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Haze gray paint and the U.S. Navy: a procurement process review

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HAZE GRAY PAINT AND THE U.S. NAVY: A PROCUREMENT PROCESS REVIEW

December 2017

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Haze gray paint is a critical element to topside preservation, maintenance, and corrosion control on all ships in the United States Navy (USN). This research focuses on the current procedure for procuring haze gray paint in support of the USN fleet, the transition plan for 1K Polysiloxane during drydock maintenance availability, and the inventory level of 1K Polysiloxane in support of the fleet. The research encompasses both qualitative and quantitative analytical tools utilizing historical demand data for Silicone Alkyd and 2K Polysiloxane paint, average number of ships in a drydock maintenance availability, and DOD acquisition procedure and best practices from industries. Other than during a drydock maintenance overhaul period, touch-up painting is done solely by sailors stationed onboard the ship. Having an adequate inventory of paint on hand to support the fleet provides multiple opportunities for cost savings, minimizes waste, and conserves manpower. The end goal is to suggest improvements to the current procurement and supply chain processes, and recommend a procurement procedure in order to minimize the risk of wasted manpower and material while ensuring the fleet is supported with its hazardous materiel needs.

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HAZE GRAY PAINT AND THE U.S. NAVY: A PROCUREMENT PROCESS REVIEW

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Submitted in partial fulfillment of the requirements for the degree of

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ABSTRACT

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LIST OF ACRONYMS AND ABBREVIATIONS

1K	single component
2K	two-component
CLIN	contract line item
COMNAVSEASYSCOM	commander, Naval Sea Systems Command
DLA	Defense Logistics Agency
DOD	Department of Defense
EOQ	economic order quantity
FAR	Federal Acquisition Regulation
FSC	federal supply class
FSG	federal supply group
FP-EPA	fixed-price contract with economical price adjustment
FFP-EPA	firm-fixed-price contract with economical price adjustment
GAO	U.S. Government Accountability Office
HAZMAT	hazardous materiel
ID/IQ	indefinite delivery, indefinite quantity
LSA	low solar absorbent
MBA	Master of Business Administration
NSN	national stock number
NRL	Naval Research Lab
OFRP	optimized fleet response plan
PCAN	purchase card administrative notice
TS	troop support
TVC	total variable cost
USN	United States Navy

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I. INTRODUCTION

A. BACKGROUND

Haze gray paint is a critical element to topside preservation, maintenance, and corrosion control on all ships in the United States Navy (USN). Naval Supply Systems Command is responsible for hazardous material control and management policy and procedures associated with acquiring, and managing hazardous materiel (HAZMAT) (Department of the Navy [DON], 2014). As of 2014, all Federal Supply Group (FSG) 80 materiel such as paints, sealants, and adhesives is managed by Defense Logistics Agency (DLA) Troop Support (TS). Commander, Naval Sea Systems Command (COMNAVSEASYSCOM) is the technical warrant holder for ship coatings. The existing types of paint authorized for shipboard use under MIL-PRF-24635, and their current prices, are listed in Table 1.

Table 1. Types of Haze Gray Paint

Type	National Stock Number	Unit of Issue	Unit Price
Legacy Type III Silicone Alkyd	8010-01-533-2577	1 gallon can	$66.29
Legacy Type III Silicone Alkyd	8010-01-533-2578	5 gallon can	$229.19
Type V Polysiloxane Haze Gray	8010-01-585-0983	1 gallon can	$148.37
Type VI Polysiloxane Haze Gray	8010-01-587-0844	1 gallon can	$241.63

Low solar absorbent (LSA) paints were developed by the Navy and have been used since the late 1990s to reduce the surface temperature of Navy ships topsides when exposed to direct sunlight (Iezzi, Martin, Slebodnick, Wegand, & Lemieux, 2013). Past data shows that LSA Silicone Alkyd Type II paints reduce topside surface temperatures by up to 5 degrees Fahrenheit and thus decrease the load on the ship's air-conditioning

systems and improve overall ship energy efficiency (Commander, Naval Sea Systems Command [COMNAVSEASYSCOM], 2010). LSA Silicone Alkyd coatings are designed to be a single-component (1K) meaning “all in one can,” and do not begin to cure until applied to the surface and after the solvent evaporates (Iezzi et al., 2013). These coatings present zero obsolescence and are considered user-friendly to sailors and contractors. Over time, Silicone Alkyds Type II coatings fade to a pink shade (Figure 1); however, this does not degrade the LSA performance or corrosion-control performance. According to COMNAVSEASYSCOM and the Naval Research Lab (NRL), Silicone Alkyd paint exhibits premature failure due to coloring fading within two to three years, and shows higher levels of fading, chalking, loss of gloss, and vulnerability to rust-staining (Iezzi et al., 2013).

Figure 1. Pink Shade of Silicone Alkyd Coating. Source: Iezzi et al., (2013).

These conditions led to the development of an improved “second generation” LSA Silicone Alkyd Type III known as LSA Polysiloxane, with the purpose of enhancing color stability, reducing topside maintenance, and increasing durability of the ship’s

exterior. According to Ault, Lockwood, Cloutier, and Kinee (2016), "Polysiloxane coatings have been available to the marine industry since the mid 1990's…and Navy's approval came 20 years later" (Ault et al., 2016, p. 1).

With testing since 2005, Types V and VI LSA Polysiloxane maintain high durability and color stability that is approximately four times longer than Silicone Alkyds coating (Jones, 2017). Type V is a two-component (2K) paint that requires mixing parts A and B before application using a static mixing tip (COMNAVSEASYSCOM, 2010). Once mixed, the two-part paint must be used entirely within 24 hours because the coating will either chemically cure in the can (A. Jones, personal communication, July 13, 2017), or will not cure properly if inadequately mixed before application (Iezzi et al., 2013).

The 2K LSA Polysiloxane is manufactured by three different vendors, Sherwin Williams, PPG, and International-Marine. While each of these coatings meets FED-STD-595C Haze Gray, the shades of gray differ differ with each manufacturer (Figure 2), causing a ship's exterior to be in a patchy quilt pattern when different brands of paint are used (Figure 3).

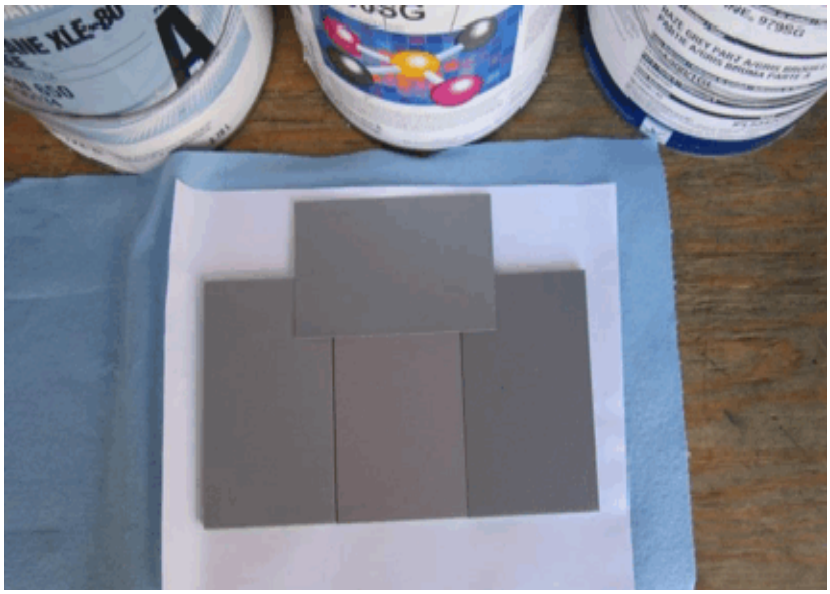

Figure 2. Different Shades of Polysiloxane Haze Gray Paint.
Source: Naval Supply Systems Command (2017).

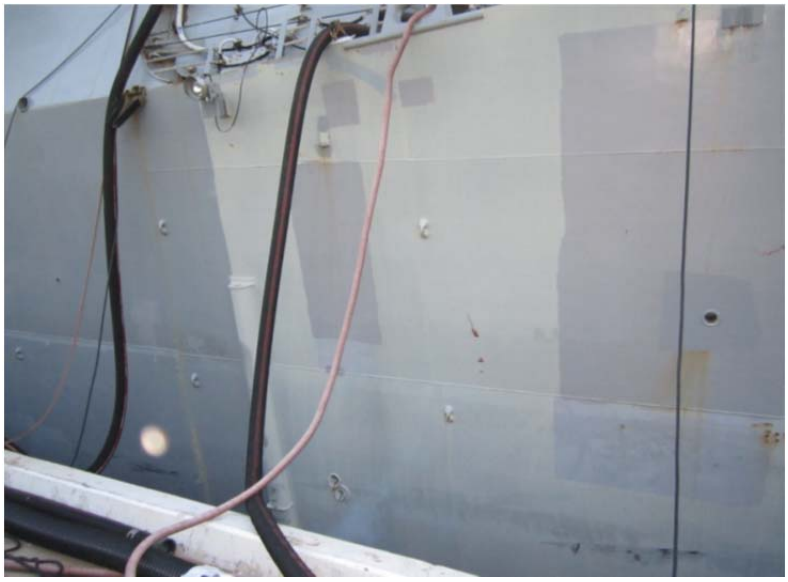

Figure 3. Quilt Pattern of Paint on a Ship. Source: Naval Supply Systems Command (2017).

Approximately 25% of the ships in the Navy's fleet are painted with 2K LSA Polysiloxane while the rest are still painted with LSA Silicone Alkyd (P. LeBlanc, personal communication, October 12, 2017). Based on the current Optimized Fleet Response Plan (OFRP) cycle, each ship should go through a maintenance availability every three years and should drydock every nine years. That means one-ninth of the total number of ships should be in a drydock maintenance and modernization each year. It is only during the drydock availability that the ship's hull is blasted and painted, and touched up and cleaned as required for the next nine years (P. LeBlanc, personal communication, October 12, 2017).

As of August 2017, ships are no longer authorized to use or procure Silicone Alkyd Types II and III paint through the Navy supply system. Requisitions for Silicone Alkyd Types II and III paint are rejected with a recommendation to procure LSA Polysiloxane Type V or VI instead (A. Jones, personal communication, July 13, 2017). In the summer of 2017, the NRL announced the successful development and trial of a new single-component 1K Polysiloxane. NRL reported that in comparing "the exterior color stability using accelerated weather instruments, NRL's 1K Polysiloxane outperformed qualified LSA Silicone Alkyds and 2K LSA Polysiloxane topside coatings" (Iezzi et al.,

2013, p. 90). Furthermore, Chen describes that "1K Polysiloxane received rave reviews from Sailors for being easy to use because no mixing is required prior to application" (Chen, 2017, p. 1). 1K Polysiloxane will come in a five-gallon can and with its own NSN 8010–01-665-5803. Date of availability to the fleet is to be determined.

B. RESEARCH OBJECTIVE

The objectives of this thesis research are to analyze the current procurement procedure for haze gray paint in the USN fleet, compare the business rules used for ship hull paint in parallel industries such as cruise ship lines, and develop an inventory policy as the fleet transitions to 1K Polysiloxane. Additionally, this study demonstrates the difference in Total Variable Cost (TVC) between having a long-term contract in place and non-long term-contract[1] during the transition period. According to Peltz et al. (2015), "long term contracts provides shorter lead times and supports smaller order quantities, and most suppliers prefers long term contracts due to the guaranteed minimum orders and longer contract lengths" (Peltz et al., 2015, p. xvi). Furthermore, Peltz et al. (2015) explains that "long term contracts at DLA is known as outline agreements for items set at 90-day coverage duration for items with high annual demand below $100,000, and items with high annual demand above $100,000 are set at 30-day coverage duration" (Peltz et al., 2015, p. 32).

