2021-12

INCREASING DEFENSE CONTRACTOR COMPETITION IN A PREDOMINANTLY SOLE-SOURCE CONTRACTING ENVIRONMENT

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http://hdl.handle.net/10945/68774

NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

MBA PROFESSIONAL PROJECT

INCREASING DEFENSE CONTRACTOR COMPETITION IN A PREDOMINANTLY SOLE-SOURCE CONTRACTING ENVIRONMENT

December 2021

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REPORT DOCUMENTATION PAGE			*Form Approved OMB No. 0704-0188*
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington, DC 20503.			
1. AGENCY USE ONLY ***(Leave blank)***	**2. REPORT DATE** December 2021	**3. REPORT TYPE AND DATES COVERED** MBA Professional Project	
4. TITLE AND SUBTITLE INCREASING DEFENSE CONTRACTOR COMPETITION IN A PREDOMINANTLY SOLE-SOURCE CONTRACTING ENVIRONMENT			**5. FUNDING NUMBERS**
6. AUTHOR(S) Samuel O. Adjei and Crette O. Hendricks II			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000			**8. PERFORMING ORGANIZATION REPORT NUMBER**
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A			**10. SPONSORING / MONITORING AGENCY REPORT NUMBER**
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.			
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release. Distribution is unlimited.			**12b. DISTRIBUTION CODE** A

13. ABSTRACT (maximum 200 words)

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14. SUBJECT TERMS NAVSUP WSS, spend analysis, defense industrial base, sole source contracting, resource dependency theory, competition, competitive contracting, Kraljic's supply matrix, leading company contracting, leader-follower			**15. NUMBER OF PAGES** 105
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	**18. SECURITY CLASSIFICATION OF THIS PAGE** Unclassified	**19. SECURITY CLASSIFICATION OF ABSTRACT** Unclassified	**20. LIMITATION OF ABSTRACT** UU

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

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Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF BUSINESS ADMINISTRATION

from the

NAVAL POSTGRADUATE SCHOOL
December 2021

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LIST OF ACRONYMS AND ABBREVIATIONS

AI	Artificial Intelligence
AMC	Acquisition Method Code
AMRAAM	Advanced Medium Range Air-to-Air Missile
AMSC	Acquisition Method Suffix Code
ASO	Aviation Supply Office
BBP	Better Buying Power
BOA	Basic Ordering Agreement
CAGE	Commercial and Government Entity
CICA	Competition in Contracting Act
CLIN	Contract Line Item Number
CMS	Contract Management Standard
DFARS	Defense Federal Acquisition Regulation Supplement
DIB	Defense Industrial Base
DOD	Department of Defense
DON	Department of the Navy
FAR	Federal Acquisition Regulation
FSC	Federal Supply Classification
FY	Fiscal Year
GAO	Government Accountability Office
GLS	Global Logistics Support
IDIQ	Indefinite Delivery Indefinite Quantity
JCMPO	Joint Cruise Missile Project Office
LCC	Leading Company Contracting
LPTA	Lowest Price Technically Acceptable
MDAP	Major Defense Acquisition Programs
MRG	Main Reduction Gear
NAVICP	Naval Inventory Control Point
NAVSUP	Navy Supply Systems Command
NAVSUP-WSS	Naval Supply Systems Command Weapons System Support
NCMA	National Contract Management Association

NDS	National Defense Strategy
NIIN	National Item Identification Number
NSIB	National Security Innovation Base
NSN	National Stock Number
NSS	National Security Strategy
NSS-Supply	Naval Sustainment System–Supply
NWCF	Navy Working Capital Fund
OEM	Original Equipment Manufacturer
OSA	Open Systems Architecture
PSICP	Program Support Inventory Control Point
RDT	Resource Dependency Theory
RMC	Repair Method Code
RMSC	Repair Method Suffix Code
SAP	Simplified Acquisition Procedures
SCM	Supply Chain Management
SEFoM	Supply Effectiveness Figure of Merit
SPCC	Ships Parts Control Center
T&D	Transportation and Distribution
TCoPD	Truthful Cost or Pricing Data
TINA	Truth in Negotiations Act
WSS	Weapons System Support

ACKNOWLEDGMENTS

We want to thank Dr. Geraldo Ferrer and Dr. Rene Rendon for acceptance as our advisors and for their guidance throughout this process. We also acknowledge Chris Daubert, Julie Crespo, Amy Ford, and the team at NAVSUP-WSS for providing their guidance as well and the data for this research.

***

Samuel Adjei: I would like to use this acknowledgment section to reflect on my 18 months of experience at the Naval Postgraduate School (NPS). My pandemic-era graduating class spent most of our time together in Monterey but apart from each other. I, however, acknowledge the Navy, the Supply Corps, my professors, classmates, thesis partner, the Acquisition Research Program, and the NPS community for the outstanding education, support, and experience.

Finally, I acknowledge my supply chain management program. If there was ever a time in history to acknowledge supply chain complexities, it is now. I, therefore, thank God for his guidance, my mother Victoria, my uncle Osei-Owusu, my family in Ghana, and the United States for their continuing moral support and prayers. Thank you.

***

Crette Hendricks: First and foremost, I give thanks to God the father, through you all things are possible.

I would also like to express gratitude to my parents. I would not be the man that I am today without your support and love. To my children, thank you for being the guiding light in my life and for providing me with the motivational purpose to make myself a better man for you. Dad will always be here and will love you unconditionally with all that I am forever. To my beautiful wife, Michelle, thank you for making all this possible. You are the foundation of my life and the glue that holds our family together, without you I’d be nothing. Lastly, thank you to all the Sailors and Marines that have helped me to grow through the years and to my thesis partner: thank you for all your hard work and dedication. We finally did it, buddy!

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I. INTRODUCTION

This chapter introduces our research. We first provide some background information on government contracting within the Department of Defense (DOD), the Department of the Navy (DON), and Naval Supply Systems Command Weapons System Support (NAVSUP-WSS). We then present the statement of the problem as was identified by NAVSUP-WSS and state the purpose of this research, and the organization of this report. Finally, we present the benefits and limitations of our study.

A. BACKGROUND

The DOD spent $360 billion on contracts in fiscal year (FY) 2018 and this value continues to increase (McGregor, 2021). The expenditure on contracts constituted about half of the entire DOD budget: of the $360 billion budget, 52% was spent on services, 40% on goods, and 8% went towards research and development (McGregor, 2021). By contrast, in FY18 the Department of the Navy (DON) spent $171.5 billion—32% on operations and maintenance, 29% on procurement, 28% on military personnel, 10% on research and development, and 1% on infrastructure (Department of the Navy [DON], 2017). Of the $49.5 billion spent on procurement, the Navy purchased 14 battle force ships and 91 airframes (DON, 2017). From FY19 through FY20, NAVSUP-WSS spent more than $5.2 billion on spare part procurement and repair contracts. During the period under review (FY19–FY20), Weapons System Support (WSS) awarded more than 30,700 contracts; of those, 75% (23,022) were spare procurement contracts and 25% (7,694) were repair contracts. For the spare procurement contracts, only 12.9% were awarded under full and open competition, according to value, and for repair contracts, only 8.2% were awarded under full and open competition (NAVSUP-WSS, 2021). In total, more than 80% of NAVSUP-WSS contracts are awarded under sole-source conditions.

Full and open competition is the preference for government contracting, which leads to fair and reasonable pricing and a strong and resilient defense industrial base (DIB). The sole-source condition exists when “only one responsible source and no other supplies or services will satisfy agency requirements” (FAR 6.302-1, 2021). Sole source is a more challenging contracting mechanism that hinders the development of the DIB and does not lead to fair and reasonable pricing, without taking additional actions such as Truthful Cost or Pricing Data (TCoPD) formerly known as the Truth in Negotiations Act (TINA). Sole-source contracting practices produce both opportunities and threats within a supply chain, but the disadvantages of operating in this environment greatly outweigh the benefits for the U.S. government. Sole-source contracting, the DIB, and TCoPD are discussed in detail in the literature review section of this report.

The DIB is a massive industry that supplies DOD with equipment, technology, services, and personnel support. It also includes prime contractors and subcontractors (McGregor, 2021). The prime contractors receive defense contracts and deal directly with the DOD. The subcontractors work with the prime contractors and do not normally interface with government. McGregor (2021) observed that the defense contracting industry is known for its cost overruns, productions delays, employee training deficiencies, and lack of public oversight.

B. STATEMENT OF THE PROBLEM

As identified by NAVSUP-WSS, more than 80% of their contracts are sole-source contracts and operating in this environment is not the preferred method for the government. Having only one source of supply places the government at a negotiating disadvantage with the defense industry and shifts the bargaining power in favor of the defense contractor, creating the potential to increase overall sustainment costs. Competition works to lower the cost of goods and services for the government (Gansler, 2011). Furthermore, sole-source contracting increases supply chain risk and decreases supply chain resiliency by creating a bottleneck within the Navy supply chain. Having only one source presents a challenge for the government: a single source could shift its product mix away from an aging weapons system to pursue a more profitable venture, go out of business, succumb to destruction by natural disaster, or cease to provide a product or service for other unforeseen reasons. This type of situation creates risk for the government and has the potential to impact overall readiness levels for the Navy.

C. PURPOSE OF THE RESEARCH

The purpose of this research is to analyze the NAVSUP-WSS contracting environment to determine how it can increase competition in a predominately sole-source environment. More specifically the purpose of this research is to answer the following three research questions:

- Why is NAVSUP-WSS operating in a sole-source environment?
- What is the current NAVSUP-WSS strategy for increasing contractor competition?
- How can NAVSUP-WSS increase contractor competition in a predominantly sole-source environment?

D. ORGANIZATION OF THE REPORT

This report contains six chapters. Chapter I introduces the research with background information, and it also discusses the statement of the problem and our research questions. It then discusses the report's organization, the benefits of our research as well as its limitation. Chapter II is our literature review which presents a summary of the available literature. We first discuss the resource dependency theory. A theory which informs our research and guides our analysis. We then discuss the defense industrial base (DIB) which provides all the goods and services to the DOD. We also discuss supply chain risk that is present in the way the DOD relies on the defense industry. The literature review continues with a discussion of spend analysis and how this type of study has been used in research to help improve strategic contracting decisions. We then present the contracting life cycle, competitive and sole-source contracting, and then we discuss the importance of competition. Finally, we review the Better Buying Power initiatives, ways to create and maintain a competitive contracting environment, and leader company contracting.

In Chapter III we present an overview of NAVSUP-WSS. We follow its early history, missions, organizational restructure to its current operations, and NSS-supply. Chapter IV discusses the methodology we used for this research. We discuss how we utilized a mixed methods approach by applying both quantitative and qualitative techniques to obtain insight into NAVSUP-WSS contracting operations. We also discuss our application of business intelligence methods such as clarifications, data cleaning and spend analysis. In Chapter V we discuss our analysis, results, and recommendation. Finally, we present our summary and areas for further research in Chapter VI.

E. BENEFITS AND LIMITATIONS OF THE RESEARCH

Our research will show how NAVSUP-WSS can improve its competitive contracting environment. Full and open competition as required by law is the preference for government contracting. The findings of this research will help WSS to increase competition for select spare procurements and repair contracts of high dollar value or high purchase frequency. The findings of this research could also benefit other DOD agencies and other services to increase contractor competition in the sole-source environments in which they currently operate.

However, our analysis is limited to the NAVSUP-WSS contracts for the period under review, FY19 through FY20. This research is also limited to the dataset that was provided by NAVSUP-WSS to conduct this study, which included only spare and repair contracts. Lastly, we analyzed only a small number of national item identification numbers (NIINs) for spare procurements and repair contract actions, specifically the top two spare and repair NIINs according to the number of contracts awarded.

F. SUMMARY

In this chapter we introduced our research and provided background information on DOD, DON, and NAVSUP-WSS contracting. We then presented the statement of the problem and stated the purpose of our research. Lastly, we discussed the organization of this report and what we consider to be the benefits and limitations of our study. The next chapter sets the theorical foundation for our research and provides a review of the available literature in the areas for our research.

II. LITERATURE REVIEW

Chapter II presents a summary of the available literature and sets the foundation for this research. We first discuss the resource dependency theory. We then discuss the Defense Industrial Base (DIB) and supply chain risk that is present in the way the DOD is reliant on DIB. The literature review continues with a discussion of spend analysis, the contracting life cycle phases, competitive and sole-source contracting, Truthful Cost or Pricing Data and the importance of competition. Finally, we review the Better Buying Power initiatives, the competitive contracting environment, and leader company contracting.

