range Minimum	17787.69
Range Maximum	2271113.44
Range Width	2253325.75
Mean Std. Error	2491.35



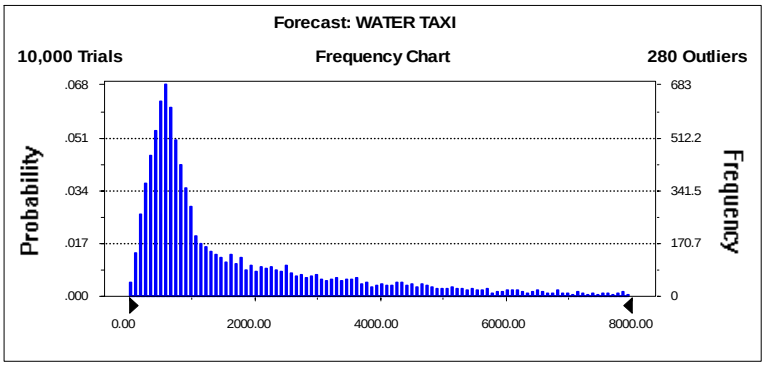
Forecast: WATER TAXI

Summary:

Display Range is from 0.00 to 8000.00
Entire Range is from 5.28 to 22518.78
After 10,000 Trials, the Std. Error of the Mean is 22.68

Statistics:

	Value
Trials	10000
Mean	1943.34 DY
Median	955.18 DY
Mode	---
Standard Deviation	2267.81 DY
Variance	5142966.30
Skewness	2.52
Kurtosis	11.68
Coeff. of Variability	1.17
Range Minimum	5.28
Range Maximum	22518.78
Range Width	22513.50
Mean Std. Error	22.68

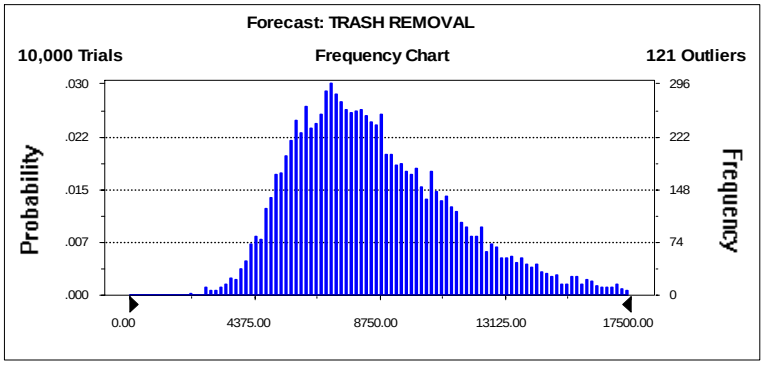


Forecast: TRASH REMOVAL

Summary:

Display Range is from 0.00 to 17500.00
Entire Range is from 1810.12 to 34442.70
After 10,000 Trials, the Std. Error of the Mean is 29.85

Statistics:	Value
Trials	10000
Mean	8675.82 DY
Median	8170.99 DY
Mode	---
Standard Deviation	2985.43 DY
Variance	8912810.03
Skewness	1.09
Kurtosis	5.16
Coeff. of Variability	0.34
Range Minimum	1810.12
Range Maximum	34442.70
Range Width	32632.58
Mean Std. Error	29.85



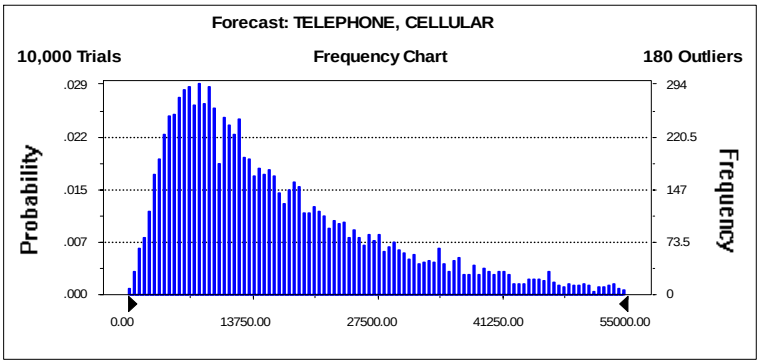
Forecast: TELEPHONE, CELLULAR

Summary:

Display Range is from 0.00 to 55000.00
Entire Range is from 0.00 to 132214.55
After 10,000 Trials, the Std. Error of the Mean is 132.56

Statistics:

	Value
Trials	10000
Mean	17227.58 DY
Median	13350.22 DY
Mode	---
Standard Deviation	13255.68 DY
Variance	175713136.95
Skewness	1.66
Kurtosis	6.96
Coeff. of Variability	0.77
Range Minimum	0.00
Range Maximum	132214.55
Range Width	132214.55
Mean Std. Error	132.56



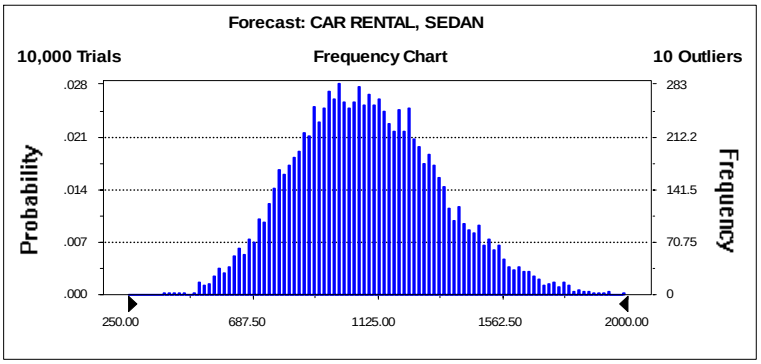
Forecast: CAR RENTAL, SEDAN

Summary:

Display Range is from 250.00 to 2000.00
Entire Range is from 355.00 to 2314.85
After 10,000 Trials, the Std. Error of the Mean is 2.57

Statistics:

	Value
Trials	10000
Mean	1093.93 DY
Median	1078.86 DY
Mode	---
Standard Deviation	256.52 DY
Variance	65803.82
Skewness	0.35
Kurtosis	3.12
Coeff. of Variability	0.23
Range Minimum	355.00
Range Maximum	2314.85
Range Width	1959.84
Mean Std. Error	2.57



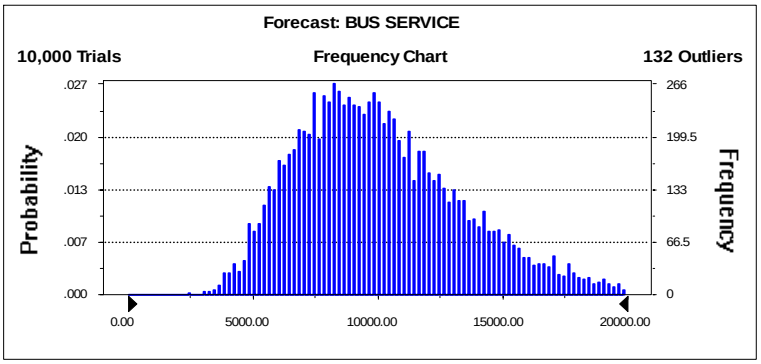
Forecast: BUS SERVICE

Summary:

Display Range is from 0.00 to 20000.00
Entire Range is from 2319.45 to 29086.05
After 10,000 Trials, the Std. Error of the Mean is 35.11

Statistics:

	Value
Trials	10000
Mean	10229.64 DY
Median	9740.77 DY
Mode	---
Standard Deviation	3511.11 DY
Variance	12327888.62
Skewness	0.86
Kurtosis	4.07
Coeff. of Variability	0.34
Range Minimum	2319.45
Range Maximum	29086.05
Range Width	26766.60
Mean Std. Error	35.11