C. RESEARCH QUESTIONS

The primary research questions in this report are as follows:

1. What is the current procurement process and can there be any improvements to the current procurement process?

2. Can we calculate a transition plan of required haze gray quantity for the next nine years of drydock maintenance availability for 1K Polysiloxane utilizing 1K Silicone Alkyd and 2K Polysiloxane demand history?

[1] In the RAND article that was referenced for this information there is no specific duration for a long term or short term contract (Peltz et al., 2015).

Our secondary research question asks the following:

1. What are the business rules used for ship hull paint in parallel industries such as cruise ship lines, and can the USN apply similar rules?

D. SCOPE

The thesis research project is broken into three different parts: (1) an overview of the current procurement process; (2) a comparison of parallel industry, other Department of Defense (DOD) services, and data analysis; and (3) a discussion of best practices derived from both current and parallel industries and other DOD services.

1. This project seeks to analyze the current processes that the DOD utilizes in order to procure and stock the Polysiloxane type paint.
2. Once the current DOD processes have been detailed, the intention is to analyze how the cruise line industry procures and stocks consumable items to determine whether if any efficiencies can be learned and applied to DOD practices. It is also important to evaluate how the various services manage commodities by looking at strategic sourcing initiatives.
3. In order to provide a recommended strategy going forward, this research will also look at previous demand in order to allow for contracting officers to devise the proper scope of future contracts.

Based on the research and analysis performed, the desired end state is to create a process that can be adapted to other consumable or commodity-type items for future procurement efforts.

E. METHODOLOGY

The research relies on both qualitative and quantitative analytical tools to review the current procurement process and the industry's best practices, with the intention to make a recommendation to the DLA for a planned transition to 1K Polysiloxane during the drydock maintenance availability and inventory level. The qualitative methodology involves contract analysis of applicable haze gray paint National Stock Number (NSN). The quantitative methodology consists of utilizing two years' demand history to develop an inventory policy.

F. ORGANIZATION OF THESIS

The thesis research is presented in four chapters: Chapter I is the introduction with the background and current processes; Chapter II reviews existing literature; Chapter III reports findings from research and analysis; and Chapter IV comprises the conclusion, recommendations, and suggestions for further research.

G. LIMITATIONS OF RESEARCH

During the conduct of this project, an effort was made to obtain information such as average customer wait time, transportation costs, and information regarding criteria for why the contracts were awarded. Without an understanding of the processes that led to the contract award, analysis on the DLA contracts was limited to an overview of the published contracts including amplifying information on the contract types. DLA's inventory policies were derived from a RAND report in 2015. DLA's exact method currently used to determine hazmat order quantities is unknown. Also, the thesis research's foundation relies heavily on the U.S. Government Accountability Office (GAO) and RAND reports for historical data, DLA's processes, and information. Finally, demand history for Silicone Alkyds and 2K LSA Polysiloxane is from Enterprise Resource Planning and Inform 21. However, the data does not specify individual ship requisition. This limited the ability to narrow the demand by specific ship to measure the frequency of paint touch-ups.

H. SUMMARY

It is critical for the USN to have an adequate amount of paint inventory on hand in order to ensure cost saving, minimize waste, and conserve manpower. This chapter provided an overview of the history and challenges surrounding the variations of haze gray paint types through the years that led to the development of 1K Polysiloxane. Moreover, it detailed the research's objective, questions, scope, methodology, and limitations. DLA's business rules and inventory policy method were not available as part of this research, which limited the findings.

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II. LITERATURE REVIEW

A. INTRODUCTION

The purposes of this chapter are to review the current fleet process for obtaining haze gray paint and then to explore a RAND study of how the DLA obtains order quantities. This discussion is followed by an overview of the current contract vehicles and the federal regulations associated with those contract vehicles. The following sections discuss the strategic sourcing initiative's intent and how that concept is used within the DOD. The final section of this chapter discusses how the cruise line industry manages supply chains, to determine whether or not efficiencies can be gained through their model.

B. FLEET'S PROCESS TO OBTAIN HAZE GRAY PAINT

The Federal Acquisition Regulation (FAR) and DOD and NAVSUP policy require all HAZMAT to be obtained using the descending order of priority of required sources of supply (DON, 2014). For the U.S. Navy, the primary source of supply for HAZMAT is through the Naval Supply System, which constitutes "Inventories of the requiring agency" (FARsite, 2017, 8.002). Once a Military Standard Requisitioning and Issue Procedures is released from an activity, such as a ship to an inventory point, the requisition places an order for the respective NSN. The ship also liaises with the Regional Consolidated Hazardous Material Reutilization and Inventory Management Program Centers for support. If there is no inventory available to satisfy the mission requirements, ships are authorized to commercially acquire the HAZMAT products utilizing a Government Commercial Purchase Card with approval from their respective type commander.

C. DLA'S PROCESS TO OBTAIN ORDER QUANTITIES

DLA uses the term *coverage duration* to specify order quantities. Peltz et al. (2015) described coverage duration as "the number of days of demand that the order should be able to cover, and thus represents the expected time between orders" (Peltz et

al., 2015, p. 32). DLA constructs a table of coverage durations based on the Economic Order Quantity (EOQ) logic, rounded to 30-day increments, and on the item's forecasted annual demand (Peltz et al., 2015). Average annual demand value is the forecasted annual demand multiplied by its unit price (Peltz et al., 2015, p. 32). Ultimately, this approximates the EOQ but requires additional rules, and manual overrides to compute the order quantities (Peltz et al., 2015, p. 31). According to Peltz et al. (2015), DLA's holding cost parameter has been set inaccurately to meet a constraint, thus causing a higher inventory holding cost resulting in smaller order quantities and higher number of purchase requests (Peltz et al., 2015, pp. 31–32). Furthermore, the study notes that the estimated ordering cost per non-long-term contract is $441.55, while the estimated ordering cost per long-term contract is $20.82 (Peltz et al., 2015, p. 33). Additionally, the study states that from 2005 to 2013, DLA disposed of an average of more than $1 billion per year of excess inventory that equates to 14% of the annual DLA sales (Peltz et al., 2015, pp. xiii, 4). According to One Touch support, DLA Distribution Tracy, CA, New Cumberland, PA, Yokosuka, Japan, and Sigonella, Italy, currently hold various inventory quantities of haze gray paint as of October 6, 2017 (Table 2).

Table 2. Current On-Hand Quantity for Haze Gray Paint at DLA Distribution Centers. Source: One Touch Customer Service Agent, S. Harris, personal communication (October 6, 2017).

Type	DLA New Cumberland	DLA Tracy	DLA Yokosuka, Japan	DLA Sigonella, Italy
Legacy Type III Silicone Alkyd 8010-01-533-2577	0	107	132	
Legacy Type III Silicone Alkyd 8010-01-533-2578	647	137		
Type V Polysiloxane 8010-01-585-0983	11	47		12
Type VI Polysiloxane 8010-01-587-0844	3	61		

D. CURRENT CONTRACT VEHICLES BEING UTILIZED FOR HAZE GRAY PAINT

At the time of this thesis study, DLA had the two NSNs that were being analyzed under two separate contracts. NSN 8010-01-585-0844 was contained in Contract SPE8EG-16-D-0058, and NSN 8010-01-587-0983 is contained in Contract SPE8E7-15-D-0006. These two contracts are described in detail in the following section.

1. SPE8EG-16-D-0058

DLA Contract SPE8EG-16-D-0058 is a commercial fixed-price contract with economical price adjustment (FP-EPA) for the procurement of 8010-01-585-0844. This contract is an indefinite delivery, indefinite quantity (ID/IQ) contract with a two-year base period with additional one-year options, for a maximum period of performance of five years (Defense Logistics Agency—Troop Support, 2016, pp. 1–3). This contract states that the contractor shall function as the supplier for the 13 NSNs in Federal Supply Class (FSC) 8010 as contained in the solicitation SPE8EG-16-R0017 (Defense Logistics Agency—Troop Support, 2016, p. 3). It utilized full and open competition with restrictions, and it was awarded on September 16, 2016. There were five contractors that competed for this contract; however, the contract was awarded to a single source (Federal Procurement Data System, 2017a).

SPE8EG-16-D-0058 has a maximum value of $11 million and a minimum dollar amount of 10% of the annual estimated dollar figure based on the annual estimated quantity for the 13 NSNs.[2] The estimated value for the two-year base period is $291,252.20. The contract states that all customer direct delivery orders exceeding $35,000 will utilize fast pay procedures and that all DLA direct delivery orders will utilize prompt pay procedures (Defense Logistics Agency—Troop Support, 2016).

This contract articulates very specific delivery procedures and Contract Line Item (CLIN) structure. The contractor is to deliver the required amount no later than 30 days

[2] Having an effective demand forecasting tool is essential for this type of contract.

after issuance of the delivery order[3] (Defense Logistics Agency—Troop Support, 2016, p. 3). There shall be no deliveries prior to the issuance of a delivery order (Defense Logistics Agency—Troop Support, 2016). Each NSN that is covered by this contract has its own respective CLIN number. Payment of the delivery orders will be made under the applicable CLIN for the NSN that was procured. This contract does not outline whether or not the contractor or the government pays the transportation costs.

As discussed, this contract allows the contractor to account for economic price adjustments.[4] DLA mandates that the contractor utilize the Producer Price Indexes, which are published by the Department of Labor, Bureau of Labor Statistics for the following code: WPU062 Chemicals and Allied Products (Defense Logistics Agency—Troop Support, 2016). DLA states that there is one price adjustment opportunity per year.

2. SPE8E7-15-D-0006

DLA Contract SPE8E7-15-D-0006 is a commercial fixed price contract with economic price adjustment (FFP-EPA). SPE8E7-15-D-0006 serves as the vehicle for the procurement of 8010-01-587-0983. Much like the contract above, this contract is an ID/IQ and has a base year with several one-year options for a maximum of a five-year period of performance (Defense Logistics Agency—Troop Support, 2015). This contract covers only one NSN. It utilized simplified acquisition procedures and had two competitors (Federal Procurement Data System, 2017b). The contract was awarded by DLA Troop Support on March 11, 2015.

SPE8E7-15-D0006 has a maximum value of $1,200,000.00. The contract minimum dollar value is ten percent of the annual estimated dollar value based on the estimated quantity required for the applicable NSN (Defense Logistics Agency—Troop Support, 2015, p. 3).

This contract has identified delivery timelines and an established CLIN structure. The contractor is required to deliver the requested material no later than 30 days after

[3] Delivery and task orders are discussed in a subsequent section.

[4] Economic Price Adjustments will be discussed in more detail in a subsequent section.

receipt of the delivery order. There are two CLINs on this contract, 0001 and 0002. CLIN 0001 is for Customer Direct Deliveries and CLIN 0002 are for DLA direct deliveries (Defense Logistics Agency—Troop Support, 2015, p. 3). Customer direct deliveries are to fulfill a customer direct requirement, whereas DLA direct deliveries are to fill stock requirements or sent to one of DLA's distribution centers according to a DLA customer service representative (personal communication May 31, 2017). Like the previous contract, there is no information on whether or not DLA or the contractor pays for the transportation of materials.

Since this contract deals with one specific NSN there is a significant amount of background information on the applicable NSN. This contract requires the contractor to procure a specific part number PSX700SG, from a specific cage code 07FX1 (Defense Logistics Agency—Troop Support, 2015). For this NSN, the unit of issue is Kit and references the Military specification of: MIL-PRF-24635E "Coating Systems, Weather-Resistant, Exterior Use" (Defense Logistics Agency—Troop Support, 2015, p. 4). The contract also articulates very specific packaging and labeling requirements. The material should be packed in accordance with the suppliers' normal commercial practices. Inspection and acceptance are at forward operating base (Defense Logistics Agency—Troop Support, 2015, p. 7).