A. RESOURCE DEPENDENCY THEORY

From the time that Resource Dependency Theory (RDT) was presented by Jeffrey Pfeffer and Gerald Salancik in 1978, the concept has been widely used to review organizational behavior and structure across multiple industries (Nienhüser, 2008). The central theme of RDT is that organizational decisions are extensively influenced by their dependence on critical resources and that the organizations' decisions can easily be explained based on the specifics of that dependency situation (Nienhüser, 2008). The basic idea of RDT can be seen as a framework outlining the central proposition of the theory. See Figure 1.

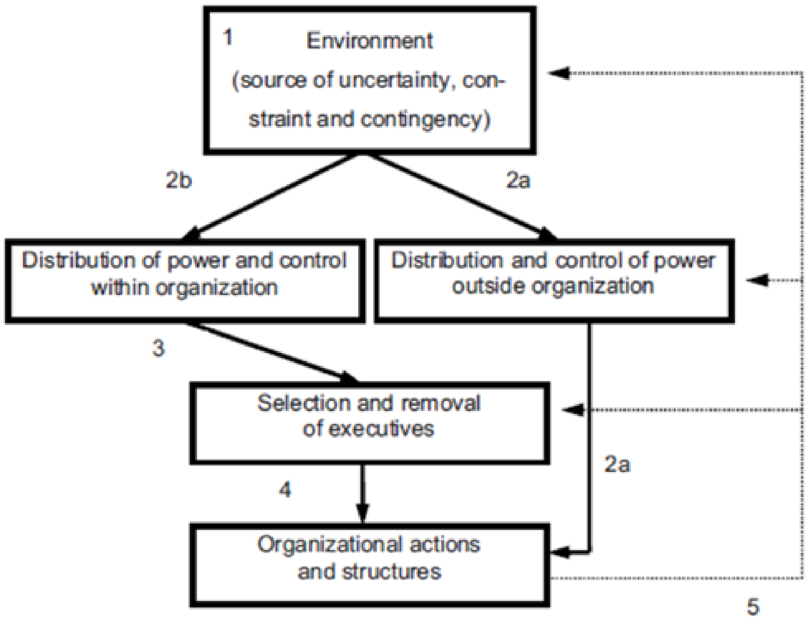

Figure 1. The Connection Between Environment, Organization, and Organizational Decisions or Actions. Source: Nienhüser (2008).

The fundamental concept of RDT is that an organization's unique situation must be considered when seeking to understand its behavior. The organization's actions and decisions can be understood by looking at its ecology (Nienhüser, 2008). Although environmental concerns include internal processes of resource usage within an organization, RDT emphasizes the issue of resource acquisition (Nienhüser, 2008). An organization acquires critical resources from its environment and a resource is critical if an organization cannot operate without that resource or without a market for the product using that resource (Nienhüser, 2008).

In this case, the total quantity of the resource acquired is not as important as the potential disruption to the organization should the resource be absent. In other words, a resource may be proportionally smaller in quantity when compared to the total volume of resources the organization acquires; however, if in the absence of that resource the organization cannot continue normal operations or sell its products, then that particular resource is critical to the organization (Nienhüser, 2008). Nienhüser (2008) linked the RDT to the bounded rationality theory (Simon, 1990) when discussing the decision-makers relationship within the industrial environment their organizations operate. Nelson (2019) also observed that managers operating with such environmental constraints experience limitations on their rational decision-making abilities.

The environment is the main source of uncertainty and critical resource distribution in the environment defines the extent of the uncertainty. The scarcity of the resource and the action of its controlling agents exacerbate environmental uncertainty (Nienhüser, 2008). In the abundance of resource supply or reserve, dependence is reduced and conflict between players is also reduced. However, a smaller supply base concentrates power in a few hands, increasing interdependencies, conflicts, and uncertainties. At this stage, an organization makes every effort to lower its uncertainties (Nienhüser, 2008).

RDT postulates that whoever controls resources controls whomever needs these resources. The greater the dependency, the greater the control. A dependent organization has two options to reduce dependency—reduce need or find alternate sources of supply (Nienhüser, 2008). In this way RDT can be applied to the DOD contracting environment, for example when a prime contractor owns the proprietary data or controls the bulk of critical supplies required by the government but does not themselves need any resources from the government the contractor becomes comparatively powerful and will make high demands of the government. It is therefore rational for the government to get involved in managing and avoiding dependence by developing dual or alternative sources (Nienhüser, 2008).

The DIB is far ahead of the government with their merger and acquisition strategy which consolidates their power. RDT explains that mergers and acquisition in an industrial environment must be viewed as an attempt by an organization to reduce their own external uncertainty and increase their resource-controlling power. In the same way, vertical integration ensures their control over resources is extended while horizontal integration broadens power over other resource providers (Nienhüser, 2008). The major defense prime contractors in the defense industrial base use these strategies to decrease competition by acquiring competitor organizations, to control interdependence with their suppliers, and to diversify operations (Hillman et al., 2009). Research conducted in multiple industries corroborates this theory and provides extensive empirical evidence validating the reciprocal effect of uncertainty and interdependence on the action of various organizations (Hillman et al., 2009).

B. GOVERNMENT ACCOUNTABILITY OFFICE DOD REVIEW

A review of defense contracts in 2013 revealed that over the preceding five years the competition rate dropped from 62.6% in 2008 to 57.1% in 2012. Most contracts used sole-source procedures because only one reliable contractor could meet the government requirements (GAO, 2013). As depicted in Figure 2, in the report titled *17th Annual Assessment of the DOD's $1.69 Trillion Portfolio for 82 Major Weapon Systems Acquisition Programs*, the GAO reviewed 183 major contracts and observed that the DOD used noncompetitive procedures for 67% of those 183 contract awards. In addition, the GAO noted that 47% of the 183 contracts went to just five prime contractors (GAO, 2019).

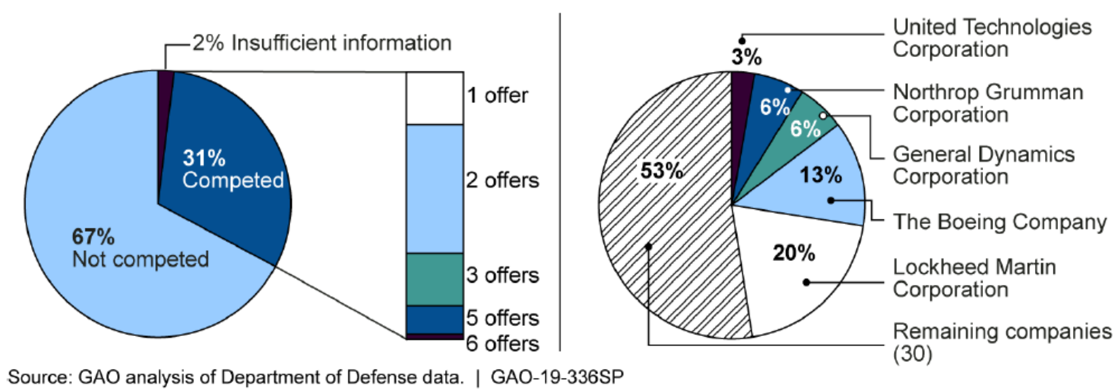

Figure 2. GAO Review: 82 of DOD's Major Weapon Systems Acquisition Programs. Source: GAO (2019).

C. DEFENSE INDUSTRIAL BASE

The DIB primarily consists of both private and public companies that vary broadly in range, depth, and structure. They design and manufacture the warfighting systems that support the defense mission (Rendon & Snider, 2019). According to McGinn (2021) these firms can be classified into three major groupings:

- A small number of large companies that serve as prime contractors and integrators on major weapons systems, such as Boeing and Lockheed Martin.
- A larger number of mid-tier companies that manufacture major subsystems or provide technical services to DOD customers.
- A very large number of small companies that manufacture spare parts or provide material serving both commercial and defense customers, serve as nontraditional start-ups developing innovative technologies, or are focused on a particular defense segment or customer base. (McGinn, 2021)

The DIB is a vital part of the United States national security (Walter, 2019). The industrial base develops and manufactures America's weapon systems, and it provides critical services to meet U.S. military requirements in all warfare domains. A healthy, secure, and resilient DIB has been an essential national security priority for decades. According to McGinn (2021), due to the reestablishment of near peer great power competition with China and Russia, the DOD has reshaped many of its priorities thus impacting the endeavors and structure of the DIB. The 2017 National Security Strategy (NSS) established the concept of the National Security Innovation Base (NSIB) as "the American network of knowledge, capabilities, and people—including academia, National Laboratories, and the private sector—that turns ideas into innovations, transforms discoveries into successful commercial products and companies, and protects and enhances the American way of life" (White House, 2017, p. 21). The 2018 National Defense Strategy (NDS) notes that to sustain the DOD's technological edge over our adversaries the DIB must modernize its culture, sourcing, and safety measures throughout the National Security Innovation Base.

The total number of existing prime contractors and the number of new companies entering the DIB have been declining in recent years (Walter, 2019). Data shown in Figure 3 reveals that during 2018 the total number of companies doing business with the DOD declined by 9%, and the number of new companies declined by 7%. Since 2015 the overall total has fallen by 15% and 16%, respectively. These trends are problematic, particularly for the decline in the number of new entrants. The NDS places emphasis on the NSIB and lays out the desire for the DOD to attract non-traditional defense companies to do business with the DOD (McCormick, 2019).

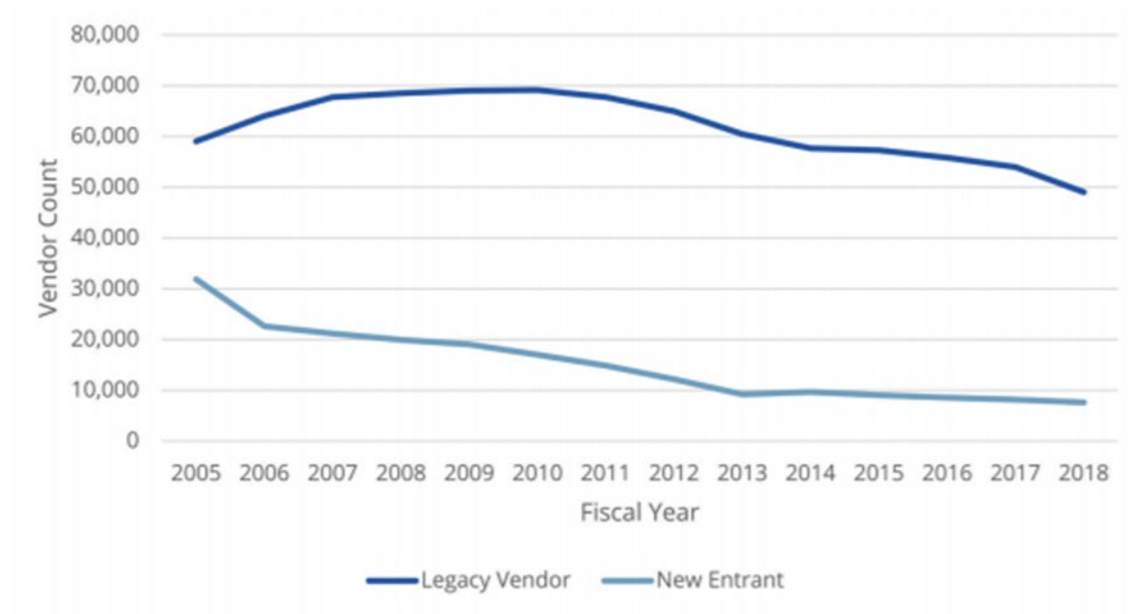

Figure 3. DOD Contractor Count. Source: McCormick (2019).

Michael Porter came up with a model linking the intensity of competition to the nature of decision making in an industry (Porter, 1980). He identified that an industry's fundamental economic and technological characteristics control the veracity of five forces. Porter's (1980) five forces are listed below:

- Threat of new entrants.
- Bargaining power of buyers.
- Rivalry between existing competitors.
- Threat of substitute products.
- Bargaining power of suppliers. (Porter, 1980, p. 30)

Gansler et al. (2009) found that Porter's framework affords analysts a simplified technique to scrutinize and evaluate an industry. The five competitive forces framework considers factors such as supply, demand, availability of substitutes, presence of complementary services or products, costs consideration and economies of scale, and the structure of the marketplace (i.e., is the industrial environment a monopoly, an oligopoly, or a perfect competition; Gansler et al., 2009). Here we apply Porter's model for the five competitive forces that shape industry to better understand the WSS contracting environment. Figure 4 depicts Porter's five forces model as applied to the defense industry (Gansler et al., 2009).