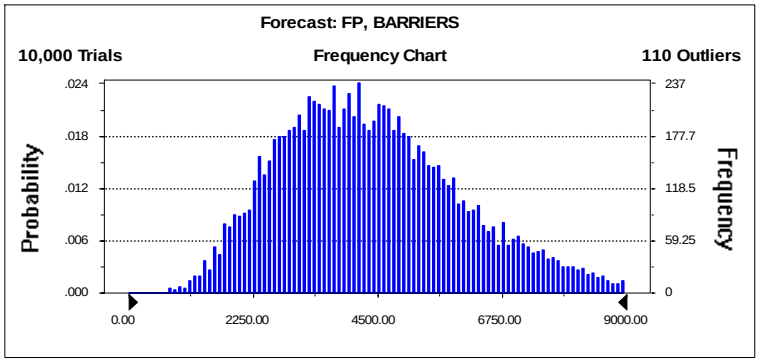
Forecast: FP, BARRIERS

Summary:

Display Range is from 0.00 to 9000.00
Entire Range is from 534.87 to 12885.86
After 10,000 Trials, the Std. Error of the Mean is 17.07

Statistics:

	Value
Trials	10000
Mean	4440.41 DY
Median	4243.41 DY
Mode	---
Standard Deviation	1706.91 DY
Variance	2913547.01
Skewness	0.66
Kurtosis	3.49
Coeff. of Variability	0.38
Range Minimum	534.87
Range Maximum	12885.86
Range Width	12350.98
Mean Std. Error	17.07



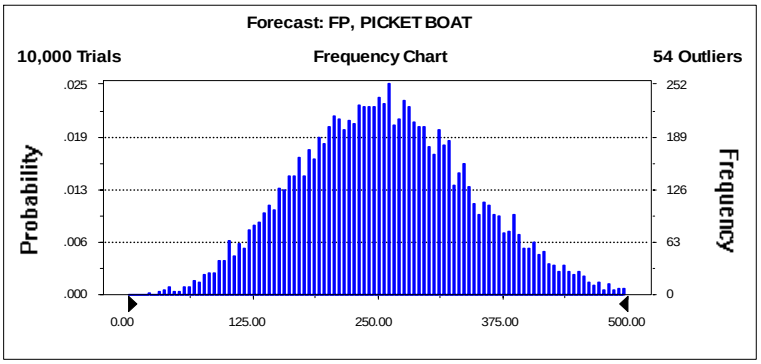
Forecast: FP, PICKET BOAT

Summary:

Display Range is from 0.00 to 500.00
Entire Range is from 22.88 to 624.36
After 10,000 Trials, the Std. Error of the Mean is 0.87

Statistics:

	Value
Trials	10000
Mean	258.74 DY
Median	255.74 DY
Mode	---
Standard Deviation	87.10 DY
Variance	7586.79
Skewness	0.25
Kurtosis	2.97
Coeff. of Variability	0.34
Range Minimum	22.88
Range Maximum	624.36
Range Width	601.48
Mean Std. Error	0.87



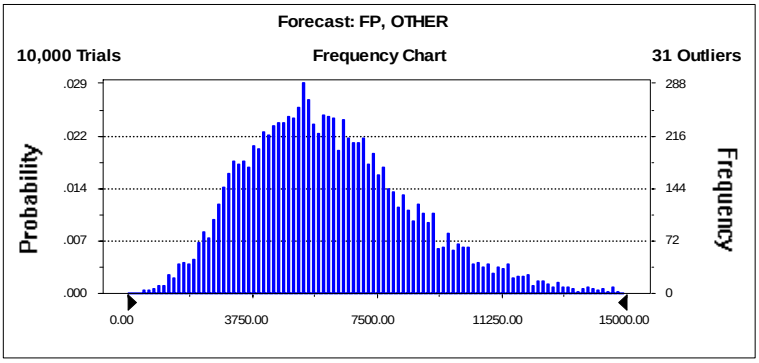
Forecast: FP, OTHER

Summary:

Display Range is from 0.00 to 15000.00
Entire Range is from 216.04 to 19535.54
After 10,000 Trials, the Std. Error of the Mean is 25.23

Statistics:

	Value	
Trials	10000	
Mean	6107.32	HR -- LT
Median	5828.02	HR -- LT
Mode	---	
Standard Deviation	2523.06	HR -- LT
Variance	6365831.91	
Skewness	0.71	
Kurtosis	3.79	
Coeff. of Variability	0.41	
Range Minimum	216.04	
Range Maximum	19535.54	
Range Width	19319.50	
Mean Std. Error	25.23	



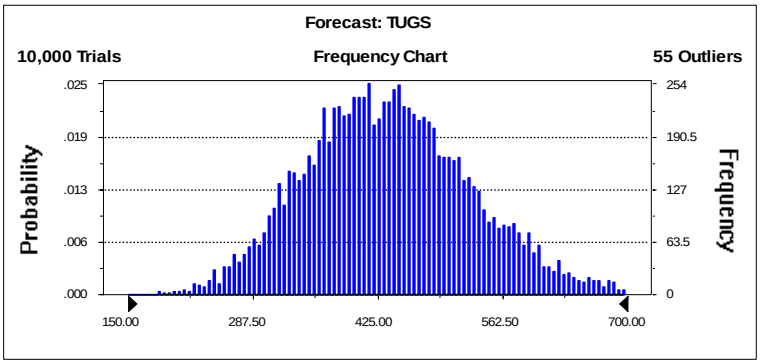
Forecast: TUGS

Summary:

Display Range is from 150.00 to 700.00
Entire Range is from 150.15 to 855.33
After 10,000 Trials, the Std. Error of the Mean is 0.93

Statistics:

	Value
Trials	10000
Mean	439.04 DY
Median	434.96 DY
Mode	---
Standard Deviation	92.53 DY
Variance	8562.46
Skewness	0.33
Kurtosis	3.18
Coeff. of Variability	0.21
Range Minimum	150.15
Range Maximum	855.33
Range Width	705.18
Mean Std. Error	0.93

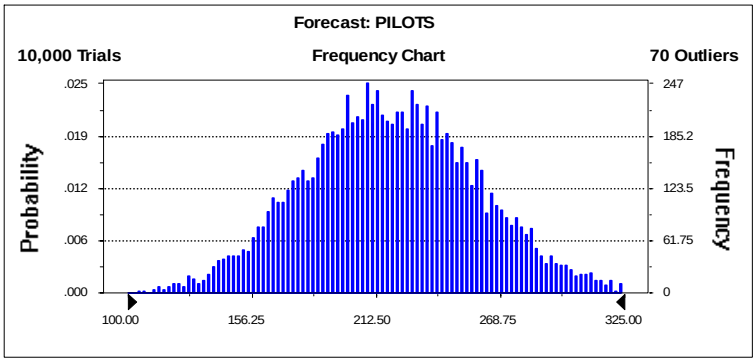


Forecast: PILOTS

Summary:

Display Range is from 100.00 to 325.00
Entire Range is from 63.37 to 380.26
After 10,000 Trials, the Std. Error of the Mean is 0.40

Statistics:	Value
Trials	10000
Mean	219.82 HR
Median	218.88 HR
Mode	---
Standard Deviation	40.01 HR
Variance	1600.69
Skewness	0.13
Kurtosis	3.05
Coeff. of Variability	0.18
Range Minimum	63.37
Range Maximum	380.26
Range Width	316.88
Mean Std. Error	0.40