3. COMMERCIAL FP-EPA ID/IQ INFORMATION

The two contracts listed above utilized the FP-EPA contract type. Details on a FP-EPA is covered in FAR (Federal Acquisition Regulations) Part 16.203. The FAR states that a FP-EPA contract "provides for upward and downward revision of the stated contract price upon the occurrence of specific contingencies" (FARsite, 2017, p. 16.203-1). The three general types are:

1. "Adjustments based on established prices
2. Adjustments based on actual costs of labor and material
3. Adjustments based on cost indexes of labor materials" (FARsite, 2017, p. 16.203-1).

As described above and in the two contracts, the contracting officers utilized the adjustments based on cost indexes of labor or material for both SPE8EG-16-D-0058 and SPE8E7-15-D-0006.

a. Fixed Price-Economic Price Adjustment

There are two situations that constitute the utilization of an FP-EPA-type contract that is detailed in FARsite, 2017, p. 16.203-2.

1) "There is serious doubt concerning the stability of market or labor conditions that will exist during an extended period of contract performance

2) Contingencies that would otherwise be included in the contract price can be identified and covered separately in the contract. Price adjustments based on established prices should normally be restricted to industry-wide contingencies." (FARsite, 2017, p. 16.203-2)

In this case, the chemicals that are required to make Polysiloxane type paint are subject to various market fluctuations that cause the price to decrease or increase. The FAR also states that contracting officers shall establish a base price or base index from where the adjustments will either shift upward or downward (FARsite, 2017, p. 16.203-2). SPE8EG-16-D-0058 provides a sample on how the administrative contracting officer will perform the adjustment for price indexing; however, it does not specify any base price due to the contract containing 13 different contracts. SPE8E7-15-D-0006 states that the base price is $114.00. Adjustments would shift upward and downward from that number.

b. Indefinite Delivery/Indefinite Quantity (ID/IQ)

There are three major types of Indefinite Delivery contracts: definite quantity, requirements, and indefinite quantity (FARsite, 2017, p. 16.501-2). The contracting officers utilized the ID/IQ type of contracts for both contracts being analyzed here. ID/IQ contracts can be utilized for both supplies and services. A services-type ID/IQ utilizes task orders, while a supplies-type ID/IQ utilizes delivery orders (FARsite, 2017, p. 16.501-1).

ID/IQ contracts are used when the government does not know the exact times and quantities of the required product or service prior to the contract award (FARsite, 2017, p. 16.501-2). In other words, an ID/IQ allows the government to procure goods and services to meet actual demand requirements, instead of procuring forecasted demand estimates.

Procuring forecasted demand estimates has both upsides and downsides. An upside to procuring a product based on forecasted estimates is that the lead-time to satisfy a customer's requirement is potentially shorter if the product is already in government stock. The downside, especially with HAZMAT, which often has shelf-life expiration dates, is that there is a high chance of waste. ID/IQs also have downsides: these contracts are reactive in nature, and could have longer lead times to fulfill requirements. Another downside is that if there is no actual demand, the government still has to pay the contractor the minimum price stated in the contract (FARsite, 2017, p. 16.504). The minimum price "'must be more than a nominal amount' but recent recommendations by the Government Accountability Office suggest that $500 can be used as the guaranteed minimum, regardless of the maximum ordering limitations or total contract value, in the absence of reliable historical data suggesting otherwise" (Manuel, 2010, p. 14).

ID/IQ contracts do require some demand forecasting prior to the government issuing a request for proposals. An ID/IQ contract shall contain a minimum and maximum amount of supplies to be procured by the Government during contract performance (FARsite, 2017, p. 16.504). The contract shall also spell out a minimum and maximum quantity to be satisfied per delivery order (FARsite, 2017, p. 16.504). The FAR states that there are seven items that must be included in an ID/IQ solicitation; and these are included in Appendix C.

ID/IQ contracts can be awarded to a single source or multiple sources. Single award contracts have one contractor who fulfills the task or delivery orders, and multiple award contracts have several contractors that compete for each delivery or task order (Manuel, 2010, p. 13). According to Manuel (2010), "FASA has established a 'preference' for multiple-award contracts" (p. 13). SPE8EG-16-D-0058 and SPE8E7-15-D-0006 opted to utilize the single source option. As discussed in the limitations, the

justification for utilizing the single source option was not available. The following section discusses the various contracting phases, standard contracting format, and the various FAR regulations associated with two contracts that were analyzed.

c. Contract Phases and Standard Contract Format

There are typically four phases of any government acquisition. These four phases are applied to all the types of government acquisitions. The process, according to Garret (2010), includes the following:

1. Pre-Award Phase
    a. Procurement Planning
    b. Solicitation Planning
    c. Solicitation
2. Award Phase
    a. Source Selection
3. Post-Award Phase
    a. Contract Administration
    b. Contract Closeout. (p. 20)

The solicitations and subsequent proposals are divided up into a set format detailed in FAR 15. 204–1. This format includes four main parts with subpart (FARsite, 2017, p. 15.205-1).

Part 1—The Schedule

a. Solicitation/contract form
b. Supplies or services and prices/costs
c. Description/specifications/statement of work
d. Packaging and marking
e. Inspection and acceptance
f. Deliveries or past performance
g. Contract Administration Data
h. Special contract Requirements

Part 2—Contract Clauses

i. Contract clauses

Part 3—List of Documents, Exhibits and Other Attachments

j. List of Attachments

Part 4—Representations, and instructions

k. Representations, certifications, and other statements of offerors or respondents

l. Instructions, conditions, and notices to offerors

m. Evaluation factors for award. (FARsite, 2017, p. 15.205-1)

A description for the rest of the standard contract format for negotiations elements is provided in Appendix C.

d. Negotiated Acquisitions (FAR Part 15)

There are two types of negotiated acquisitions: sole source acquisitions and competitive acquisitions (FARsite, 2017, pp. 15.002 (a)-(b)). As previously discussed, the contracts that were utilized to procure the Polysiloxane paint, were competitive acquisitions. When dealing with a competitive negotiated contract, the government follows the aforementioned set process in order to award a contract. A negotiated type contract allows the contracting officer and the offeror the ability to come to an agreement on a fair and reasonable price (FARsite, 2017, p. 15.405). It is important to note that the fair and reasonable price is for both the government and the contractor (FARsite, 2017, p. 15.405 (b)).

Section M of the standard contract format states “the factors and sub-factors that will be considered in awarding the contract in relative importance” (FARsite, 2017, p. 15.204-5(c)). The solicitation should also state whether or not a tradeoff was made, if price was not the most important factor (FARsite, 2017, p. 15.304 (e)).

e. FAR Part 12 (Commercial Acquisitions)

A *commercial item* is define in the FAR as “any item, other than real property, that is of a type customarily used by the general public or by non-governmental entities for purposes other than governmental purposes and has been sold, leased or licensed to

the general public or has been offered for sale, lease or license to the general public" or "through advances in technology or performance and is not yet available in the commercial marketplace, but will be available in the commercial marketplace" (FARsite, 2017, p. 2.101).

1. Commercial Item Determination

To utilize FAR Part 12, a contracting officer must determine whether the product is commercial. A report generated by the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics (OUSD[AT&L]) has outlined a three-part test for commerciality determination (Figure 4).

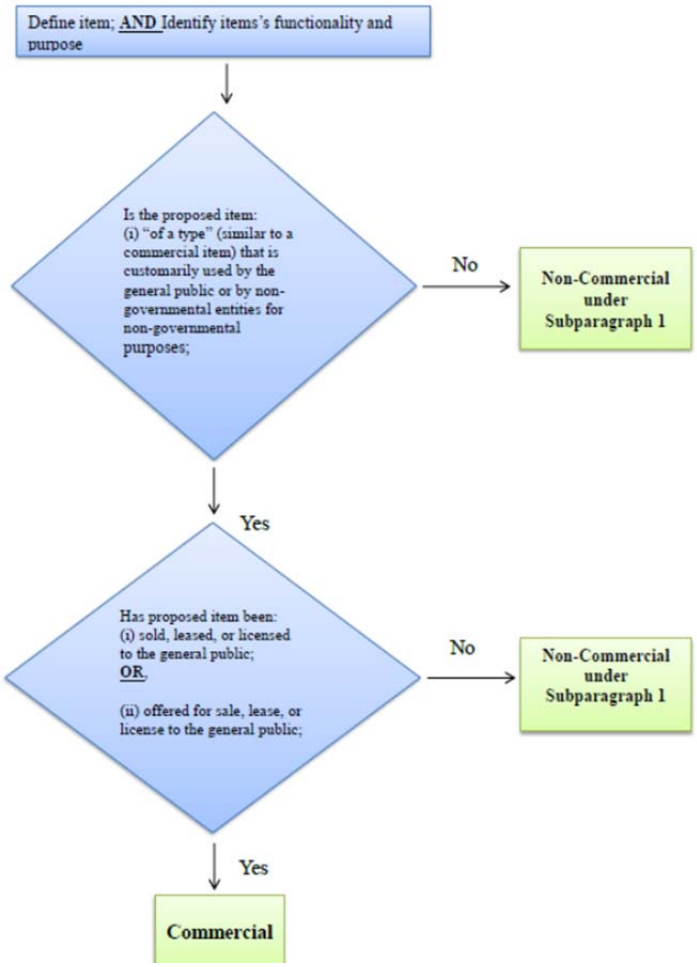


Figure 4. Commercial Item Determination. Source: OUSD(AT&L) (2017).

The FAR states that contracting officers shall use firm-fixed-price contracts or firm-fixed-price contracts with economic price adjustment to procure commercial items (FARsite, 2017, p. 12.207(a)). FAR Part 12.207(b) describes when alternative contract types can be utilized, but are not applicable to the contracts being evaluated in this project. FAR Part 12 also allows for the use of indefinite delivery contracts when "the prices are established based on a firm-fixed-price or fixed-price with economic price adjustment … basis" (FARsite, 2017, p. 12.207(c)).

Contracting officers are not absolved from determining fair and reasonable price for the acquisition of a commercial item. However, contracting officers must take into account delivery timelines, warranties, liability of the seller, order quantities, period of performance and specific performance criteria (FARsite, 2017, p. 12.209).

Acquiring technical data for commercial items is something for the contracting officer to consider. In most commercial item acquisitions, the government is privy only to the technical data that is customarily provided to the general public (FARsite, 2017, p. 12.211). Based on past experience, contractors are hesitant to provide their various trade secrets, or more detailed technical data, than what they normally provide to their non-governmental customers.

f. FAR Part 13 (Simple Acquisition Procedures)

SPE8E7-15-D-0006 was competed under FAR Part 13 Simple Acquisition Procedures (SAP). Agencies are required to utilize SAP to the maximum extent practicable in order to: "reduce administrative costs, improve opportunities for small, small disadvantaged, women-owned, veteran-owned, HUBZone, and service-disabled veteran owned small business concerns to obtain a fair proportion of Government contracts, promote efficiency and economy in contracting and avoid unnecessary burdens for agencies and contractors" (FARsite, 2017, p. 13.002).

The applicable SAP threshold for SPE8E7-15-D-0006 is $7 million (FARsite, 2017, p. 13.500). The total contracted amount including options was $1,100,000. The

contract does not state the base contract award amount or the follow-on award amounts, but the assumption is that the base amount and the option amounts do not exceed the $7 million threshold.

The three manufacturers of Polysiloxane paint are: Sherwin Williams, PPG, and International Marine. The next paragraphs provide background information on the three manufacturers.

1. Sherwin Williams

The Sherwin-Williams Company has been in business for 150 years and currently operates with locations in North America, South America, Europe, and Asia. There are a total of 4,180 locations in North America and the Caribbean, 383 in South America, 35 in Europe and eight in Asia, totaling 4,606 locations. The Paint Stores group in particular manages the protective and marine produces within which the Polysiloxane falls. Sherwin-Williams employs over 40,000 people worldwide (Sherwin Williams, 2016).