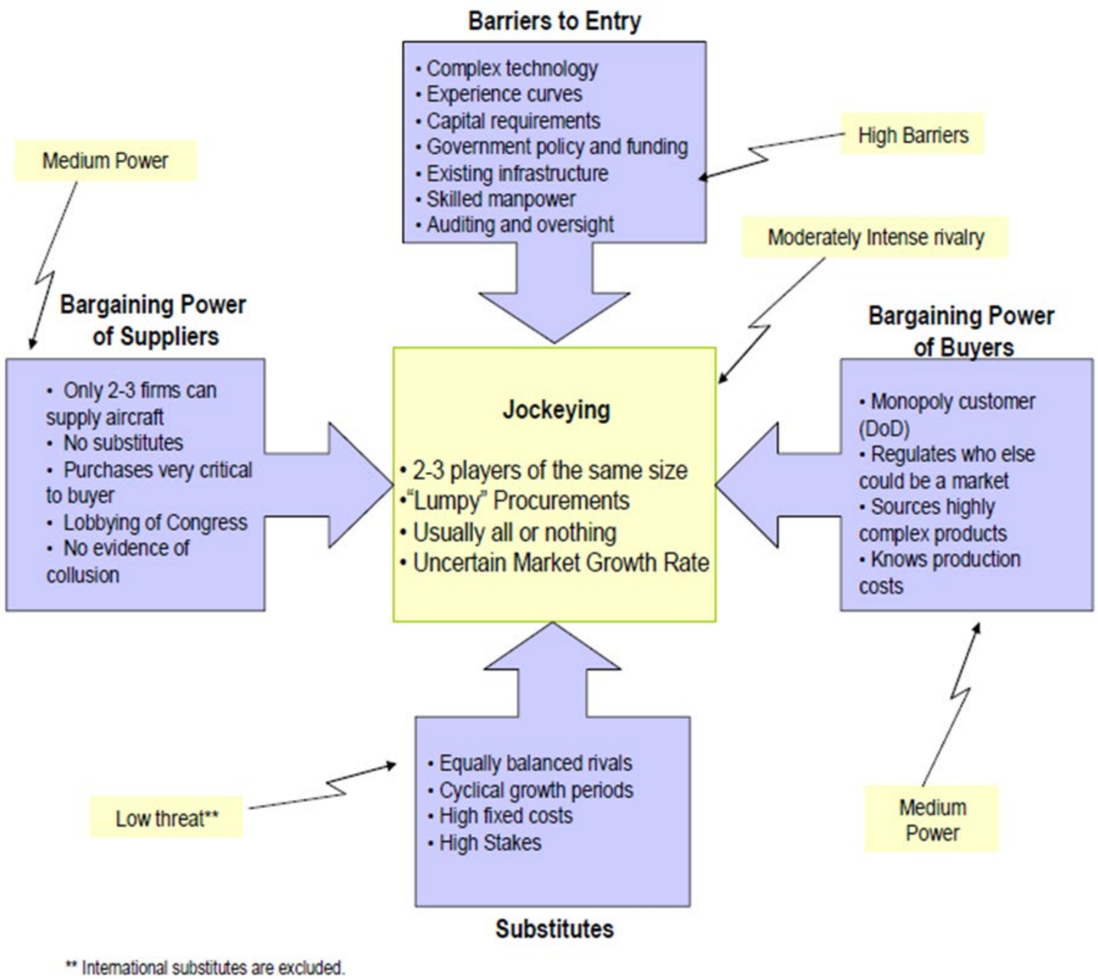

Figure 4. Porter's Five Competitive Forces Adapted for the Defense Industry. Source: Gansler et al. (2009).

Using Porter's five forces to analyze the defense industry reveals high barriers to entry, which creates a bargaining power shift that is in favor of existing defense contractors. Furthermore, the threat of substitutes is low due to the defense industry's connection to national security, thus the government's purchasing power is reduced. It is, therefore, essential to have multiple competitive contractors available to supply goods or services to the government (Gansler et al., 2009). This is particularly true for NAVSUP-WSS, more than 80% of NAVSUP contracts are sole-source, which dramatically decreases the bargaining power of the government and increases the bargaining power of defense contractors. Such conditions eventually act as obstacles to competition and adversely affect the flexibility, elasticity, sensitivity, and productivity of companies within the DIB (Gansler et al., 2009). Prime contractors and subcontractors that conduct business with the DOD participate in the DOD supply chain, and within the DOD supply chain there exists many supply chain risks. Supply chain risk is discussed in the following section.

D. SUPPLY CHAIN RISK

Supply chain risk is an increasing concern for leaders in the private sector as well as the public sector (Wang et al., 2010). Risk management in the public sector is more critical than in the private sector because within the DOD mission, risk considerations are essential for defense acquisition decisions (Rendon & Snider, 2019). The reliability of contractors is a highly visible concern in defense contracting. Contractor reliability was identified among the top three supply chain concerns for contractors. The two remaining major supply chain concerns identified by Wang et al. (2010) include on-time delivery and supply availability.

The COVID-19 pandemic and its associated impact on the global supply chain revealed multiple supply chain risks (El Baz & Ruel, 2021). The pandemic disruption demonstrated that a holistic strategy and time is required to mitigate supply chain risk (Van Hoek, 2020). One of the most common mitigation strategies is for the buying activity to invest in making the supply base reliable by sourcing from multiple suppliers or by influencing their supplier to improve reliability (Wang et al., 2010). Other strategies focused on methods to minimize interruption due to quality and delivery issues by increasing the frequency of inventory inspections and auditing. More emphasis has also focused on management, supplier training, and dual sourcing strategies (Wang et al., 2010).

Additional supply risk includes financial default. When suppliers default, there is a direct effect on the buying activity (Wang et al., 2010). Suppliers' problems can impact both delivery reliability and production in a buying activity. Using qualitative and strategic considerations, buyers in the private sector have invested in supplier development (Friedl & Wagner, 2012). Supplier developments involve activities a buyer does to build the capability of its supplier base with an aim to increase supplier performance (Friedl & Wagner, 2012). Supplier development activities include introducing competition through the addition of multiple sourcing, using incentives including offering to pay a higher price or increasing purchasing volume, and investing directly to increase supplier performance (Wang et al., 2010).

Wang et al. (2010) identified in the private sector that in some situations, improving the supplier's performance is preferred over dual sourcing. However, in a situation of cost heterogeneity, the dual sourcing approach is favorable, while high reliability heterogeneity does well with supplier improvement. In an environment where contractors provide similar supplies, low reliability encourages improvement, but a lower capacity or lower cost supports dual sourcing. Finally, using a strategy that combines both approaches can add significant value in situations where both capacity and reliability are low (Wang et al., 2010). The next section discusses Kraljic's supply matrix on how organizations can use comprehensive supply chain strategy to mitigate supply risks.

E. KRALJIC'S SUPPLY MATRIX

Peter Kraljic's supply matrix is useful in analyzing supply management problems and devising solutions for implementation. The matrix is an effective model that links procurement strategies to supply chain management (Kraljic, 1983). See Figure 5.

Kraljic (1983) linked purchasing practices with supply risks and the need to develop a comprehensive strategy unique to the organization to manage these risks. He used factors such as supply availability, number of suppliers, competition, make-or-buy prospects, storage concerns, and availability of substitutes to gauge supply chain risks. He mapped these factors against two key criteria which are the importance of purchasing and the complexity of supply market. Using the two criteria, he developed four quadrants to describe different stages of purchasing sophistication (Kraljic, 1983). This approach is now known as Kraljic's Supply Matrix (Webb, 2017). The model shows how cost reduction and supply security maximization are linked (Supply Chain Cards, 2020). His model is also applicable to DOD contracting operations. Within the defense industry the DOD can analyze its supply chains and identify supply chain risks by conducting spend analysis, which is discussed in the next section.

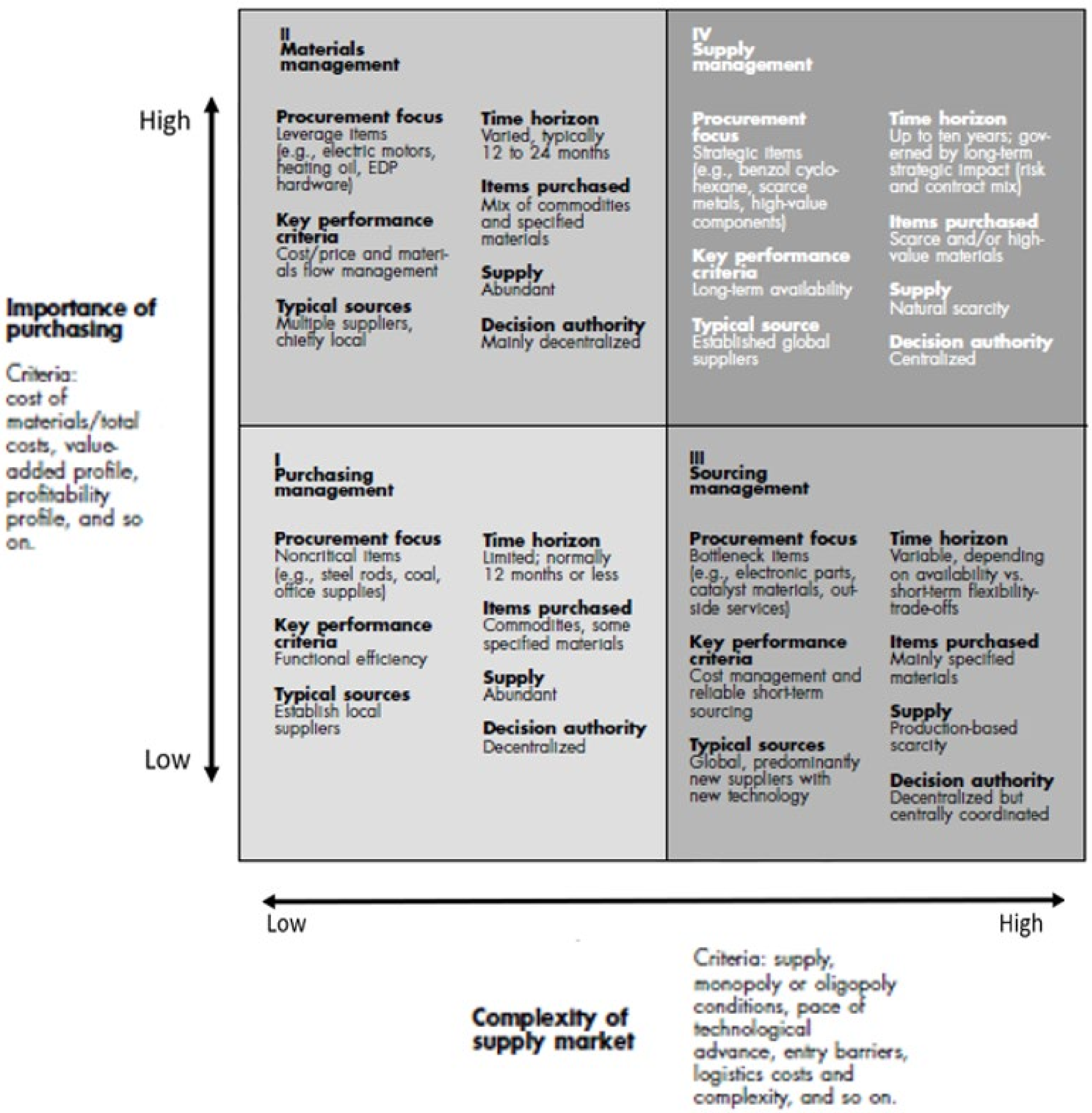

Figure 5. Kraljic's Supply Matrix. Source: Kraljic (1983).

F. SPEND ANALYSIS

Spend analysis is the practice of evaluating expenditures to find ways of cutting costs, improving efficiency, or enhancing the relationships between an organization and its suppliers (Sievo, 2021). The process requires the analyst to conduct data collection, data cleansing, data classification, and data analysis (Sievo, 2021). Spend analysis creates actionable information to help managers improve buying power and cost performance (Moore et al., 2004). Conducting a spend analysis on procurement produces data that could serve as a baseline to gauge progress. Additionally, spend analysis outcomes could provide reliable data for making strategic savings (Sievo, 2021). Figure 6 provides a visual of the key benefits of spend analysis according to Sievo (2021).