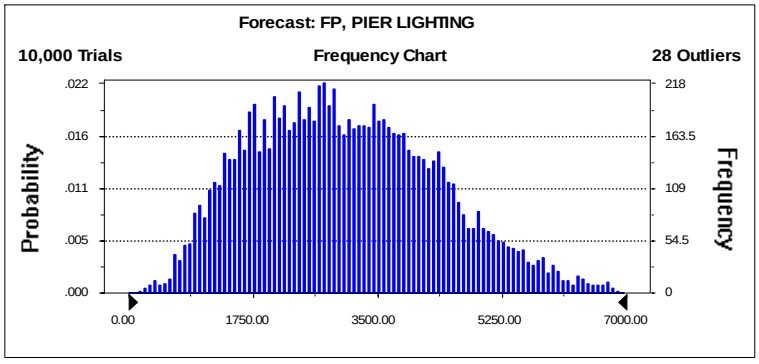


Forecast: FP, PIER LIGHTING

Summary:

Display Range is from 0.00 to 7000.00
Entire Range is from 111.00 to 8269.34
After 10,000 Trials, the Std. Error of the Mean is 13.14

Statistics:	Value
Trials	10000
Mean	3064.64 DY
Median	2953.24 DY
Mode	---
Standard Deviation	1313.69 DY
Variance	1725781.14
Skewness	0.40
Kurtosis	2.75
Coeff. of Variability	0.43
Range Minimum	111.00
Range Maximum	8269.34
Range Width	8158.34
Mean Std. Error	13.14



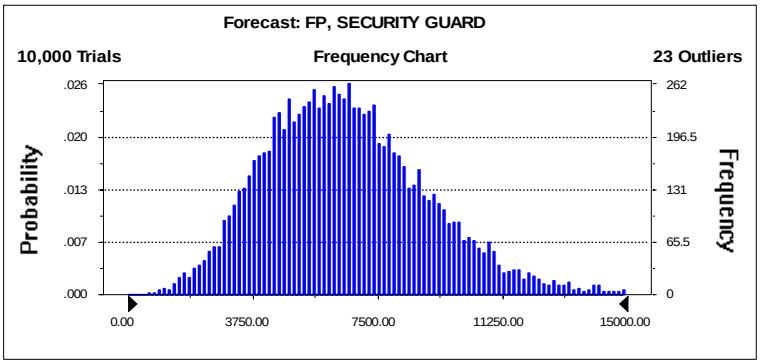
Forecast: FP, SECURITY GUARD

Summary:

Display Range is from 0.00 to 15000.00
Entire Range is from 674.38 to 17750.92
After 10,000 Trials, the Std. Error of the Mean is 24.50

Statistics:

	Value
Trials	10000
Mean	6594.59 DY
Median	6380.86 DY
Mode	---
Standard Deviation	2450.47 DY
Variance	6004808.59
Skewness	0.55
Kurtosis	3.41
Coeff. of Variability	0.37
Range Minimum	674.38
Range Maximum	17750.92
Range Width	17076.54
Mean Std. Error	24.50



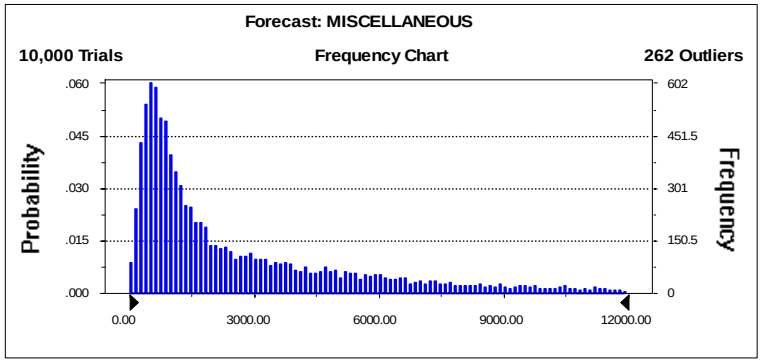
Forecast: MISCELLANEOUS

Summary:

Display Range is from 0.00 to 12000.00
Entire Range is from 20.02 to 29428.43
After 10,000 Trials, the Std. Error of the Mean is 33.39

Statistics:

	Value
Trials	10000
Mean	2930.02 LT
Median	1525.36 LT
Mode	---
Standard Deviation	3338.82 LT
Variance	11147716.05
Skewness	2.17
Kurtosis	9.09
Coeff. of Variability	1.14
Range Minimum	20.02
Range Maximum	29428.43
Range Width	29408.41
Mean Std. Error	33.39

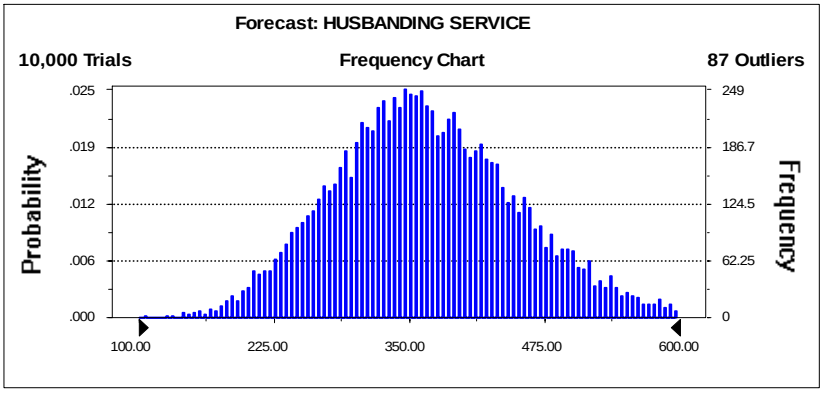


Forecast: HUSBANDING SERVICE

Summary:

Display Range is from 100.00 to 600.00
Entire Range is from 84.67 to 796.26
After 10,000 Trials, the Std. Error of the Mean is 0.87

Statistics:	Value	
Trials	10000	
Mean	367.28	DY
Median	361.80	DY
Mode	---	
Standard Deviation	87.29	DY
Variance	7619.84	
Skewness	0.35	
Kurtosis	3.27	
Coeff. of Variability	0.24	
Range Minimum	84.67	
Range Maximum	796.26	
Range Width	711.59	
Mean Std. Error	0.87	

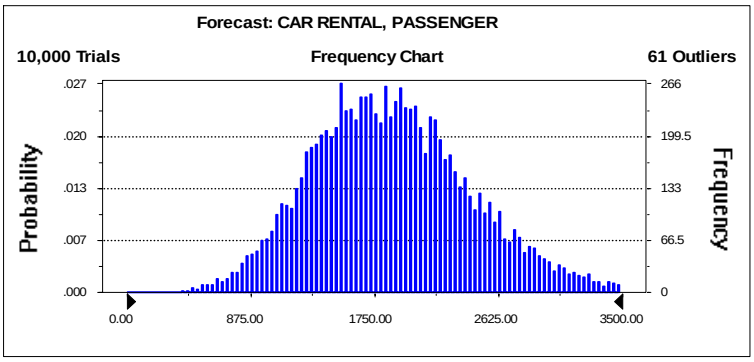


Forecast: CAR RENTAL, PASSENGER

Summary:

Display Range is from 0.00 to 3500.00
Entire Range is from 313.51 to 4661.68
After 10,000 Trials, the Std. Error of the Mean is 5.70

Statistics:	Value
Trials	10000
Mean	1885.61 DY
Median	1848.13 DY
Mode	---
Standard Deviation	570.13 DY
Variance	325049.12
Skewness	0.43
Kurtosis	3.28
Coeff. of Variability	0.30
Range Minimum	313.51
Range Maximum	4661.68
Range Width	4348.17
Mean Std. Error	5.70



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