2. PPG

The PPG Company has been in business for 138 years and currently operates in North America, South America, Europe, the Middle East, Africa and Asia. There are a total of 45 sites in the United States; 14 sites in South America; 64 sites in Europe, the Middle East and Africa; and 33 sites in Asia. PPG employs approximately 47,000 people worldwide (PPG Industries, 2017).

3. International-Marine

International-Marine is a part of the International Corporation whom is a member of the AkzoNobel conglomerate. It has been in business for 136 years and operates in North America, South America, Europe, the Middle East, Africa, Asia, and Australia. International-Marine employs approximately 55,000 people worldwide in more than 80 countries. (International-Marine, 2017)

The previous sections discussed how the fleet submits paint requirements, as well as the contracts that DLA utilizes to meet customer demand, with amplifying information on the contracts themselves. There was also discussion on the different manufacturers of the paint, and discussing their global posture. The following section discusses the strategic sourcing initiative, as well as provides information about how the cruise line industry performs supply chain functions, including its rationale on how to procure paint products.

E. STRATEGIC SOURCING

1. Category Management and Strategic Sourcing

The concept of strategic sourcing within the government is not a new concept. The mandate for the government to adopt strategic sourcing practices was articulated in the 2005 OMB Memorandum, titled *Implementing Strategic Sourcing* (Johnson, 2005). As a result of this memorandum, the Federal Strategic Sourcing Initiative (FSSI) was created to oversee the government-wide implementation of this concept (Chaplain et al., 2012, p. 13). The FSSI mission is to "encourage agencies to aggregate requirements, streamline processes and coordinate purchases of like products and services to leverage spending to the maximum extent possible" (Chaplain et al., 2012, p. 13).

According to Defense Procurement and Acquisition Policy (DPAP; 2017), strategic sourcing falls within the Category Management concept. The Category Management concept (Figure 5) focuses efforts on "eliminating redundancies, increasing efficiency and delivering more value and savings from the governments acquisition programs" (DPAP, 2017).

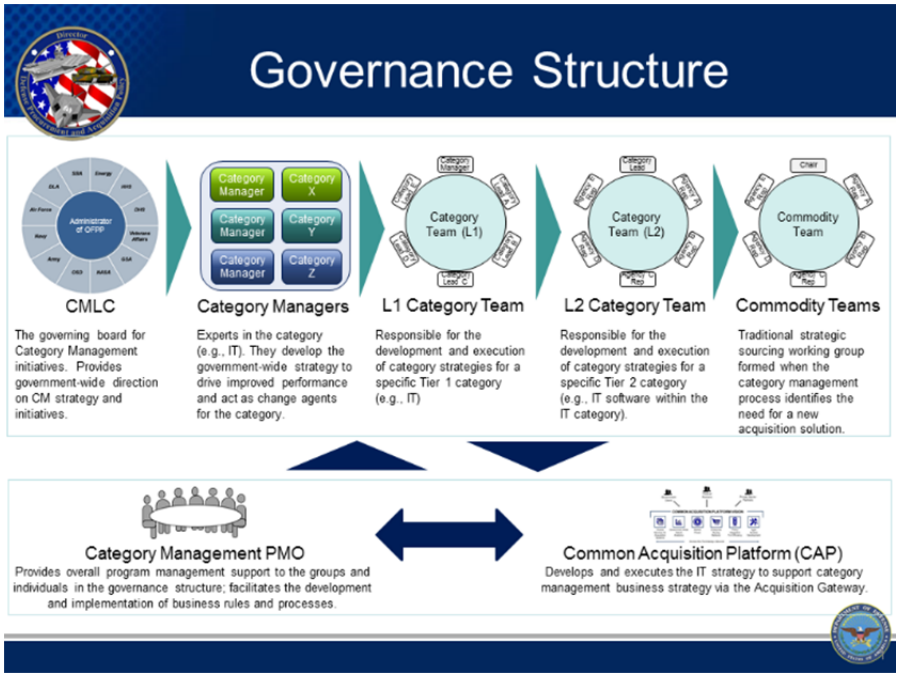


Figure 5. Governance Structure. Source: DPAP (2017).

Strategic sourcing is a key concept under Category Management (DPAP, 2017). DPAP defines strategic sourcing as "the *collaborative and structured* process of critically analyzing an organization's spending and using this information to make business decisions" (DPAP, 2017). The intent of strategic sourcing is to maximize the value of each dollar that the government spends, by analyzing these four criteria (DPAP, 2017):

- Identifying core areas of expenditure
- Collectively developing heightened levels of expertise
- Leveraging shared best practices
- Providing acquisition, supply and demand management solutions

The concept of strategic sourcing requires government acquisition entities to breakout of the typical governmental hierarchical bureaucratic processes and cross communicate in order to successfully implement. Chaplain finds that the various governmental agencies have a very decentralized acquisitions structure; therefore, adopting strategic purchasing concepts and techniques is difficult to achieve (Chaplain et

al., 2012). However, companies that adopted the Strategic Sourcing concept saved approximately 10–20 percent. The report then states that if the various agencies were to fully implement this concept it would amount to $50 billion in savings (Chaplain et al., 2012, p. 3).

Prior to entering into Phase One of the strategic sourcing process, the agencies need to evaluate and identify the products that are to be considered for strategic purchasing by doing spend analysis (Chaplain et al., 2012, p. 11). Spend analysis consists of determining the answer to the following questions: "How much is being spent for which products and services? Who is buying the products or services? Who are the sellers, and Where are the opportunities to leverage strategic sourcing?" (Chaplain et al., 2012, p. 11). This spend analysis must be a continuous process, not just prior to a contract award (Chaplain et al., 2012, p. 11).

2. Strategic Sourcing: A Continuous Process

As discussed previously, strategic sourcing is a continuous process. Like most business strategies, a sourcing strategy is typically broken up into tasks and subtasks (Rendon, 2005). Once the tasks and subtasks have been assigned, target savings metrics are applied and tracked by a variety of different analytical tools to ensure that the strategy adapts and continues to provide value to the respective organization (Rendon, 2005, p. 11).

3. DOD Strategic Sourcing

According to the GAO report, the DOD only realized 0.06% savings from strategic sourcing initiatives, which was the lowest savings of the four agencies that were studied (Chaplain et al., 2012, p. 15). The report stated that there were several issues within the DOD when it came to strategic sourcing:

1) No clear goals or metrics

2) Lack of visibility on strategic sourcing initiatives

3) No formal process for reporting these initiatives (Chaplain et al., 2012, pp. 16–17).

DLA was heralded as utilizing strategic sourcing the most out of all of the DOD agencies, having reported 46% of acquisitions were strategically sourced (Chaplain et al., 2012, p. 17). According to the GAO report it is important to note that DLA had implemented strategic sourcing for most of their products; however, there was no initiative or planned initiative for the strategic sourcing of fuels, and petroleum based products (HAZMAT; Chaplain et al., 2012, p. 22). As discussed previously, DLA is still relatively new to the HAZMAT procurement function; therefore, new initiatives are not contained in this GAO report.

a. DOD Best Practices

In order to implement strategic sourcing, Rendon (2005) has recommended that the DOD adopt some best practices from industry. The best practices that are recommended are to consolidate commodity procuring processes, increase training to the cross-functional teams, increase and sustained leadership support and involvement, and standardize requirements (Rendon, 2005, p. 17).

Each service—Army, Navy, Air Force, and Marine Corps—has its own purchasing processes (Bowman, Reed, Hudgens, & Searle, 2006; Chaplain et al., 2012; Rendon, 2005). Therefore, the DOD as a whole is not necessarily leveraging as much savings as it could if there was one single DOD process versus delegating down to the services (Rendon, 2005, p. 17). Even at the service level, there are no set processes or data tracking systems (Rendon, 2005, p. 17). Therefore, even if the DOD wanted to share lessons learned or leverage buying power via a cross-service arrangement, analyzing the spend data would be very difficult due to the use of the different systems (Chaplain et al., 2012, p. 21).

Leadership within the DOD must support strategic sourcing initiatives. (Chaplain et al. (2012) and Rendon (2005) both imply that support, although stated, is not necessarily demonstrated. In order for leadership to demonstrate their commitment, they need to grant decision-making authority to the councils, as well as providing overarching metrics and resources, human and non-human (Rendon, 2005, p. 17).

The last best practice, "standardizing requirements," is the most salient recommendation to this research. Rendon (2005) stated, "Commodity strategies involve consolidating all of an organization's requirements for a specific supply or service into one or a few standardized configuration requirements" (p. 17). Standardizing the requirements truly helps to prevent overstocking and waste. The downside is that it limits the customer's flexibility and options (Rendon, 2005, p. 17).

1. Commodity Councils

The Commodity Council concept was originally developed by private industry to make strategic sourcing decisions on the products or items within their respective commodity groups (Bowman et al., 2006, p. 31). The council is a "cross-functional" team of experts in their respective areas that analyzes spend data and agency requirements, and performs market research in order to maximize value at the lowest costs (Bowman et al., 2006, p. 31). According to Rendon (2005), a commodity council should utilize the following when developing a commodity strategy and he referenced Lasseter's balanced sourcing model as follows:

1) Spend Analysis

2) Industry Analysis

3) Cost/Performance Analysis

4) Supplier Role Analysis

5) Business Process Reintegration

6) Savings Quantification and

7) Implementation. (Rendon, 2005, pp. 9–10)

The DOD needs to ensure that the commodity council members are competent. Rendon (2005) stated that the DOD needs to ensure "these team members are educated and multi-skilled in all aspects of the commodity such as requirements analysis, cost analysis, purchasing and supply chain management and negotiations" (p. 17). If the council members are not skilled in all aspects of their respective commodity groups, then

the overall strategy will at best be flawed or ineffective. These strategies should not be made in a vacuum. The council should request involvement early and often from its customers (Rendon, 2005, p. 17).

The Air Force established a website for the roles and responsibilities of Commodity Councils and how they fit into their strategic purchasing initiatives. The following section looks at how the cruise line industry performs supply chain functions to include their rationale on contract sourcing.

F. CRUISE LINE INDUSTRY

The purpose of this section is to discuss how the cruise line industry operates and how it performs supply chain management, including vendor sourcing. The intent is to determine whether any efficiencies can be gained by viewing a similar maritime industry.

Operating in a maritime environment with large ships exposes supply chain managers to unique challenges due to the transient nature of the assets coupled with the harsh maritime environment. Having the ability to have the right supplies available at the right time at the right place is essential. The cruise line industry is an interesting model to evaluate due to the maritime nature of its operations and the fact that it is a private business. It should be no surprise that their mission is inherently different from that of USN ships; however, the basic concept of replenishing and maintaining its maritime assets with a limited window offers valuable insight. It is also important to understand that due to the nature of the business, maximizing profit is at the forefront of its business model. Therefore, analyzing their operational structure and their performance of supply chain functions can provide useful insight.

1. Cruise Ship Operations

a. Cruise Line Organization and Operations

A typical cruise ship has two major departments—the hotel and guest services—which comprise a transient group of people from various nationalities, and the Marine department, which runs the engine room and navigational operations (Veronneau, 2012). Much like the Navy, every cruise ship is commanded by the captain, who is accountable

for all the operational aspects of the ship including the hotel and deck departments (Veronneau, 2012, p. 244). The deck department, comprised of the marine personnel, is also directly responsible for the preventive maintenance ensuring the "longevity of the operating system" (Veronneau, 2012, p. 243).