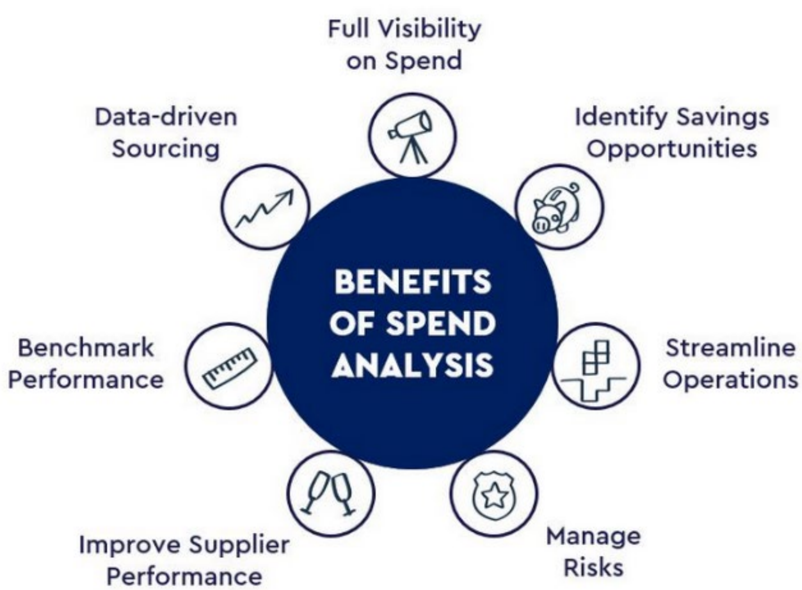

Figure 6. Benefits of Spend Analysis. Source: Sievo (2021).

Spend analysis has been used to analyze and study various aspects of the U.S. Navy's acquisition operations. Brill and Surarujiroj (2019) used spend analysis to study how the Navy procures studies and analysis services. In their research, they reviewed contracting offices, contractors, types of services, and types of contracts. Because studies and analysis services directly influence defense capabilities, the spend visibility was important to decision makers. The spend analysis outcomes provided Navy leadership multiple opportunities to look at how money was being spent, whether the contracting operation was proficient, and the state of contractor-contracting officer relationships. Additionally, the research provided a baseline strategy to improve strategic sourcing for national defense strategies (Brill & Surarujiroj, 2019).

Spend analysis was also used at the Naval Postgraduate School to research prospects for strategic sourcing in the school's contracting office (Lyons et al., 2014). Lyons et al. (2014) enumerated areas where efficiency could be gained. They recommended reducing the number of contractors to lower the number of contract actions awarded in addition to using Indefinite Delivery Indefinite Quantity (IDIQ) contracts. They also recommended a robust taxonomy structure to categorize requirements (Lyons et al., 2014). Similarly, Moore et al. (2004) used spend analysis techniques to analyze the Air Force centralized expenditure data source, known as DD350 data. The DD350 data contains 96% of all Air Force contract transactions. The outcome of the spend analysis identified areas where the Air Force could gain efficiencies. These included the following recommendations (Moore et al., 2004):

- Consolidate multiple contracts from the same or similar contractors.
- Group contracts if they were awarded to a particular contractor and have the contractor ID codes and purchase office codes to reduce the cost of contract administration.
- Examine all sole-sourced goods or services contracts to find ways to increase Air Force leverage over the contractors. (Moore et al., 2004, pp. 31–43)

The results of a spend analysis can reveal to what extent an organization is operating in a full and open competitive environment and how it can improve its competitive contract environment. The next sections discuss the contract life cycle, competitive contracting, the importance of competition and sole-source contracting.

G. THE CONTRACTING LIFE CYCLE

The DOD follows the National Contract Management Association's (NCMA) Contract Management Standard (CMS) Publication for its Contracting Competency Model. The CMS includes the contracting life cycle. As depicted in Figure 7, the contracting life cycle can be viewed through three distinct phases: pre-award, award, and post-award. We discuss the parameters of the contracting life cycle to better explain and examine how sole-source relationships are formed and managed within a contract (DOD, 2020).

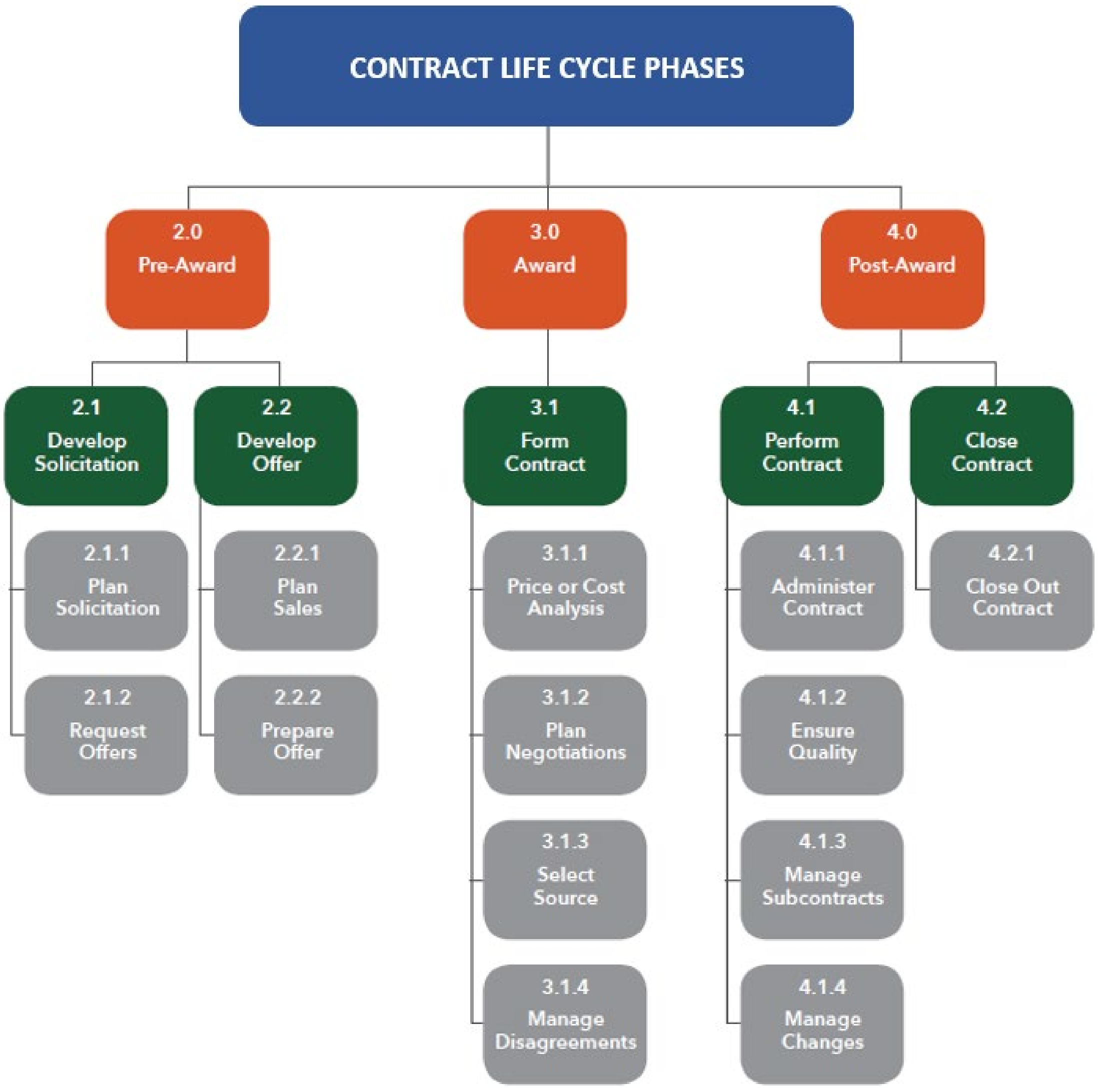

Figure 7. The Contracting Life Cycle. Source: National Contract Management Association (2019).

1. Pre-Award Phase

The pre-award phase is the first phase in the contracting life cycle, it begins with developing a solicitation which involves planning the solicitation and requesting offers.

The pre-award phase also includes developing the offer which involves planning the sales and preparing the offer. Many of the elements in the pre-award phase play a critical role in shaping competition when soliciting companies for government requirements (NCMA, 2019). The government's tasks during the pre-award phase are:

- Shape internal customer requirements.
- Conduct market research.
- Perform risk analysis.
- Formulate contracting strategy.
- Finalize and execute solicitation plan.
- Prepare solicitations.
- Issue and amend solicitations. (NCMA, 2019)

2. Award Phase

The second phase is the award phase which involves all work between the government and the selected offeror to generate a contract. The award phase includes forming the contract which involves cost and price analysis, planning negotiations, source selection, and the management of disagreements. The overall goal of this process is to ascertain a fair and reasonable price while meeting all government requirements (NCMA, 2019). The government's tasks during the award phase are:

- Evaluating offers.
- Conducting negotiations (as applicable).
- Selecting the source.
- Awarding the contract(s).
- Debriefing offerors.
- Addressing mistakes in offers. (NCMA, 2019)

3. Post-Award Phase

The post-award contract life cycle phase starts after the contract is awarded. This phase includes both "contract administration" and "contract closeout" (NCMA, 2019). The goals of contract administration are to mitigate risk while improving the probability of successful contract performance. Although contract administration tasks differ considerably depending on the contract complexity, both the government and the contractor are actively involved in the contract administration process to ensure satisfactory contract performance and to bring the contract to a successful conclusion (NCMA, 2019). Government and contractor tasks during the post-award phase are:

- Administer contract.
- Ensure quality.
- Manage subcontractors.
- Manage changes.
- Closeout contract. (NCMA, 2019)

In the next section we discuss competitive contracting and why competition is important to DOD.

H. COMPETITIVE CONTRACTING

Levenson (2014) evaluated the competitive situations relevant to the DOD's attempt to manage the cost of Major Defense Acquisition Programs (MDAP). These were grouped under four categories: competitive pressure on profit margin, bidding accuracy, innovation, and incumbent advantages. Surprisingly, the result from the study called into question the reasoning behind promoting competition based on cost saving. Levenson (2014) demonstrated that cost increased in situations where competition existed. Competition in defense acquisition does not always lead to actual cost reduction but creates a compelling perception of cost control (Levenson, 2014). Moreover, the post award modification phase of a competitively awarded contract is a sole-source environment. Therefore, the government would require certified cost and pricing data to make a fair and reasonable determination if the contract exceeds the TCoPD threshold. TCoPD will be discussed in detail after sole-source contracting.

Nevertheless, since 1809, when Congress passed the law advocating "formal advertising" for procurement contracts, there has been a strong preference for competition in government acquisition. However, competition in government contracting has ebbed and flowed throughout history. There have been times when legislation strengthens competition requirements only to be followed by other legislation that relaxes those same requirements to meet the nation's demand in peacetime or wartime. The 1984 Competition in Contracting Act (CICA) set the foundation and requirement for "full and open competition through the use of competitive procedures." Over the years, the CICA has been amended to provide alternatives to competition under specific conditions (Levenson, 2014).

When a competitive bidding situation leads to a reduction in the profit margin, a sole-source supplier is not affected by this pressure. However, in a competitive environment, each competitor will be under pressure to cut or negotiate the margin of profit to support their competitive position (Levenson, 2014). Often a struggling business will be willing to cut the profit margin significantly to win a contract by beating its competition with lower prices. Studies show that the low bids promise cost savings to the government but may in fact turn out costly when the winning company is unable to meet contract expectations and product delivery schedules (Levenson, 2014). The government can mitigate this risk by moving away from a Lowest Price Technically Acceptable (LPTA) strategy and by selecting the appropriate source selection methodology. The government can also conduct cost realism or cost competitive analysis to determine if the cost is too low or too high (Berteau et al., 2011).

Additionally, when the contract involves developing a new technology or equipment, there are extra uncertainties to consider as the item price determination is not straightforward. Contractors use best judgement and analysis to estimate cost when submitting an offer. This is different in the commercial market where before a product is put on sale it goes through development and an initial production run and cost estimates reflect actual cost. Commercial market suppliers can therefore accurately gauge demand, evaluate the competition, and set prices and production rate to maximize profit. However, inaccurate price estimates in government contracting environment can lead to an increase in cost overruns (Levenson, 2014).

Innovation in design or production can offer overall cost reduction because advanced manufacturing methods have the potential to cut down production costs to levels lower than the costs of prevailing methods. In this case, competitive contracting is preferable to sole-source contracting. Widespread merger and acquisition in the DIB have created powerful incumbents with greater capabilities and experience unmatched by potential competitors and new entrants. It is therefore difficult to introduce competition. Levenson (2014) added that the incumbent capability and infrastructure give it competitive advantage over any potential newcomer. Additionally, the threat of new entrants is low since the incumbents develop market knowledge and information systems that allow it to accurately estimate cost better. A potential competitor not having the same deep knowledge of the market may easily miscalculate developmental expenses. However, competitive contracting environments often combine the two factors and create an impression that the incumbent and the newcomer are equals (Levenson, 2014).

However, Gansler (2011) demonstrated that competition works. He described the transformation that both government and the DIB need to make to ensure competition drives down cost. He argued that the prevailing model of an increasing defense spending on outdated weapon systems must be replaced by strategies combining a healthy economy, and effective foreign policy, and a stronger but more affordable national security posture (Gansler, 2011). The next section details the importance of competitions.

I. WHY IS COMPETITION IMPORTANT?

The GAO (2013) stated, "Competition is the cornerstone of a sound acquisition process and a critical tool for achieving the best return on investment for taxpayers" (p. 1). The CICA of 1984 aimed to encourage competition, decrease cost, and increase performance. CICA instituted the standard of "full and open competition" for most procurements while also permitting some exceptions to competition (DOD, 2014). Additionally, the Defense Department (2014) stated that contractor competition is important for the following reasons:

- Competition creates an incentive for contractors to provide goods and services at a lower price (economic efficiency).
- Competition spurs innovation of transformational technologies, which enables the DOD to field the best weapon systems for our warfighters quickly.
- Competition yields improvements in the quality of products delivered and services rendered (firms that produce low quality are driven out of the market).
- Competition allows the DOD to acquire performance improvements (e.g., faster, lighter, more sustainable) by using "best value" source selection criteria.
- Competition provides opportunities for small businesses to enter new markets.

- Competition enhances the DIB, which provides an operational surge capability to meet demand spikes during periods of increased operational requirements.
- Competition curbs fraud by creating opportunities to reassess sources of goods and services, reinforcing the public trust and confidence in the transparency of the Defense Acquisition System. (DOD, 2014)

Government acquisition policies prefer and attempt to promote defense contractor competition. The FAR permits sole-source contracting only when circumstances do not make the competitive process a viable route to meet mission requirements. Even in those situations, the regulation encourages practices deliberately designed to ensure that the transaction is fair and reasonable to the taxpayer, defense contractor, the government, and end-user. The next section discusses sole-source contracting.

J. SOLE-SOURCE CONTRACTING

Government policies and regulations have historically encouraged competition in favor of sole source contracting. An 1809 legislation stated that "all purchases and contracts for supplies or services . . . shall be made by open purchases." Despite these preferences sole-source contracting persists (Turley, 2019). There are statutes and regulations that create room for contracting when it is not feasible to do full and open competition. The 10 U.S.C. 2304(c) provides authorization for contracting without going through full and open competition when certain conditions are met (Contracts Competition Requirements, 1977). A sole-source (or other than full and open competition) contract occurs when the government does not go through the typical competitive process before awarding a contract. This usually happens when the government has determined that the only source available to meet requirements is the prime contractor (AcqNotes, 2021).

Similarly, FAR 6.3 lists situations under which "contracting without providing for full and open competition" is authorized. It is mandatory for the contracting officer to provide justification in writing when negotiating a sole-source contract or before making a contract award without providing for full and open competition. However, competition is not appropriate in all situations, the FAR 6.302 (2021) lists the following circumstances for awarding sole-source contracts:

- Only one responsible source and no other supplies or services will satisfy agency requirements. (FAR 6.302-1, 2021)
- Unusual and compelling urgency. (FAR 6.302-2, 2021)
- Industrial mobilization, engineering, developmental or research capability, or expert services. (FAR 6.302-3, 2021)
- International agreement. (FAR 6.302-4, 2021)
- Authorized or required by statute. (FAR 6.302-5, 2021)
- National security. (FAR 6.302-6, 2021)
- Public interest. (FAR 6.302-7, 2021)

Contracting officers are also required to certify that their sole-source justification is accurate and complete, and must obtain the approval before moving forward (AcqNotes, 2021). Contracting officers are required to write in their justification statement an explanation for why they decided that the sole-source award was the best decision for the mission, the government, and the taxpayer (Turley, 2019).

Gansler et al. (2009) discussed a case where sole-source contracts were used during Operation Iraqi Freedom to support requirements to prevent increasing casualties count resulting from roadside bombs. Two contractors, Force Protection, Inc. and Armor Holdings International, were each awarded a sole-source contract to produce mine resistant vehicles for the U.S. Army. The awards were justified on the basis that the requirements met the compelling urgency criteria (Gansler et al., 2009). Later, even after the vehicles were developed and delivered for operational use, the government kept using sole-source awards for subsequent orders. However, those subsequent awards experienced cost and schedule overruns (Gansler et al., 2009). As a result, in 2007, about 15 contracts valued at $2.2 billion awarded to those two companies for the vehicles were audited by the Defense Department Inspector General (Jolliffe et al., 2007). The audit found many irregularities, one was that Force Protection, Inc. and Armor Holdings International were not the only contractors capable of producing the vehicles. However, all the awards went to the two sole-source contractors. The audits also noted that two prime contractors were not motivated to meet production schedules. For example, of the 122 vehicles produced, 120 (98%) were delivered late (Jolliffe et al., 2007). Gansler et al. (2009) noted that bringing in competition creates incentives to lower costs while ensuring efficiency and delivery schedule accuracy.

Therefore, although sole-source contracts are essential they should only apply when justifiable reasons exist and their use should be rare and limited (Gansler et al., 2009).

Moreover, a sole-source environment presents multiple supply chain risks to Navy readiness. Dealing with a single repair contractor may be effective during normal operations but can impact reliability, resiliency, and readiness when the operational tempo increases. Also, single-source contracting does not promote the geographical dispersion of contractors (Gansler et al., 2009). Contractors may choose to forgo doing business with the government and repurpose their facilities to support the commercial market. An effort is therefore required to promote competition now to support a future high-tempo environment.

Additionally, researchers at the Naval Postgraduate School conducted a study showing the plight of contracting officers when operating in a sole-source environment. 90% of respondents in the survey study reported that they operate with a negotiating disadvantage when contracting in a sole-source environment (Hartmann et al., 2020). Additionally, the respondents identified two constraints in their qualitative responses. First, the sole-source environment itself contributes to the problem and second, many respondents reported that they also operate at an informational disadvantage compared to their private counterparts (Hartmann et al., 2020). One way of supporting contracting officers in an environment like this to make fair and reasonable determination by utilizing TCoPD. TCoPD is discussed in the next section.

K. TRUTHFUL COST OR PRICING DATA

TCoPD formerly known as TINA, requires an offeror to produce certified cost or pricing data if an ensuing purchase exceeds the TCoPD threshold. The TCoPD threshold applies to the following contracts (DFARS 215.4, 2020). Contracts that exceed $2,000,000 if awarded after June 30, 2018, and contracts that exceed $750,000 if awarded on or before June 30, 2018.

Under TCoPD, the contracting officer is required to obtain “accurate, complete, and current data” from the offeror to verify a “fair and reasonable price” (FAR 15.4). TCoPD also permits a “price adjustment remedy” if a contractor did not previously provide “accurate, complete, and current data” (FAR 15.4). However, the TCoPD requirement comes with a cost—more precisely, schedule cost. A case in point is when the government requested high-quality and highly detailed certified cost and pricing date from subcontractors working with the primes on the F-35 Lightning II program, the opposition from the contractors and negotiation resulted in the program schedule slipping (Lorell et al., 2018).

In the following section we discuss exemptions to certify cost or pricing data requirements. For exemptions, the head of activity is required to clearly document whether supplies or services could not otherwise be obtained without an approved waiver. TCoPD waivers must be carefully considered and only be approved in circumstances that the government would be unable to fill a specific requirement without a waiver. The following is a good representation of when a waiver is applicable. If the requirement is mission essential, sole-source, and the contractor is unwilling to release the required data. Even if an exception is applicable, the contracting officer must still establish price reasonableness. Additionally, the procuring agency should still seek a strategy for procuring the requirement in the future without a waiver. Examples of such strategies include developing a second source, selecting a suitable substitute, or seeking organic production within the DOD through additive manufacturing, reverse engineering, or another organic method (DFARS 215.4, 2020). These methods among others for creating and maintaining a competitive environment and the DOD better buying power initiatives are discussed in the next section.

L. BETTER BUYING POWER INITIATIVES

In 2010, under the leadership of Under Secretary of Defense for Acquisition, Technology, and Logistics Ashton Carter, the DOD released the Better Buying Power (BBP) initiative. The BBP initiative was designed to achieve increased productivity and efficiency in DOD expenditure by enhancing the overall effectiveness of the Defense acquisition enterprise (Kendall, 2011). Since then, two additional iterations have been released from the DOD: BBP 2.0 and BBP 3.0.

The following section focuses on the guidelines in Area 5 of BBP 2.0 entitled "Promote Effective Competition, Emphasizing Competition Strategies, and Creating and Maintaining Competitive Environments as an Opportunity for Improving Our Competitive

Posture Within the Department." These rules are aimed to support and work in conjunction with the following four primary principles found in BBP 2.0:

- Think and not default to the "school solution."
- Attract, train, and empower acquisition professionals.
- Start with the basics, the acquisition fundamentals work.
- Streamline decision-making. (DOD, 2014, p. 1)

M. CREATING AND MAINTAINING A COMPETITIVE ENVIRONMENT

The DOD has been largely effective with competing a program at the start of its life cycle but once a contract is awarded, the government becomes locked in a sole-source relationship with the winning prime contractor or service provider. This situation is called "vendor lock" (DOD, 2014). When these events occur, which is often the case with WSS contracts, it places the DOD in a disadvantaged position during contract negotiation. In a noncompetitive environment, the government has no leverage in controlling program cost increases. Therefore, operating continuously in a competitive environment at every stage of a program's life cycle is the preferred situation for the government (DOD, 2014). General techniques and approaches for creating and maintaining a competitive environment as adapted from BBP 2.0 and other sources are listed here.

(1) Conduct Thorough Market Research

Information gathered from market research can be used to determine what services or products are commercially available to meet the government needs. The government then makes the determination on whether any of the identified commercial services or products can adequately resolve the requirement or if there is a need to modify the requirement to be able to use any of the commercial solutions. Once the determination is made, the government can pursue full and open competition to acquire the service or product. If that is not possible, the government can pursue a limited or other than full and open competition. Market research can also be used to ascertain if another government agency has already procured the same service or product or has the intellectual property or data rights. If another government agency owns the data rights it could be used to support the new requirement by generating competition. Market research can also reveal alternative suppliers (DOD, 2014).

(2) Promote Small Business

Small business set-aside authority should be utilized anytime the market research suggests it is reasonable and practical. The small business set-aside authority is designed to stimulate growth in the industrial base and nurture healthy competition. Maintaining a robust small business presence in the DIB provides enough competition and support at both the prime and subcontractors level which leads to significant cost savings (DOD, 2014).

(3) Employ Open Systems Architecture

The government should use open systems architecture (OSA) methods every time there is a supporting business case. In some situations, developing an open system tends to be cost effective when it leads to a decrease in material cost because of using commercially available interfaces. This can eventually result in efficient maintenance and modification throughout the program life cycle. Open standards and open business principles can be applied to open system architecture to develop a competitive acquisition environment. OSA uses modularization and applies the comprehensive and rigorous technique of separating the modules into individual parts. These technical procedures deliver components that could be procured form different contractors, thereby enabling competition. OSA supports better prospects for competition aimed at increasing innovation especially at the systems and subsystem levels (DOD, 2014).

(4) Utilize Intellectual Property to Enable Future Competition

Another approach to increase competition is the acquisition, ownership, and utilization of intellectual property and data rights. The acquisition strategy at a program office should therefore include the requirement to acquire and maintain technical data for critical technologies. The intellectual property strategy should be structured to provide support through the acquisition and sustainment phases of the program. The strategy must be designed to capably increase competitive options and sustain competition throughout the program's life cycle. These include subsequent procurement of repair and spare parts, ability to be adjusted and altered to seamlessly work with multiple systems, and capacity improvements or technology incorporation (DOD, 2014). However, data rights procurement is expensive. The government must explore balancing necessary cost analysis to procure intellectual property and data rights to support the sustainment of a weapon system (Murray, 2012).

(5) Utilize Data Rights Previously Secured

"Data rights" implies a specific form of intellectual property license that gives the DOD the power to make use of or distribute certain identifiable technical data or computer software (DOD, 2014). In general, the Defense Federal Acquisition Regulation Supplement (DFARS) 252.277-7017 clauses govern the type of data rights to be released to the government. When the government owns the data rights it maintains its options on subsequent contract award. A good example of where the Navy used previously acquired data rights to reduce cost is with the main reduction gear (MRG) program that is used on the Arleigh Burke (DDG 51) class of destroyers (DOD, 2014). The Navy had previously acquired the technical data for the MRG. As a result, when the original equipment manufacturer (OEM) was acquired, and the new owners increased their prices the Navy furnished the data to other contractors during the contracting process and was able to secure a fair and reasonable price from a different contractor. This ability to compete the award was possible because the Navy owned the intellectual property rights (DOD, 2014).