The Marine department personnel, when on voyage, work seven days a week on 12-hour shifts (Veronneau, 2012, p. 243). These hours are similar to a typical USN workweek during a deployment or underway operations. Marine personnel accrue time off based on time onboard, and it can vary from company to company. However, most offer a 1:1 ratio of time onboard to time off (Veronneau, 2012, p. 243). The cruise lines' personnel rotation and time off policy is very different from normal Navy policies. A typical voyage can last anywhere from one to two weeks in various locations based on the season (Veronneau & Roy, 2012). Due to the variable nature of voyage routes and port visits, the necessity of a flexible supply chain is paramount for the cruise industry (Veronneau & Roy, 2012).

2. Cruise Line Logistics

a. Tiered Approach to Logistics Planning

Cruise Lines supply chain planning consists of three different levels. Figure 6 provides a flow chart of a cruise lines supply chain planning levels. The strategic level is the top level, which determines target markets to operate and where to source materials in those markets, and is typically produced years out from any given voyage (Veronneau & Roy, 2012, p. 93). The tactical level determines the ships loading schedule, manages the various transportation and materiel contracts, manages the ship's bill of materials, and focuses on eight to 16 months in advance (Veronneau & Roy, 2012, p. 93). The operational level utilizes the various contractual vehicles provided by the tactical planners to order materiel and food based on their inventory levels, which can change by the hour (Veronneau & Roy, 2012, p. 93).

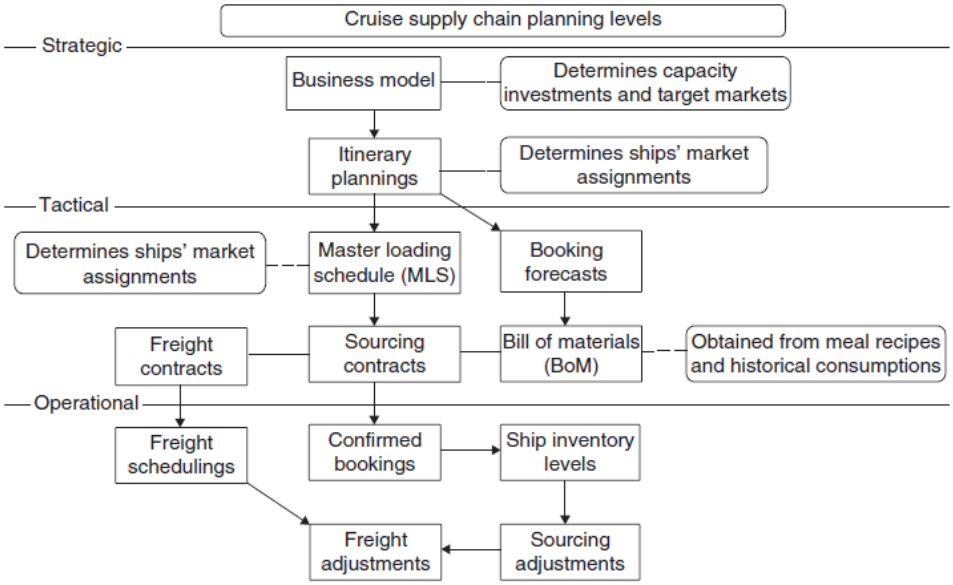


Figure 6. Cruise Supply Chain Planning Levels.
Source: Veronneau & Roy (2012a, p. 92).

b. Centralized Oversight

As discussed previously, the selection of vendors to provide products and services is a task of the tactical planners. Therefore, as discussed in Veronneau and Roy (2012), having real-time visibility of assets and their inventory levels is key to ensuring the success of the operation. The recommendation for cruise lines to establish a centralized "operations center" to monitor the requirements flow in the supply chain operation 24 hours a day, 365 days a year (Veronneau & Roy, 2012, p. 97). Due to the small time windows the ships have to resupply, the rapid exchange of information is critical to the growing industry success (Veronneau & Roy, 2012, p. 97).

c. Supplier Sourcing

For the cruise line industry, the selection of competent flexible suppliers is an important function. Suppliers have to be able and willing not only to provide scheduled support, but also to flex and meet spikes in demand (Veronneau & Roy, 2012, p. 98). Over time the cruise line company and the supplier build up "relational capital" and mutual understanding, thus allowing more efficiencies gained over time as the working

relationship matures (Veronneau & Roy, 2012, p. 98). However, there should be consideration to maximize competition through a bidding process, to prevent a monopoly scenario, which could create complacency and lead to inefficient performance of a supplier (Veronneau & Roy, 2012, p. 98).

Veronneau was asked specifically about how cruise lines manage paint during a meeting in August of 2017. Through his experience, having worked in the marine department aboard a cruise ship, the ship's presentation is an important aspect of the industry. Bonuses are awarded based on customer surveys, and one of the survey questions addresses ship presentation. Veronneau stated that from his experience, companies utilized only one manufacturer to provide the paint for the hull of the ship. He stated that, according to what he experienced, no matter how stringent the color specification, each manufacturer's product will differ slightly. Typically, companies do not change paint manufacturers often, due to ship presentation having financial impacts (S. Veronneau personal communication, August 17, 2017).

Section F discussed how the cruise line industry manages supply chain and sourcing functions in an effort to realize cost savings. In addition to discussing cruise line cost saving best practices, the EOQ Principle is another way for the government to realize cost savings. The following section discusses how the EOQ Principle can provide potential cost savings to the government when applied correctly.

G. ECONOMIC ORDER QUANTITY PRINCIPLE

The Federal Property Management Regulations subpart 101–27.102-1 states that:

> all executive agencies, except the Department of Defense, within the United States, excluding Alaska and Hawaii, shall replenish inventories of stock items having recurring demands, except items held at points of final use, in accordance with the EOQ principle. (Federal Property Management Regulations, 1964)

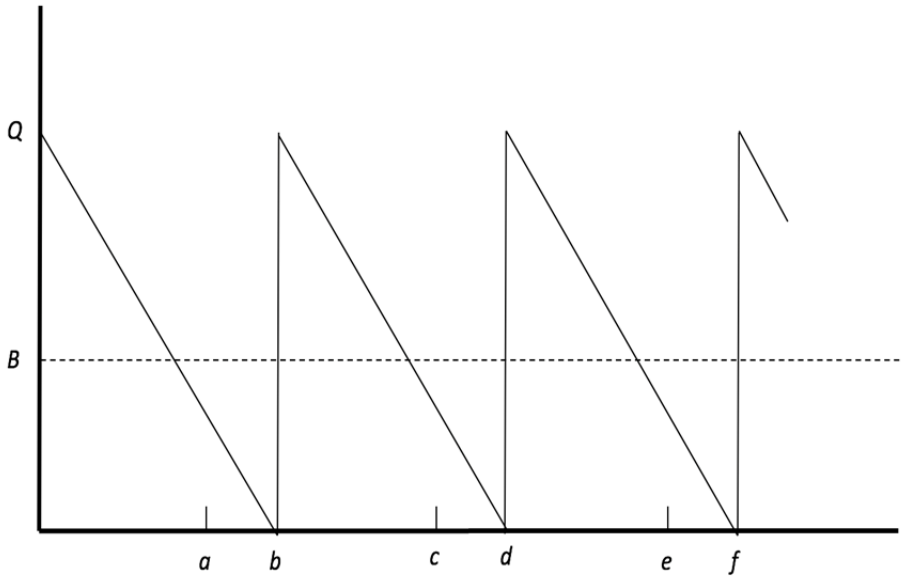
The concept of EOQ began with Harris in 1913 and is a mathematical formula to calculate optimal lot size for batch manufacturing or the optimal ordering quantity (Harris, 1913). In Choi's (2014) book summarizes Harris (1913) description of the EOQ model as "a very simple deterministic inventory planning model with a tradeoff between

fixed ordering cost and inventory carrying cost" (Choi, 2014, p.v). GAO (1993) explains that:

> ordering cost includes the costs of determining replenishment needs, processing purchases, and receiving orders. Holding cost consists of investment costs meaning those funds tied up in inventory which represents the value of money over time; storage cost, which includes the amortized cost of warehouses; obsolescence cost which represents the effect of all factors that render an item superfluous to need; and inventory losses, which include pilferage, theft, and inventory adjustment. (p. 12)

The classical inventory model shows that Q is the order size (Figure 7). Tersine (1994) stated that "upon receipt of an order, the inventory level is Q units; units are drawn from inventory at a constant demand rate, which is represented by the negative sloping lines" (p. 92). Additionally, "at reorder point B, an order is placed for Q units and after a fixed time period, the order is received and placed into inventory which is indicated by the vertical line and each time an order is received just as inventory reaches zero, thus the average inventory is expressed as Q/2" (Tersine, 1994, p. 92).

EOQ's objective is to find the ordering lot size that balances holding and ordering cost in order to minimize the total cost (Ferrer, 2016). If a large lot size is ordered, this increases holding cost and vice versa for a smaller lot size (Ferrer, 2016). Consequently, "as lot size increases, the ordering cost reduces and the holding cost increases" (Figure 8; Ferrer, 2016, p. 79).



Q = lot size; *Q*/2 = average inventory; *B* = reorder point; *ac* = *ce* = interval between orders; *ab* = *cd* = *ef* = lead time.

Figure 7. Classical Inventory Model. Source: Tersine (1994, p. 93).

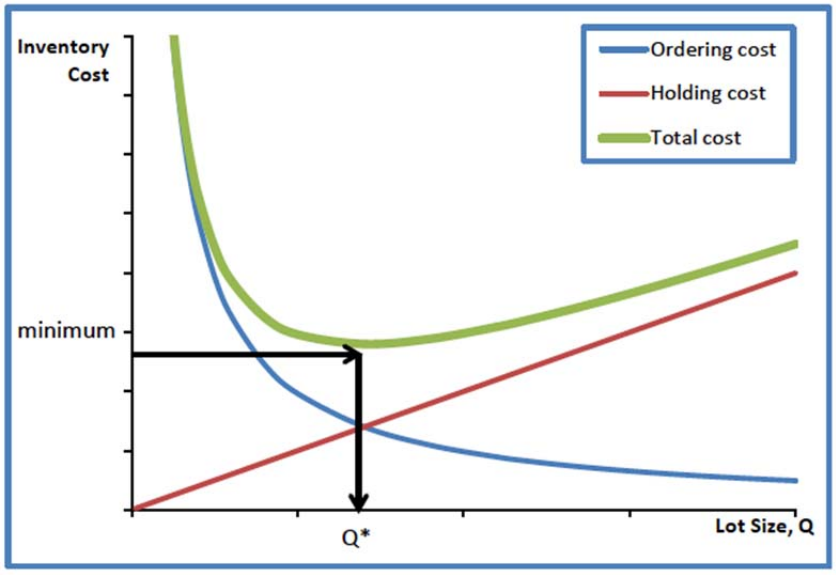


Figure 8. Cost Components of EOQ Source: Ferrer (2016, p. 79).