(6) Dual Sourcing

Dual sourcing is a process where a contract is solicitated competitively and an award is made to two or more contractors where the contractor with the lowest price receives a bigger portion of the award (DOD, 2014). A business case analysis is required to make the determination on using dual sourcing. Contracting officers are required to factor in cost and schedule implication of maintaining two or more development pipelines and supporting multiple competing contractors. Dual sourcing must support the interest of the Navy. A good example of the use of this strategy is how the Navy maintains and supports two surface combatant shipyards. The Navy has determined that having the two shipyards is cost effective because it a provision for surge in future demands for ships (DOD, 2014).

(7) Competitive Multi-Sourcing with Distributed Awards

This is a way to develop the capacity of an alternative contractor in case the prime contractor fails to meet expectation. This strategy is different from the standard dual sourcing mainly because the alternate contractor is not awarded a substantial share of the contract but receives enough money to develop an alternative product to compete with the winning contractor (Wydler et al., 2013). The government provides support to the alternative contractors to keep them in the competition (DOD, 2014).

(8) Reverse Engineering

Reverse engineering involves the physical replication of an item while maintaining its dimensions and utility in the new product. This is achieved by physical measurement and evaluation of an original component to recreate the physical attributes and data required for competitive sourcing (DOD, 2014). This method maybe effective if the original item was procured under sole-source conditions and is viable for increasing competition if the item is of high dollar value since reserve engineering is not normally economical for the government (DOD, 2014). Nevertheless, reverse engineering is necessary in situations where the government does not have access to the intellectual property, the design drawings are not suitable, and there are no prime contractors available to meet government requirement. A cost benefit analysis covering the items entire life cycle is useful to assist in determining whether to pursue reverse engineering (DOD, 2014).

(9) Reverse Auctioning

Another method that could suit the government is reverse auctioning. As the name suggests, this is different from traditional auctioning in that with reverse auctioning there is one buyer and multiple sellers (DOD, 2014). The government as the buyer in this case begins the reverse auction process to meet a government requirement with a built-in function for price adjustment and time limitation. The start date is published and extensively circulated to allow maximum participation from contractors as multiple contractors are allowed to bid (DOD, 2014). Each bidder can see the price competitors are offering at every stage in the process. In the end the contractor with the lowest price wins and the entire process can occur online. Reverse auctioning had been effectively used by the Defense Logistics Agency and other government agencies. It is an effective tool to meet government requirements while ensuring that prices are fair and reasonable (DOD, 2014).

(10) Indefinite Delivery Indefinite Quantity Contracts

Indefinite Delivery Indefinite Quantity (IDIQ) contracts are designed to allow indefinite quantities of supply or services over a specified period. IDIQs support simplification of contracts and increase delivery time for products and services (DOD, 2014). This type of contract is situatable for supporting contracts designed to meet repairs or architect-engineer related needs. The prime contractor is awarded a base year contract with option years that government can exercise. The contract will have a limit for the maximum and minimum quantities or money that can be spent (DOD, 2014). Therefore, when requirements are generated, contracting officers submit delivery orders or task orders on the base contract to meet the supply or service needs respectfully. IDIQ can be designed to eliminate barriers to competition, with a period of performance reasonable enough to ensure the government is not locked in a deal for too long and is unable to take advantage of the latest development and innovation in a competitive environment (DOD, 2014).

(11) Indirect Competition

Indirect competition is achieved when an incumbent contractor or service provider is made to believe the government has multiple alternative contractors. This threat from indirect competition can be achieved by using every necessary means to reduce the "switching costs" of moving from one contractor to another (DOD, 2014). Furthermore, if another contractor can produce at good price-performance trade-off, the "threat" become compelling. The DOD can use OSA or competition to achieve the same mission to reduce "switching costs" (DOD, 2014). Indirect competition can demonstrate an early deployment of a state-of-the-art technology, an available commercial off-the-shelf system, or a new upgrade to existing capabilities. For example, the F-35 Helmet Mounted Display System was able to reduce supply risk by employing indirect competition when the program office introduced a second contractor with a direct supply base (DOD, 2014). The aim of using this method was to create performance and cost benefits by adding an alternate supplier with the potential of replacing the original prime contractor who was encountering significant technical difficulties. The competitive strategy offered possible cost reductions and technical improvements that might not have been achieved without the introduction of a second source (DOD, 2014).

(12) Technology and Artificial Intelligence

The DOD has an opportunity to leverage technology and artificial intelligence (AI) to bridge the gap between the DOD and industry. This method is not included in BBP 2.0 but could prove to be an excellent method for increasing competition within the defense industry. Porter's five forces model as applied to the defense industry revealed that barriers to entry are high within the DIB. Companies like GovShop could be utilized by both industry and various levels of government to lower these barriers to increase competition. The Air Force Director for Strategic Sourcing said,

> The features in GovShop are a gamechanger. With inclusion of hundreds of thousands of non-traditional vendors and the ability to search by socio-economic status and by proximity to an installation we can reach far deeper into the commercial vendor base, increase small business participation, and increase competition. And we can do this instantaneously. (GovShop, n.d.)

The site is a user-friendly portal that is open for free to all government agencies, as well as suppliers. It provides an easy way for buyers to search for new suppliers through an open search term feature, as well as by specific product or service categories. The site provides access to a market intelligence library hosted by the Public Spend Forum and is a high-resolution supplier intelligence platform designed specifically to help the government find the right suppliers and partners. The site uses AI-enabled rapid market intelligence to quickly identify qualified suppliers. The site also provides advisory consulting powered by AI, tech scouting, AI-enabled requirements development, supply chain studies and assessments. The site currently has the capability to connect more than 2 million suppliers to more than 250 government agencies utilizing more than 62,000 contract vehicles (GovShop, n.d.).

(13) Leader Company Contracting

Leader company contracting (LCC) is an outstanding acquisition method that is applicable in special circumstances and can be utilized when allowed by agency procedures. The method works when a prime contractor or sole-source developer of a product or system is awarded a contract under LCC as the leader company and is required to provide technical assistance and knowledge under a contract agreement to a single or multiple designated follower contractor, to develop their capacity to become proficient suppliers (FAR 17.401, 2021). Leader-follower contracting was successfully used for the Advanced Medium Range Air-to-Air Missile (AMRAAM) program (GAO, 1990). The contract was awarded to Hughes Aircraft Company as the lead prime development contractor under a leader-follower contract. Raytheon Company was assigned as the follower to learn and assist in the missile's development. The relationship helped Raytheon to develop to become a major player in the industry (GAO, 1990).

According to the DOD the objectives of the LCC method are to:

- Reduce delivery time.
- Achieve geographic dispersion of suppliers.
- Maximize the use of scarce tooling or special equipment.
- Achieve economies in production.
- Ensure uniformity and reliability in equipment, compatibility, or standardization of components and interchangeability of parts.
- Eliminate problems in the use of proprietary data that cannot be resolved by more satisfactory solutions.
- Facilitate the transition from development to production and to subsequent competitive acquisition of end items or major components. (DOD, 2014)

Like most acquisition regulations, LCC has statutory limitations. The government shall retain the authority to approve prime contractor and subcontractor relationship when leader company contracting is used (FAR 17.4, 2021). With reference to FAR 17.402a, leader company contracting should only be used when

- The leader company has the necessary production know-how and is able to furnish required assistance to the follower(s).
- No other source can meet the government's requirements without the assistance of a leader company.
- The assistance required of the leader company is limited to that which is essential to enable the follower(s) to produce the items.
- Its use is authorized in accordance with agency procedures (FAR 17.4, 2021).

FAR 17.4 (2021) establishes the procedures for awarding contracts under LCC to a prime contractor:

- Leader company, obligating it to subcontract a designated portion of the required end items to a specified follower company and to assist it to produce the required end items
- Leader company, for the required assistance to a follower company, and a prime contract to the follower for production of the items
- Follower company, obligating it to subcontract with a designated leader company for the required assistance. (FAR 17.4, 2021)

One of the key tenets of LCC techniques is that contracting officers are required to make sure LCC contracts contains "a firm agreement regarding disclosure, if any, of contractor trade secrets, technical designs or concepts, and specific data, or software, of a proprietary nature" (FAR 17.4, 2021). Interestingly, there is no DFARS 217.4 detailing the application of LCC in the DOD. This is a testament to why this powerful procedure is relatively unknown among DOD contracting officers.

A 2005 RAND report titled, *Priced-Based Acquisition Issues and Challenges for Defense Department Procurement of Weapons Systems* found another successful application of LCC. At that time LCC was known as leader-follower contracting. This example includes Pratt & Whitney and General Electric. The two contractors manufacture close substitutes that were similar in "form-fit-function," but the items were not the same. The substitute items were the Pratt & Whitney F100 and the General Electric F110 engines. Both the engines possessed the capability to power the F-15 and F-16 aircraft for the Air Force. However, Pratt & Whitney won the original contract award, but reliability issues drove DOD to find a second competitive producer by utilizing the leader-follower program General Electric was able to become a second source of supply for DOD (Lorell et al., 2005).

N. SUMMARY

This chapter reviewed existing literature on sole-source and competitive contracting. It also highlighted key concepts to help understand the supply chain risks associated with operating in a sole-source environment and the importance of competition. We also introduce spend analysis, which we used extensively to analyze the current operation at NAVSUP-WSS. This literature review and our study, in general, contribute to the resource dependency theory. The theory was reviewed in this chapter. Finally, we reviewed multiple ways to increase competition within the defense industry. Chapter III provides an overview of the NAVSUP-WSS organization.

III. NAVSUP-WSS BACKGROUND

A. INTRODUCTION

In this chapter, we provide an overview of NAVSUP-WSS. We discuss its organizational structure and mission. Here, we follow NAVSUP-WSS from its origins in 1917 and then navigate through its restructuring history and mission orientations to today's Navy Sustainment System-Supply (NSS-Supply) initiative, which in our view is the future of Navy supply chain management. Finally, we present some challenges facing NAVSUP-WSS contracting.

B. COMMAND ORGANIZATION

NAVSUP-WSS is one of NAVSUP's 11 major subordinate commands. The NAVSUP-WSS mission is to support the weapon systems, programs, and supply support functions of the Navy, Marine Corps, Joint forces, and allied countries to maintain the readiness of these naval forces. NAVSUP-WSS conducts this mission as a single organization that operates from its three main sites in Philadelphia, PA, Mechanicsburg, PA, and Norfolk, VA. Figure 8 presents an overview of the NAVSUP command structure highlighting WSS as one of NAVSUP's major subordinate commands (NAVSUP-WSS, 2021).

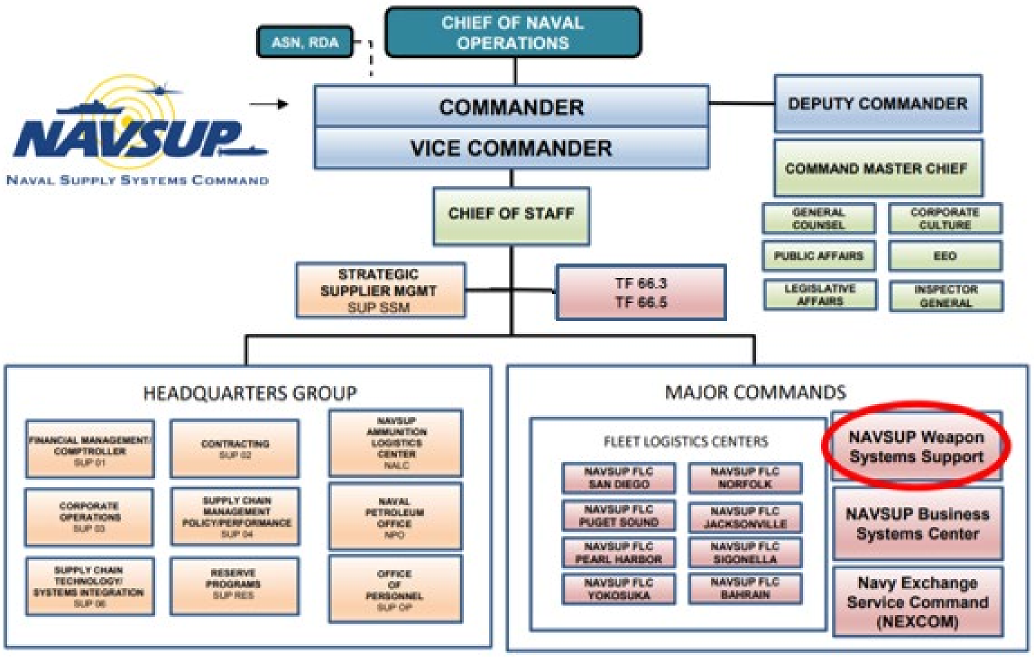

Figure 8. NAVSUP Enterprise Organizational Chart.
Source: NAVSUP (2021).

C. GENERAL HISTORY

NAVSUP-WSS was originally created with the establishment of the Naval Aircraft Factory in 1917 at the Philadelphia, PA, Naval Shipyard, and the establishment of Ships Parts Control Center (SPCC) in 1944 at the Navy Supply Depot in Mechanicsburg, PA. The Naval Aircraft Factory was built to undertake aircraft construction and aeronautical developments in support of the United States World War I efforts (Naval History and Heritage Command, n.d.). To support the expansion and increased complexity of the naval air system during the onset of World War II, the Naval Aviation Supply Office (ASO) was established in 1941, with 200 civilian personnel and 14 active-duty officers at the Naval Aircraft Factory. By 1945, when the war ended, the depot employed 5,332 civilians, 507 officers, and 676 enlisted workforces (NAVSUP-WSS, 2021).

SPCC was established in 1944 to function as a control center for Naval ship parts. In July 1945, SPCC became the single global manager for ship parts and engines components. However, its official commissioning occurred on July 24, 1953. In the 1960s, the Navy added submarine and reactor support at SPCC in the 1960s and merged all the activities in 1985. This development ensured that the ASO and SPCC became the two inventory control points delivering logistics support to the Navy (NAVSUP-WSS, 2021).

Subsequently, the Naval Inventory Control Point (NAVICP) was created by combining the Aviation Supply Office (ASO) and Ships Parts Control Center (SPCC) on October 2, 1995. The ASO remained in Philadelphia and the SPCC in Mechanicsburg. This merger ensured all the Navy's Program Support Inventory Control Point (PSICP) functions had a unified command. The merger helped to reduce overall costs and the infrastructure footprint and standardized many inventory management procedures. (NAVSUP-WSS, 2021).

In July 2011, the NAVICP became NAVSUP-WSS in a "One NAVSUP" rebranding initiative. "One NAVSUP" was structured to have each separate NAVSUP entity operate as a node within the NAVSUP network. The Transportation and Distribution (T&D) department was added to NAVSUP-WSS on October 1, 2014, as a stand-alone directorate (Code N3). The T&D operates from Norfolk, VA, providing personnel and cargo movement in support of naval operations. The realignment developed from a project undertaking by Naval Supply Systems Command–Global Logistics Support (NAVSUP-GLS), NAVSUP-WSS, and Naval Supply Systems Command Headquarters to ensure sustained performance improvement in NAVSUP-WSS's transportation decisions to support readiness across the Navy (NAVSUP-WSS, 2021).

D. CURRENT OPERATIONS

Today NAVSUP-WSS Philadelphia has more than 1,145 civilian employees; their primary focus is naval aviation and weapon system support. They support multiple aircrafts and platforms to include the F/A-18 and V-22. They also manage several engines, common avionics, and support equipment. NAVSUP-WSS Mechanicsburg has more than 1,240 civilian employees who support the hull, electrical, mechanical, and electronic spares and repair parts for ships, submarines, nuclear propulsion, and associated weapon systems (NAVSUP-WSS, 2021).

According to the NAVSUP-WSS website, the "Naval Materiel Supply Chain Management (SCM) is NAVSUP's largest product and service in terms of resources invested, with over 3,000 civilian, military, and contractor personnel involved; $43 billion of inventory on hand; and an annual material budget of over $6.6 billion" (NAVSUP-WSS, 2021). This includes about 430,000 class IX repair parts under the direct responsibility of NAVSUP-WSS. NAVSUP-WSS uses resources from the Navy Working Capital Fund (NWCF) to procure spares, repair damaged parts, and then returns the repaired parts back to the fleet for financial reimbursement. Naval Materiel SCM utilizes multiple procedures to meet the Navy's requirements by providing parts when and where they are needed, anywhere in the world (NAVSUP-WSS, 2021).

In providing Naval Materiel SCM, NAVSUP-WSS maintains a dual focus of fleet support and program support roles to deliver sustainment during the life cycle of a weapons system. NAVSUP-WSS provides the bulk of the Naval Materiel SCM effort from its two locations in Philadelphia and Mechanicsburg. Figure 9 lists the main efforts that NAVSUP-WSS executes in support of the Naval Materiel SCM (NAVSUP-WSS, 2021).

Fleet Support Role

- Determine Requirements
- Allocate Material
- Manage Repairs
- Contract Repair Services
- Develop Allowances
- Manage Financials
- Provide Customer Service

Program Support Role

- Life Cycle Management
- Reliability Improvement
- Interim Support
- Security Assistance
- Integrated Logistics
- Maintenance Planning
- Deployable Capability
- Configuration Management

Figure 9. WSS Fleet and Program Support Roles.
Adapted from NAVSUP-WSS (2021).

E. NAVAL SUSTAINMENT SYSTEM–SUPPLY

On October 19, 2020 the Navy kicked off the Naval Sustainment System (NSS)–Supply steering group. NSS-Supply seeks to "streamline the Navy's supply chains to decrease maintenance turnaround times, increase end-to-end velocity of spares, and reduce costs" (NAVSUP, 2021). The NSS-Supply combines best practices from the commercial market with good governance, process improvements, and oversight to increase productivity and efficiency in the Navy's processes. A new "Supply Effectiveness Figure of Merit" (SEFoM) became the central effort and the new paradigm for assessing supply performance. The SEFoM delivers data that can be indexed and used to measure readiness and cost implications of supply chains. Figure 10 depicts the six pillars of NSS-Supply to drive higher performance. Pillar four focuses on shaping the defense industrial base to increase contractor competition and strengthen partnerships with strategic providers (NAVSUP, 2021).

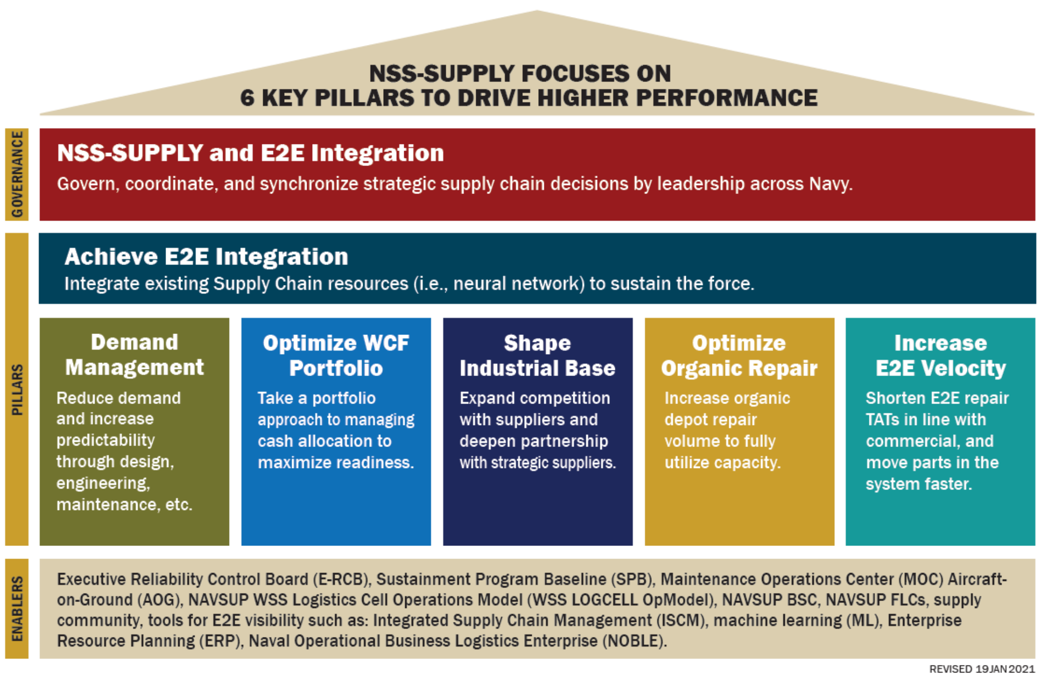

Figure 10. NSS-Supply Six Key Pillars to Drive Higher Performance. Source: NAVSUP (2021).

According to NAVSUP, the Navy's supply chain has been uncoordinated and lacking alignment for decades, which has produced several negative outcomes that include insufficient and unsustainable organic repair capacity, cash shortfalls, excess of unrepaired parts, high rates of part cannibalization, and all of these contribute to an overall degraded level of readiness for the Navy. The foundation of NSS-Supply incorporates commercial best practices from companies like Caterpillar and John Deere. End-to-end supply chain velocity focuses on moving parts in the supply chain faster by lowering repair turnaround times and unserviceable repairable condition queue times. NSS-Supply also aims to shape the industry base by expanding competition with suppliers and deepening partnerships with strategic suppliers to make commercial repairs more efficient and cost-effective, as depicted in Figure 11 (NAVSUP, 2021).

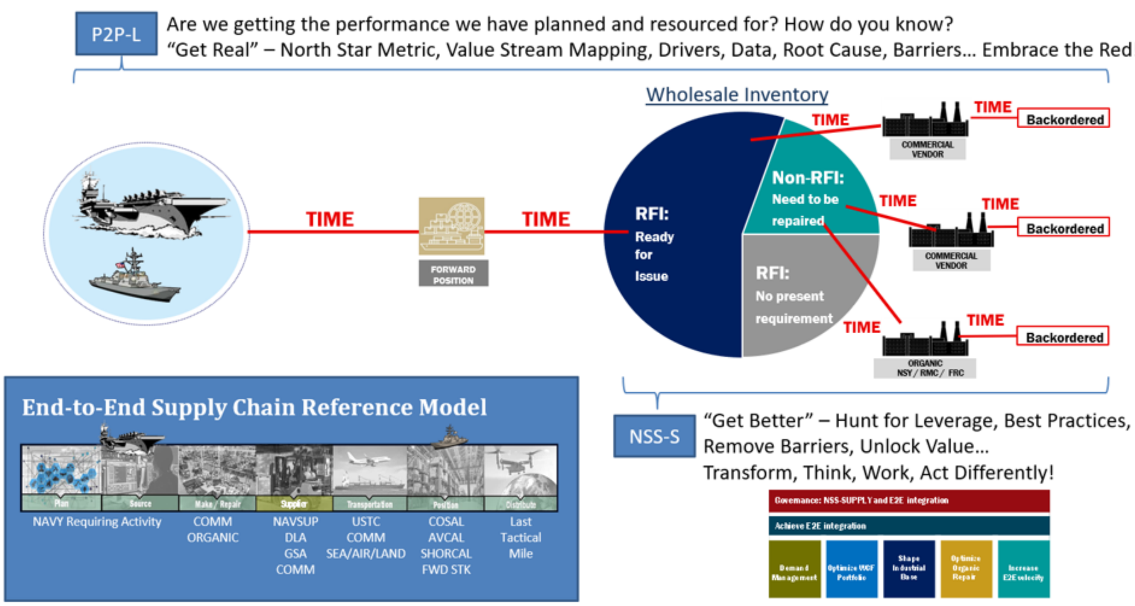

Figure 11. NSS-Supply End-to-End Supply Chain. Source: NAVSUP (2021).

F. CHALLENGES

There is a reason why sole-source contracting forms more than 80% of NAVSUP-WSS business. NAVSUP-WSS predominantly manages the Navy's weapon system spare parts and repairs of damaged systems. Defense weapon system procurements, by their very nature, may start out on a competitive basis, but becomes sole-sourced when a single contractor wins the bid (DOD, 2014). The noncompetitive sole-source environment increases supply chain risk, decreases supply chain resiliency, and threatens readiness levels across the fleet. Our study aims to find the strategies that WSS can use to increase contractor competition in a predominantly sole-source environment.

G. SUMMARY

This chapter presented an overview of NAVSUP-WSS and discussed its organizational structure and mission. We followed its early history and restructuring to its current operation and today's orientation in support of the Navy Sustainment System-Supply initiative (NSS-Supply). We also presented some challenges facing NAVSUP-WSS contracting. The next chapter introduces the methodology we used for this research.

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IV. METHODOLOGY

A. INTRODUCTION

In this chapter, we detail our data collection, data cleaning and synthesis, spend analysis, and data clarification. We also present how we employed a mixed-method approach that used qualitative and quantitative methodologies to conduct this research. The following is a detailed description of the primary research tasks we completed.

B. DATA COLLECTION

NAVSUP-WSS supplied all the data required for this research. We received more than 62,000 line items of contracting data for FY19 and FY20. That served as our primary source document, which provided an insight into NAVSUP-WSS operations.