Ferrer (2016) stated that “EOQ trades-off two expenses: holding cost and ordering cost” and describes how to determine of EOQ’s optimal lot size under the following conditions (p. 77):

- Demand (d) is constant and (D) is the annual demand
- Unit price (P) is constant
- Annual holding cost rate (F)
- Holding cost (h) is the annual holding cost rate multiplied by the unit price (P×F)
- Ordering cost (K) is fixed, regardless of the order size
- Lead-time (L) is constant
- Q* is the optimal order quantity, which minimizes total cost given the above parameters, rounded to an integer if necessary

A reasonable assumption is that the unit cost is fixed under a long-term and fixed-price contract, and lead-time is consistent with an established and reliable company that is capable of delivery in a timely manner (Choi, 2014). Under this model, “stock-out costs are not relevant because demand is satisfied when occurs” (Choi, 2014, p. 6). Therefore, the EOQ equation is user-friendly tool to calculate and put in practice (Equation 2.1; (Ferrer, 2016).

$$Q^* = \sqrt{\frac{2DK}{h}} \text{ or } \sqrt{\frac{2DK}{PF}} \tag{2.1}$$

Order cost and holding cost can be simplified into easy to compute equations (Equations 2.2; Ferrer, 2017, p. 78). Additionally, the total inventory cost per year is expressed as total annual cost = purchase cost + order cost + holding cost and total variable cost = order cost + holding cost is shown in (Equation 2.3; Ferrer, 2017, p. 79).

$$Ordering\text{Cost} = \frac{DK}{Q}$$

$$Holding\text{Cost} = \frac{Q}{2}h \tag{2.2}$$

$$TVC(Q) = \frac{DK}{Q} + \frac{PFQ}{2} \tag{2.3}$$

Safety Stock (SS) is the on-hand inventory required to alleviate stock-outs. With a certain service level, safety stock can be determined as a multiple of the standard deviation of demand during that period (Ferrer, 2016, p. 95). Reorder Point (ROP) is the level of inventory that signals a re-order when stock level drops to a certain level. SS and ROP equations are displayed in Equations (2.4).

$$SS = z\sigma_{\exp}$$

$$ROP = DL + SS \tag{2.4}$$

H. SUMMARY

This chapter provided information regarding how the fleet currently orders the Polysiloxane paint and the two different contractual vehicles that DLA utilizes to meet customer demand, with amplifying information from the FAR on those vehicles. The concept of strategic sourcing was discussed along with the cruise line industry's supply chain and sourcing processes. Lastly this chapter reviewed the EOQ principle. The following chapter serves to analyze the demand data obtained by utilizing the EOQ principle to determine whether cost savings can be realized. The current contracts are viewed through the lens of best practices obtained from strategic sourcing and cruise line supply chain and sourcing processes.

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III. DATA, ASSUMPTIONS, ANALYSIS AND RECOMMENDATIONS

A. INTRODUCTION

This chapter presents the data and utilizes equations presented in the previous chapter to calculate the dollar value and optimal quantity for various models. Computations are performed using Microsoft Excel. The two contracts discussed in the previous chapter are analyzed under the lens of strategic sourcing; the cruise lines' supply chain management and sourcing processes are also analyzed.

B. ASSUMPTIONS

This study assumes that the underlying demand history in Table 3 is normally distributed, and includes touch up and overhaul painting. This demand history is required to perform the calculations of the safety stock and re-order point at an assumed 90% service level. Chapter II discussed RAND's study of DLA's ordering process. This study utilizes RAND's estimates of the ordering cost of $20.82 with a long-term contract in place and $441.55 without long-term contract, as shown in Tables 6 and 7. Furthermore, holding cost rate components are investment cost rate, storage cost rate, and obsolescence rate. The holding cost rate from fiscal year (FY) 1992 table (appendix A) was utilized as a baseline to reverse engineer for the current rate. The FY92 investment cost rate was 10%, and according to OMB Circular (2017), the nominal interest rate in 1992 was 6.1% (Appendix B). 10% minus 6.1% = 3.9%, which is cost of inventory without interest rate. The nominal interest rate for 2017 is 1.4%, and therefore the estimated investment cost rate in 2017 is 5% + 1% storage cost rate + 7% obsolescence rate = 13% holding cost rate. Variable costs utilized in the computations for long-term and non-long-term contract are detailed in Table 4.

Chapter I indicated that each ship should go through drydock maintenance availability and modernization every nine years. Therefore, 1/9 of the fleet may transition to 1K Polysiloxane paint every year for the next nine years. In this way, 1/9 of the fleet will be using 1K Polysiloxane in Year 1, 2/9 of the fleet in Year 2, and so on. Moreover,

demand is assumed to be proportional to the amount of the fleet that has transitioned. So, the demand rate in any year *n* is *n*/9 × total demand as shown in Table 5. The calculations demonstrate TVC difference for long-term contract and non-long-term contract of 1K Polysiloxane paint using this demand schedule for the next nine years until steady state.

C. DATA

Table 3 illustrates the demand history for Silicone Alkyd, and 2K Polysiloxane haze gray paint from July 2015 through July 2017. The table also displays both the Silicone Alkyd and 2K Polysiloxane's unit of issue in gallons and five-gallon equivalent conversion. From the demand history data, the average monthly demand and the standard deviation of monthly demand were calculated.

Table 3. Haze Gray Paint Demand Data. Adapted from P. LeBlanc, personal communication (September 6, 2017).

Mon/Year	Silicone Alkyd 1 gallon	Silicone Alkyd 5 gallons	2K PSX Kit 1 gallon	2K PSX 1 gallon	Total (gallons)	Conversion (5-gal. equivalent)
Jul-15	6	255	98	0	1379	275.8
Aug-15	5	235	1	60	1241	248.2
Sep-15	7	533	155	10	2837	567.4
Oct-15	0	353	61	6	1832	366.4
Nov-15	7	351	47	5	1814	362.8
Dec-15	5	107	18	25	583	116.6
Jan-16	18	407	62	1	2116	423.2
Feb-16	0	172	29	59	948	189.6
Mar-16	3	209	164	3	1215	243
Apr-16	16	331	97	66	1834	366.8
May-16	1	289	60	7	1513	302.6
Jun-16	0	292	67	26	1553	310.6
Jul-16	0	328	46	84	1770	354
Aug-16	18	206	73	52	1173	234.6
Sep-16	4	261	63	148	1520	304
Oct-16	0	210	29	20	1099	219.8
Nov-16	2	225	11	14	1152	230.4
Dec-16	0	172	140	6	1006	201.2

Mon/Year	Silicone Alkyd 1 gallon	Silicone Alkyd 5 gallons	2K PSX Kit 1 gallon	2K PSX 1 gallon	Total (gallons)	Conversion (5-gal. equivalent)
Jan-17	39	389	150	18	2152	430.4
Feb-17	56	202	49	17	1132	226.4
Mar-17	20	281	75	26	1526	305.2
Apr-17	4	516	34	0	2618	523.6
May-17	26	387	76	0	2037	407.4
Jun-17	20	409	195	0	2260	452
				Average monthly demand		**319.25**
				Standard deviation of monthly demand		**110.02**

Table 4 describes the variable costs utilized in the computations for long-term and non-long-term contracts over the nine-year transition period to the 1K Polysiloxane haze gray paint.

Table 4. Variable Costs with a Long-Term Contract and Non-Long-Term Contract.

Price (P)	$628 per 5-gallon cans
Fixed ordering cost (K)	$20.84 or $441.55
Holding cost rate (F)	0.13
Holding cost (H)	0.13 × $628 = $81.64

D. ANALYSIS

1. ANNUAL DEMAND CALCULATION

Base on two-year demand for Silicone Alkyd and 2K Polysiloxane, the fleet's average usage per month is 319.25 5-gallon cans. The annual demand is 319.25 × 12 months = 3,831 5-gallon cans per year. Therefore, we have the annual demand estimate of overhaul painting for 1K Polysiloxane shown in Table 5.

2. DEMAND FOR YEAR 1 TROUGH 9

Table 5. Demand for Years 1 through 9 for Overhaul Painting.

Year	Annual Demand (5-gallon cans)	Standard Deviation of Annual Demand
1	1/9 × 3,831 = 426	$110 * \sqrt{12 * 1/9} = 127$
2	2/9 × 3,831 = 851	$110 * \sqrt{12 * 2/9} = 180$
3	3/9 × 3,831 = 1277	$110 * \sqrt{12 * 3/9} = 220$
4	4/9 × 3,831 = 1703	254
5	5/9 × 3,831 = 2128	284
6	6/9 × 3,831 = 2554	311
7	7/9 × 3,831 = 2980	336
8	8/9 × 3,831 = 3405	359
9	9/9 × 3,831 = 3831	381

E. LONG-TERM CONTRACT CASE WITH $20.81 ORDERING COST

Table 6 displays the optimal order quantities and total variable cost over the nine-year transition period utilizing a long-term contract.

Table 6. TVC Calculation Over 9 Years Transition Period with $20.81 Ordering Cost with a Long-Term Contract.

	EOQ (5-gallon cans)	**Ordering Cost**	**Holding Cost**	**Total Variable Cost**
Q^*_1=	14.74 = 15	$601.76	$601.76	$1,203.51
Q^*_2=	20.85 = 21	$851.01	$851.01	$1,702.02
Q^*_3=	25.53 = 26	$1,042.27	$1,042.27	$2,084.54
Q^*_4=	29.48 = 29	$1,203.51	$1,203.51	$2,407.02
Q^*_5=	32.96 = 33	$1,345.57	$1,345.57	$2,691.13
Q^*_6=	36.11 = 36	$1,473.99	$1,473.99	$2,947.99
Q^*_7=	39.00 = 39	$1,592.10	$1,592.10	$3,184.19
Q^*_8=	41.70 = 42	$1,702.02	$1,702.02	$3,404.04
Q^*_9=	44.23 = 44	$1,805.27	$1,805.27	$3,610.53
				$23,234.99

F. NON-LONG-TERM CONTRACT WITH $441.55 ORDERING COST

Table 7 displays the optimal order quantities and total variable cost over a 9 year transition period utilizing a long term contract.

Table 7. TVC Calculation over Nine Years Transition Period with $441.55 Ordering Cost with a Non-long-Term Contract.

	EOQ (5-gallon cans)	Ordering Cost	Holding Cost	Total Variable Cost
Q*1=	67.86 = 68	$2,769.88	$2,769.88	$5,539.76
Q*2=	95.96 = 96	$3,917.20	$3,917.20	$7,834.41
Q*3=	117.53 = 118	$4,797.58	$4,797.58	$9,595.15
Q*4=	135.71 = 136	$5,539.76	$5,539.76	$11,079.53
Q*5=	151.73 = 152	$6,193.64	$6,193.64	$12,387.29
Q*6=	166.21 = 166	$6,784.80	$6,784.80	$13,569.60
Q*7=	179.53 = 180	$7,328.42	$7,328.42	$14,656.84
Q*8=	191.93 = 192	$7,834.41	$7,834.41	$15,668.82
Q*9=	203.57 = 204	$8,309.65	$8,309.65	$16,619.29
				$106,950.69

G. SAFETY STOCK AND RE-ORDER POINT CALCULATION

This portion of the calculation shown in Table 8 utilizes lead time of 1 month as stated in the current 2K Polysiloxane haze gray paint contract with assumed service level of 90% (z = 1.28), and σ for each of the 9 years shown in Table 5.

Table 8. Safety Stock and Re-order Point for Years 1–9

Year	Standard Deviation of Annual Demand	Safety Stock (5-gallon cans)	Re-Order Point (5-gallon cans)
1	127	1.28 × 127 = 163	$426/12 + 163 = 198$
2	180	1.28 × 180 = 230	$851/12 + 230 = 301$
3	220	1.28 × 220 = 282	$1277/12 + 282 = 388$
4	254	326	467
5	284	364	541
6	311	399	612
7	336	431	679
8	359	460	744
9	381	488	808

H. ACQUISITION ANALYSIS

1. Contracts Utilized

The literature on the cruise line industry supply chain processes discusses the ability for suppliers or contractors to flex to meet fluctuations in demand to satisfy customer requirements (Veronneau & Roy, 2012, p. 98). The ID/IQ type instrument is intended to allow the government flexibility when the required demand is not known in advance. Therefore, the contract instrument utilized, although not specifically stated by the FAR terminology in Veronneau's articles, is in keeping with the best practices of the cruise line industry.

2. Manufacturers Utilized

In order to be responsive to the volatile nature of the demand of the various haze gray paint products, DLA chose to issue two fixed-price with economic price adjustment ID/IQ quantity contracts. As discussed in the previous sections, these contracts are long-term in nature. They were awarded with a two-year base, with the option to award three one-year options. Both contracts were awarded to the same contractor to facilitate the delivery of the required paint to the end user.

In contract SPE8E7-15-D-0006, it is very clear that this contract specifically called out the requirement for one manufacturer's product. This logic follows suit with how the cruise line industry sources its hull paint. This contract utilized one manufacturer. This, in turn, reduces the variability in performance and appearance of the product. During the course of this research, no information was obtained about the rationale for the manufacturer that was chosen.

In Contract SPE8EG-16-D-0058, there is little information regarding which manufacturer or manufacturers were to provide the required paint. This injects some uncertainty to which product will be received by the end user. The contractor could potentially source any manufacturer who produces MIL-PRF-24635E. From the demand history data in Table 3, it was not possible to determine which manufactures' product was procured and delivered to the Navy. The lack of purchasing data, has led to an inconclusive determination for this contract, and whether or not DLA is following suit with how the cruise line industry sources its hull paint.

Both contracts were awarded and subsequently managed by a central procuring activity (DLA Troop Support). This is in line with what the cruise line industry proposes as a best practice.

Fleet entities procure Polysiloxane using their government purchase card below the purchase card threshold. By procuring the Polysiloxane this way, there is no official way to standardize which manufacturers are utilized during procurement. These manufacturers that are sourced for these procurements are not managed or tracked by a centralized oversight entity. Therefore, there is no evidence or data to show which

manufacturers paint is where, and whether or not it will match with the paint that is centrally sourced by DLA. To compare DLA with the cruise lines' supply chain model shown in Figure 5, there are operational decisions being made, without a formalized feedback process to the tactical or strategic decision-makers. Therefore, this process does not follow the cruise line industry's practices.

3. Strategically Sourced

As discussed during the literature review, the intent of the initiative of strategic sourcing is to maximize the buying power of the organization by consolidating procedures and like products into fewer procurements. DLA is one of the best DOD organizations when it comes to the strategic sourcing initiative (Chaplain et al., 2012). From the research conducted, however, HAZMAT procurement is still a relatively new process for DLA.

It appears that DLA consolidated 13 NSNs onto Contract SPE8EG-16-D-0058. The assumption is that this contract was the consolidation of like products, the FSC code 8010, into one contract action. The consolidation of like products using the FSC is a step towards demonstrating one facet of strategic sourcing. Without further data or information detailing their acquisition processes, this report cannot conclusively state that the strategic sourcing initiative was obtained.

For Contract SPE8E7-15-D-0006, there was only one NSN listed on this contract vehicle. It is possible that the requirement to utilize a single manufacturers product, was a consolidation initiative to maximize the dollar spent on that one product through one long term contract. Similar to Contract SPE8EG-16-D-0058, there was no data on the processes that led to why DLA chose the manufacturer that it did with the supporting rational.

There is no evidence to suggest whether or not DLA utilizes the commodity council construct. However, a member of the DLA team takes part in an ongoing monthly Corrosion Community of Practice working group that seeks to provide support to the U.S. Navy on the issue of Polysiloxane's availability to the fleet. This suggests that DLA involves customers and experts into their acquisition decision making process. During

these meetings, the members discuss inventory levels, and the future utilization of newer haze gray paint products. Of note, the Polysiloxane paint issue is one subset of the various corrosion topics that are discussed. There is no information on whether or not the action items prescribed to DLA during these meetings are actually get factored into DLA's acquisition processes.

A process that the local fleet entities utilize is that of procuring small amounts of Polysiloxane paint via government purchase card. This process does not follow strategic sourcing initiatives. Due to the short-term nature and small quantities procured by the government purchase cards, it is not evident that the government maximizes their buying power during those procurements. However, these small procurements have a quick turnaround time from procurement to delivery.

Based on the analysis of the demand data using the EOQ equation, and utilizing the best practices from the strategic sourcing initiative and the cruise line industry, one can derive several recommendations. The following section will provide recommendations based on the analysis that was conducted.

I. RECOMMENDATIONS

Based on the analysis of the demand data using the EOQ equation and utilizing the best practices from the strategic sourcing initiative and the cruise line industry, one can derive several recommendations. The following section provides recommendations based on the analysis that was conducted.

1. Recommendation Based on TVC Comparison and EOQ Principle

Tables 6 and 7 detail the computation for the difference in variable cost between having a long-term contract and non-long-term contract in place. The major cost factor was the ordering cost. TVC for the nine years' transition period with a long-term contract is $23,234.99 and TVC with a non-long-term contract is $106,950.69. Based solely on the cost-saving factor, it is beneficial for the DOD to have a long-term contract in place for the purchase of 1K Polysiloxane paint.

Table 8 shows safety stock and re-order point for nine-year transition of overhaul painting and does not include spot painting. It is likely that newly painted ships will require less touch up and maintenance. Therefore, safety stock and re-order point will have to be scaled after Year 1 to account for touch-up painting demand. It is possible that this calculation calls for too much safety stock in the early years.

2. Recommendations Based on Strategic Sourcing

In Contract SPE8EG-16-D-0058, it appears that there has been some grouping of 13 similar NSN's based on the FSC. However, in SPE8E7-15-D-0006, there is only one NSN (8010-01-587-0983). In order to leverage the buying power of the government 8010-01-587-0983 needs to be vetted through a commodity council and grouped, if necessary, with similar products.

There needs to be senior leader involvement and support, to push policy down to the unit level dictating the use of government purchase cards for Polysiloxane procurement. The policy should state that procuring Polysiloxane using government purchase cards should not be authorized. When the customers at the unit level, order via government purchase card, demand is not fully captured and the government is paying twice for the same product. The government is effectively paying for the purchase card bills as well as for the long-term contracts. Senior leadership should hold the contractor whom was awarded the contract accountable for the delivery timeline of 30 days. Senior leaders should also look at reducing the amount of time for material delivery in future contracts. The reduction in lead-time, could potentially reduce the amount of purchase card purchases.

3. Recommendations Based on the Cruise Line Industry

The cruise line industry offers several best practices that can be used within the DOD. The cruise line industry's tiered approach to logistics planning, is already being practiced within the DOD, utilizing different terminology (Veronneau & Roy, 2012). The Strategic and Tactical tiers are accomplished at the various systems commands, or type commander levels respectively.

Centralized oversight of the Polysiloxane procurements is essential. As discussed above, the government is not leveraging its buying power when buying small quantities with the government purchase cards, but this decentralized approach has another ramification. DLA, has a contract for a specific manufacturer's product. If the unit level procures from a different manufacturer, the result could be the patchwork appearance shown in Chapter I.

J. SUMMARY

This chapter entailed the research's assumptions and where variable costs derived from. Additionally, it detailed computations to show the differences in TVC for a long-term contract and non-long-term contract, and utilized historical demand from previous types of paints to calculate overhaul paint demand, safety stock, and re-order point for the next nine-year transition period to 1K Polysiloxane. Furthermore, recommendations based on computations were provided with limitations that are discussed in Chapter IV.

The two current contract vehicles containing Polysiloxane were analyzed under the lenses of strategic sourcing initiatives and best practices from the cruise line industry. Based on the analysis conducted, it is recommended that DLA group all Polysiloxane contracts into one requirement to leverage the government's buying power and eliminate the ability for unit level assets to procure paint via government purchase card. These recommendations would allow the government to maximize its buying power and also reduce the amount of variability in the products procured, which causes the color differences.

The final chapter entails the summary of this MBA professional report, proves how this report has answered the research questions and provides areas of follow-on research that are recommended to further add value to the fleet's HAZMAT concerns.

IV. SUMMARY, CONCLUSIONS, LIMITATIONS, AND FOLLOW-ON RESEARCH

A. INTRODUCTION

This final chapter presents the MBA Professional Reports' summary, conclusions, and major findings; denotes limitations of the research; and suggests areas for future research.

B. SUMMARY

The purpose of this research was to assess the current procurement process of haze gray paint and suggest potential improvements. Additionally, the project aimed to develop a transition plan from the 2K to 1K Polysiloxane haze grazy paint using historical demand data. The transition plan encompasses the next nine years of Navy drydock maintenance availabilities. Furthermore, this report explored the business rules used for ship hull paint in parallel industries such as cruise ship lines and identify if the USN can apply similar rules.

This research performed a qualitative analysis of the two contracts that were utilized for the Polysiloxane procurement. The first part of the analysis was to describe how ID/IQ FP-EPA contracts work, and their statutory requirements. The second part was to consider the strategic sourcing initiatives and cruise line industries best practices to determine whether any of those initiatives and best practices could be adopted for future procurement efforts. A part of the future contracting effort focused on whether or not the contracts should be long or short-term, and recommended stocking levels that were provided in the quantitative analysis.

The quantitative portion examined the difference in variable costs between a long-term contract and non-long-term contract to compute and compare TVC of various models. Furthermore, it also utilized historical demand for legacy haze gray paint to calculate an inventory policy for the transition period of nine years of drydock maintenance availability.

The conclusions section gives a comprehensive recount of this research and addresses the research questions from Chapter I.

C. CONCLUSIONS

As discussed in the Summary section, this research used a qualitative and a quantitative approach to analyze the Polysiloxane haze gray paint procurement process. The research questions were as follows:

Primary research questions:

1. What is the current procurement process and can there be any improvements to the process?

2. Can we calculate a transition plan of required haze gray quantity for the next 9 years of drydock maintenance availability for 1K Polysiloxane utilizing 1K Silicone Alkyd and 2K Polysiloxane demand history?

Secondary research question:

(1) What are the business rules used for ship hull paint in parallel industries such as cruise ship lines, and can the USN apply similar rules?

1. Primary Research Question 1

During the course of this research, the information that was available was not sufficient in order to determine the entire procurement process for Polysiloxane paint. This was due to a lack of visibility into any of the major phases of contracting. Due to this lack of visibility, there was no way to determine whether or not category management or strategic sourcing initiatives were practiced. However, as discussed in the analysis portion of Chapter III, one can deduce that there is evidence of strategic sourcing, since SPE8EG-16-D-0058 grouping 13 NSNs into one contract, and Chaplain et al. (2012) stated that DLA utilizes strategic sourcing the most out of all other DOD agencies. However, consolidating the one NSN under Contract SPE8E7-15-D-0006 with the rest of the 8010 FSC codes contained in SPE8EG-16-D-0058 would further reduce administrative burdens in future procurements.

There is a difference in variable costs between a long-term contract and non-long-term contract. The computation showed a total variable cost for the nine-year transition period with a long-term contract is $23,234.99 and total variable cost with a non-long-term contract is $106,950.69. The calculations for both models illustrated that there are cost savings with a long term contract in place with a considerably cheaper total variable cost amount.

2. Primary Research Question 2

Recall from Chapter III that each ship is scheduled to go through a drydock maintenance availability and modernization period every nine years. Therefore, 1/9 of the fleet may transition to 1K Polysiloxane paint every year for the next nine years. In this way, 1/9 of the fleet will be using 1K Polysiloxane in Year 1, 2/9 of the fleet in Year 2, and so on. Moreover, demand is assumed to be proportional to the amount of the fleet that has transitioned. So, the demand rate in any year n is $n/9 \times$ total demand. The nine-year transition plan with a long term contract yielded a lower Q*, which means orders can be placed more frequently resulting in less required on-hand stock, and ultimately lowering the inventory holding cost. Furthermore, less on-hand stock means less materiel cost and leaves room to recalculate and adjust Q* as demand fluctuates, reduce the risk of of excess inventory, and consequently alleviate disposal cost. Safety stock and re-order point for years $1 - 9$ were computed utilizing lead-time of 1 month with assumed service level of 90% ($z = 1.28$), annual demand rate and σ for each of the nine years. Limitations for this calculation is discussed in the next section.

3. Secondary Research Question

The research conducted on the cruise line industry offers potential process improvements and answers the secondary research question. The key takeaways from the cruise line industry practices were to centralize the procurement process and utilize a single manufacturer for paint procurement. Centralizing the procurement process helps the strategic sourcing initiative by allowing the government to maximize its purchasing power by consolidating requirements. By using a single manufacturer, the color differences that are inherent to each manufacturer are eliminated.

D. LIMITATIONS AND FURTHER RESEARCH

Chapter I and II described several assumptions and data unavailability. The historical data that included touch-up and overhaul painting was utilized to compute the demand for 1/9 of the fleet to be repainted with 1K Polysiloxane. However, 1K Polysiloxane touch-up paint demand will accumulate, and overhaul paint demand will remain constant. Therefore, this will affect the standard deviation because touch up paint demand will be increasing. Starting in Year one, the demand of touch-up paint will scale because it is likely that newly overhauled ships will require less touch-up paint. It is possible that the computation in this research called for too much safety stock initially and overestimated the variance in the early years, and underestimated the growth rate of variance in the mid to late years. Follow-up research may be conducted by gathering true demand for touch-up and overhaul paint after Year 1 for 1K Polysiloxane paint and apply the same models conducted in this research to recalculate for safety stock and re-order point in Year 2 and so on.

As discussed in the previous chapters, information on the procurement process was limited to what was available on FPDS-NG and www.dibbs.bsm.dla.mil. It would help further research to have more access to the contract files. This transparency would allow for a more complete analysis of the Polysiloxane procurement, and reduce the amount of assumptions required.

Another area for further study would be to conduct analysis to determine whether NAVSUP WSS Mechanicsburg should institute paint procurement and management as an organizational competency. If DLA was no longer the manager, could the process be more efficient?

In the interest of maximizing the power of government procurement dollars, another area of research could be incorporating more customers into procuring Polysiloxane paint. The DOD sells naval vessels that require preservation efforts through foreign military sales. By increasing the customer pool, the DoD could more effectively leverage its buying power.

There is still a significant amount of legacy Silicone Alkyd haze gray paint on hand, as shown in Table 2. While the USN is no longer allowed to requisition these paint, further research maybe conducted to examine the cost to dispose or resell to our allies participating in the Foreign Military Sales program.

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APPENDIX A. HOLDING COST RATES. SOURCE: UNITED STATES GENERAL ACCOUNTING OFFICE (1993).

Holding Cost Rates Used by Defense Inventory Control Points During Fiscal Year 1992

Inventory control point	Holding cost component (in percent)				
	Investment	Storage	Obsolescence	Other losses	Total
Air Force (Air Logistics Centers)					
Ogden	6	1	5	[a]	12
Oklahoma City	6	1	7	[a]	14
Sacramento	6	1	10	[a]	17
San Antonio	6	1	4	[a]	11
Warner Robins	6	1	6	[a]	13
Navy					
Aviation Supply Office	10	1	10 and 12	[b]	21 and 23
Ships Parts Control Center	10	1	10 and 12	[b]	21 and 23
Army (Commands)					
Armament, Munitions-Chemical	10	1	4	0	15
Aviation Systems	10	1	2	2	15
Communications-Electronics	10	1	3	2	16
Missile	10	1	7	0	18
Tank-Automotive	10	1	4	0	15
Troop Support	10	1	6	0	17
DLA (Supply Centers)					
Construction	10	1	6	[b]	17
Electronics	10	1	8	[b]	19
General	10	1	6	[b]	17
Industrial	10	1	7	[b]	18
Fuel	[c]	[c]	[c]	[c]	[c]
Personnel					
Medical	10	1	1	[b]	12
Clothing and Textiles	10	1	7	[b]	18

[a]The Air Force includes inventory losses in its obsolescence cost rates.

[b]Neither the Navy nor DLA calculates a separate inventory loss rate.

[c]This inventory control point does not use DOD's replenishment formula, so holding cost rates do not apply.

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APPENDIX B. NOMINAL TREASURY INTEREST RATES. SOURCE: OFFICE OF MANAGEMENT AND BUDGET (2016).

November 15, 2016

BUDGET ASSUMPTIONS
Nominal Treasury Interest Rates for Different Maturities
(from the annual budget assumptions for the first year of the budget forecast)

Calendar Year	3-Year	5-Year	7-Year	10-Year	20-Year	30-Year
1979	9.7	9.2	9.1	9.0	#N/A	8.9
1980	10.9	10.6	10.6	10.6	#N/A	10.4
1981	13.4	12.8	12.6	12.2	#N/A	11.8
1982	12.8	13.1	13.2	13.3	#N/A	13.0
1983	9.5	9.8	10.0	10.2	#N/A	10.3
1984	9.8	10.0	10.1	10.3	#N/A	10.4
1985	10.3	10.7	10.8	11.0	#N/A	11.0
1986	8.6	8.8	8.8	8.9	#N/A	9.1
1987	6.3	6.5	6.6	6.7	#N/A	7.0
1988	7.3	7.7	7.8	8.0	#N/A	8.1
1989	7.8	8.1	8.2	8.3	#N/A	8.2
1990	7.4	7.5	7.6	7.7	#N/A	7.8
1991	7.2	7.4	7.4	7.5	#N/A	7.7
1992	6.1	6.5	6.7	7.0	#N/A	7.1
1993	5.6	6.0	6.3	6.7	#N/A	6.8
1994	5.0	5.3	5.5	5.7	#N/A	5.8
1995	7.3	7.6	7.7	7.9	#N/A	8.1
1996	5.4	5.5	5.5	5.6	#N/A	5.7
1997	5.8	5.9	6.0	6.1	#N/A	6.3
1998	5.6	5.7	5.8	5.9	#N/A	6.1
1999	4.7	4.8	4.9	4.9	#N/A	5.0
2000	5.9	6.0	6.0	6.1	#N/A	6.3
2001	5.4	5.4	5.4	5.4	#N/A	5.3
2002	4.1	4.5	4.8	5.1	#N/A	5.8
2003	3.1	3.6	3.9	4.2	#N/A	5.1
2004	3.0	3.7	4.2	4.6	5.4	5.5
2005	3.7	4.1	4.4	4.6	5.2	5.2
2006	4.7	4.8	4.9	5.0	5.3	5.2
2007	4.9	4.9	4.9	5.0	5.1	5.1
2008	4.1	4.3	4.4	4.6	4.9	4.9
2009	2.7	3.3	3.7	4.2	4.7	4.5
2010	2.3	3.1	3.5	3.9	4.4	4.5
2011	1.4	1.9	2.4	3.0	3.9	4.2
2012	1.6	2.1	2.5	2.8	3.5	3.8
2013	0.5	1.1	1.5	2.0	2.7	3.0
2014	1.0	1.9	2.5	3.0	3.6	3.9
2015	1.7	2.2	2.5	2.8	3.1	3.4
2016	2.0	2.4	2.7	2.9	3.2	3.5
2017	1.4	1.7	1.9	2.1	2.5	2.8

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APPENDIX C. SOLICITATION REQUIREMENTS FOR ID/IQ CONTRACTS. SOURCE: FAR 16.504(A)(4).

A solicitation and contract for an indefinite quantity must—

(i) Specify the period of the contract, including the number of options and the period for which the Government may extend the contract under each option;

(ii) Specify the total minimum and maximum quantity of supplies or services the Government will acquire under the contract;

(iii) Include a statement of work, specifications, or other description, that reasonably describes the general scope, nature, complexity, and purpose of the supplies or services the Government will acquire under the contract in a manner that will enable a prospective offeror to decide whether to submit an offer;

(iv) State the procedures that the Government will use in issuing orders, including the ordering media, and, if multiple awards may be made, state the procedures and selection criteria that the Government will use to provide awardees a fair opportunity to be considered for each order (see 16.505(b)(1));

(v) Include the name, address, telephone number, facsimile number, and email address of the agency task and delivery order ombudsman (see 16.505(b)(8)) if multiple awards may be made;

(vi) Include a description of the activities authorized to issue orders; and
(vii) Include authorization for placing oral orders, if appropriate, provided that the Government has established procedures for obligating funds and that oral orders are confirmed in writing.

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APPENDIX D. NEGOTIATED CONTRACT FORMAT DESCRIPTIONS BY PARTS. SOURCE: FAR 15.204-2–15.204-5.

15.204-2 -- Part I -- The Schedule.
The contracting officer shall prepare the contract Schedule as follows:
(a) Section A, Solicitation/contract form.

(1) Optional Form (OF) 308, Solicitation and Offer-Negotiated Acquisition, or Standard Form (SF) 33, Solicitation, Offer and Award, may be used to prepare RFPs.
(2) When other than OF 308 or SF 33 is used, include the following information on the first page of the solicitation:
(i) Name, address, and location of issuing activity, including room and building where proposals or information must be submitted.
(ii) Solicitation number.
(iii) Date of issuance.
(iv) Closing date and time.
(v) Number of pages.
(vi) Requisition or other purchase authority.
(vii) Brief description of item or service.
(viii) Requirement for the offeror to provide its name and complete address, including street, city, county, state, and zip code, and electronic address (including facsimile address), if appropriate.
(ix) Offer expiration date.

(b) Section B, Supplies or services and prices/costs. Include a brief description of the supplies or services; e.g., item number, national stock number/part number if applicable, nouns, nomenclature, and quantities. (This includes incidental deliverables such as manuals and reports.)

(c) Section C, Description/specifications/statement of work. Include any description or specifications needed in addition to Section B (see Part 11, Describing Agency Needs).

(d) Section D, Packaging and marking. Provide packaging, packing, preservation, and marking requirements, if any.

(e) Section E, Inspection and acceptance. Include inspection, acceptance, quality assurance, and reliability requirements (see Part 46, Quality Assurance).

(f) Section F, Deliveries or performance. Specify the requirements for time, place, and method of delivery or performance (see Subpart 11.4, Delivery or Performance Schedules, and 47.301-1).

(g) Section G, Contract administration data. Include any required accounting and appropriation data and any required contract administration information or instructions

other than those on the solicitation form. Include a statement that the offeror should include the payment address in the proposal, if it is different from that shown for the offeror.

(h) Section H, Special contract requirements. Include a clear statement of any special contract requirements that are not included in Section I, Contract clauses, or in other sections of the uniform contract format.

15.204-3 -- Part II -- Contract Clauses.

Section I, Contract clauses. The contracting officer shall include in this section the clauses required by law or by this part and any additional clauses expected to be included in any resulting contract, if these clauses are not required in any other section of the uniform contract format. An index may be inserted if this section's format is particularly complex.

15.204-4 -- Part III -- List of Documents, Exhibits, and Other Attachments.

Section J, List of attachments. The contracting officer shall list the title, date, and number of pages for each attached document, exhibit, and other attachment. Cross-references to material in other sections may be inserted, as appropriate.

15.204-5 -- Part IV -- Representations and Instructions.

The contracting officer shall prepare the representations and instructions as follows:

(a) Section K, Representations, certifications, and other statements of offerors. Include in this section those solicitation provisions that require representations, certifications, or the submission of other information by offerors.

(b) Section L, Instructions, conditions, and notices to offerors or respondents. Insert in this section solicitation provisions and other information and instructions not required elsewhere to guide offerors or respondents in preparing proposals or responses to requests for information. Prospective offerors or respondents may be instructed to submit proposals or information in a specific format or severable parts to facilitate evaluation. The instructions may specify further organization of proposal or response parts, such as --

(1) Administrative;
(2) Management;
(3) Technical;
(4) Past performance; and
(5) Certified cost or pricing data (see Table 15–2 of 15.408) or data other than certified cost or pricing data.

(c) Section M, Evaluation factors for award. Identify all significant factors and any significant subfactors that will be considered in awarding the contract and their relative importance (see 15.304(d)). The contracting officer shall insert one of the phrases in 15.304(e).

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