C. DATA CLEANING

We conducted extensive cleaning on the data received from NAVSUP-WSS to prepare it for analysis. We used Microsoft Excel to complete this cleaning. We identified and removed duplicates, common mistakes, typographical errors, and missing information from the data using multiple iterations of pivot tables and conditional formatting. Our contact person at NAVSUP-WSS was able to provide clarification during follow-up communication with our team. Additionally, we ran a verification search to confirm the accuracy of unit prices and total prices per national item identification number (NIIN) and contract document using a built-in formula in Excel. We also used the built-in deduplication feature in Excel to identify line items that should belong to the same commercial and government entity (CAGE) code or company. All these processes made the data smooth and ready for spend analysis.

D. SPEND ANALYSIS

We conducted a spend analysis on the data from NAVSUP-WSS to glean an insight into the expenditures in Fiscal Years 2019 and 2020. We separated expenditure for repairs from spares procurement to allow for focused research and accurate comparison. We performed an in-depth data analysis to identify patterns and create visualizations to describe critical trends in NAVSUP-WSS expenditures. We initially sorted the data, then created four separate worksheets focusing on four unique problem sets. We only pulled data into these worksheets that were needed to run our pivot tables. We then created pivot tables to help us answer the following questions:

- How many contracts were awarded for the period under review?
- Among the contracts awarded, what percentage were competitive and noncompetitive by cost?
- Among the contracts awarded, how many were competitive and noncompetitive by contract type for spare and repair contracts?
- How many companies received awards during the period under review?
- Which were the top ten contractors that WSS contracted with for repair and spare contracts during FY19–FY20?
- What were the top ten NIINs awarded on a sole-source basis by contract line-item number (CLIN) frequency?
- What were the top ten NIINs awarded on a sole-source basis by the number of contract awards?

E. DATA CLARIFICATION

The NAVSUP-WSS team provided valuable information on the processes, methods, and outcomes of how the agency develop additional sources. These data come from the contracting department, the engineering department, the sources development office, policy office, and the small business administrative office. The information demonstrated how NAVSUP-WSS is promoting competition. We scheduled follow up telephone calls to clarify the data and gain insight into how NAVSUP conducts the programs that are geared toward increasing competition in its sole-source contracting environment. Due to time difference, works schedule, and availability of these points of contacts, we conducted a series of telephone conferences with our NAVSUP-WSS points of contact. The exchanges clarified the data and provided an insight into the challenges facing NAVSUP concerning source development.

Although the telephone conferences were a natural flowing engagement, which were meant to clarify pertinent information regarding the data and information NAVSUP-WSS had provided us, they also helped focus our research. We answered the following two pivotal questions that were central to our data analysis:

- What has NAVSUP-WSS done in the past to increase contractor competition?
- What can NAVSUP-WSS do to increase contractor competition in its sole-source environment?

F. DATA SYNTHESIS

We synthesized the data gathered throughout this research, spend analysis, and engagement with key stakeholders in a coherent process map to derive insight into contractors' characteristics and their ability to conduct business with NAVSUP-WSS. We then used the synthesized data to reengage with the points of contact. Our analysis enabled us to provide recommendations on methods to increase contractor competition in a predominantly sole-source environment.

G. SUMMARY

This chapter detailed the primary research tasks completed and provided a summary of our research outputs. We discussed our mixed method approach to identify and articulate the current expenditure at NAVSUP-WSS and proposed ways to increase contractor competition in a predominantly sole-source contracting environment. We also presented how we conducted our spend analysis and data clarifications. The next chapter discusses our analysis, results, and recommendation.

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V. ANALYSIS, RESULTS AND RECOMMENDATIONS

A. INTRODUCTION

This chapter presents the results after we applied the methodology described in Chapter IV. We also relied heavily on the knowledge we acquired from the various disciplines and concepts from the defense-focused supply chain curriculum we have been exposed to over the last year and a half of our studies. Our research was focused on answering the following research questions:

- Why is NAVSUP-WSS operating in a sole-source environment?
- What is the current NAVSUP-WSS strategy for increasing defense contractor competition?
- How can NAVSUP-WSS increase defense contractor competition in a predominantly sole-source environment?

Our assumption going into this study was that operating under a sole-source environment was not the preferred form of business for the Navy. This assumption is based on the problem statement provided by NAVSUP-WSS who both sponsored and provided data for this study. Our extensive literature review provided insight to link the sole-source operating environment to the resource dependency theory and supply chain risk. We conducted spend analysis to gain understanding into the operational picture of NAVSUP-WSS and the factors that create barriers for competition within the organization.

We narrowed our focus to concentrate on the top two items each that were frequently procured on a sole-source basis for both spares and repair contracts. We focused our discussion on the barriers NAVSUP has faced in their attempt to increase competition for these identified items and how to increase defense contractor competition for these items.

B. SPEND ANALYSIS RESULTS

The total amount spent during the period under review was $5,264,654,090. As depicted in Figure 12, one outlier spares contract for $129,933,334 was awarded on

September 25, 2019 and the NIIN purchased was 01-681-4894 (landing gear parts kit for F/A-18E/F/G). The unit cost was $1.624 million, the quantity purchased was 80 units each. This was a non-competitive contract with an acquisition method code (AMC) of 4 and acquisition method suffix code (AMSC) of C (Crespo, J., personal communication, May 28, 2021).

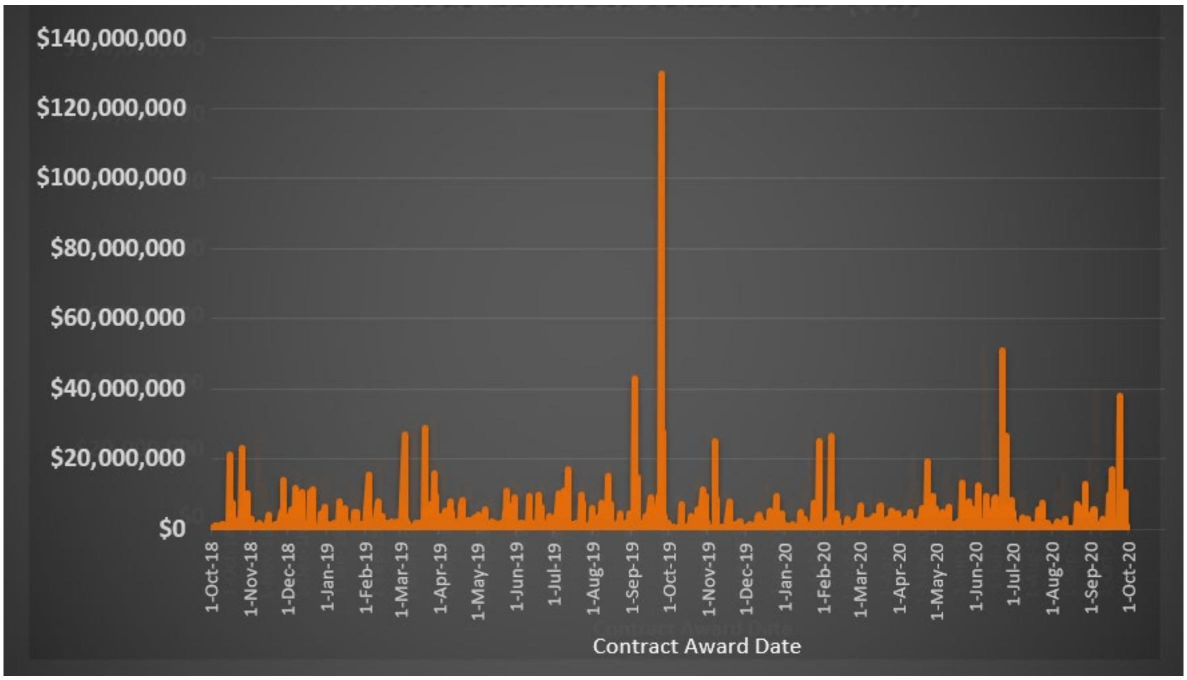

Figure 12. WSS Contract Totals FY19–FY20

According to the DFARS, an AMC of 4 indicates that the contracting officer should directly acquire this item from the original equipment manufacturer for the first time. Only one contract contained NIIN 01-681-4894 in our dataset for the period under review. An AMSC of C indicates that engineering source approval is needed for this item to preserve its quality. The government does not own the data rights. The approved OEM or prime contractor holds the intellectual property, the technical information and essential knowledge about the item. Acquiring the data would not be economical. If one prime contractor is on file, AMCs 3, 4, or 5 are applicable. However, if multiple contractors are approved or the government owned the data that could be used to develop and qualify additional contractors, then AMCs 1 or 2 are applicable (Appendix). A complete listing of the acquisition and repair codes and suffix codes are listed in Appendix.

a. How many contracts were awarded for the period under review?

Overall, 30,716 contracts worth $5.26 billion were awarded between FY19–FY20. Of those, 7,694 (25%) were repair contracts valued at $1,466,116,464 and 23,022 (75%) were spares contracts valued at $3,798,537,627. These totals are depicted in Figure 13.

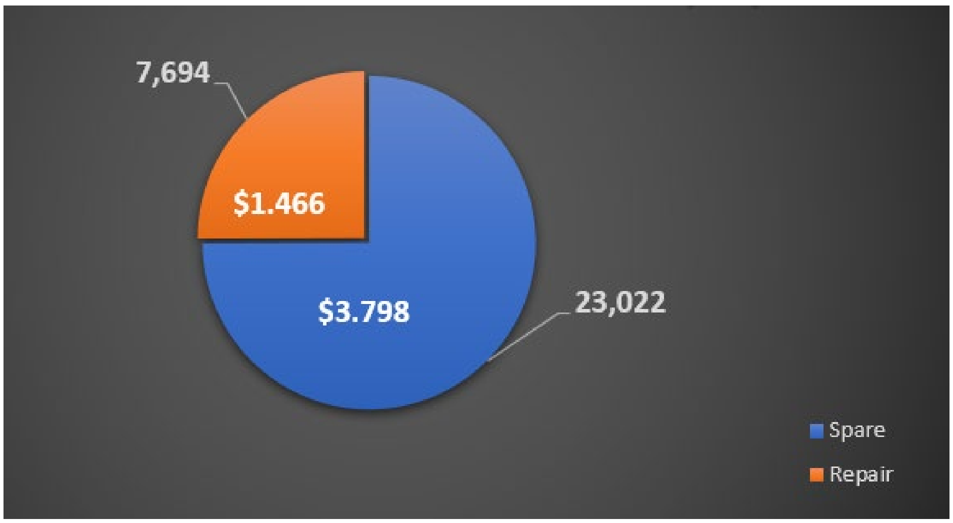

Figure 13. WSS Total Contract Awards in $ Billion FY19–FY20

b. Among contracts awarded, what percentage were competitive and noncompetitive by cost?

Overall, 11.60% ($610 million) were competitive, 87.98% ($4,631 million) of the contracts were noncompetitive, and 0.42% contained no data. Figure 14 depicts overall contract competition by value.

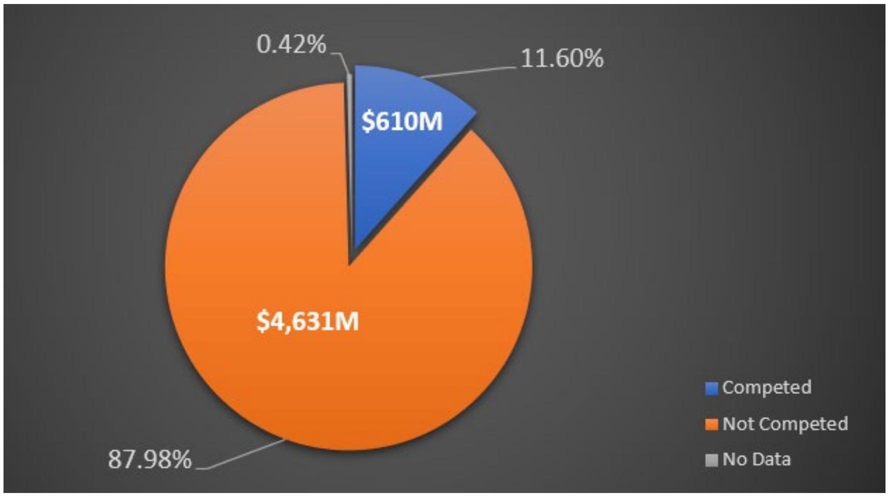

Figure 14. WSS Overall Competition by Dollar Amount

Among spares contracts, 12.91% ($490 million) were competitive, 86.52% ($3,286 million) were noncompetitive, and 0.58% contained no data. Figure 15 depicts spare contract competition by dollar amount in millions.

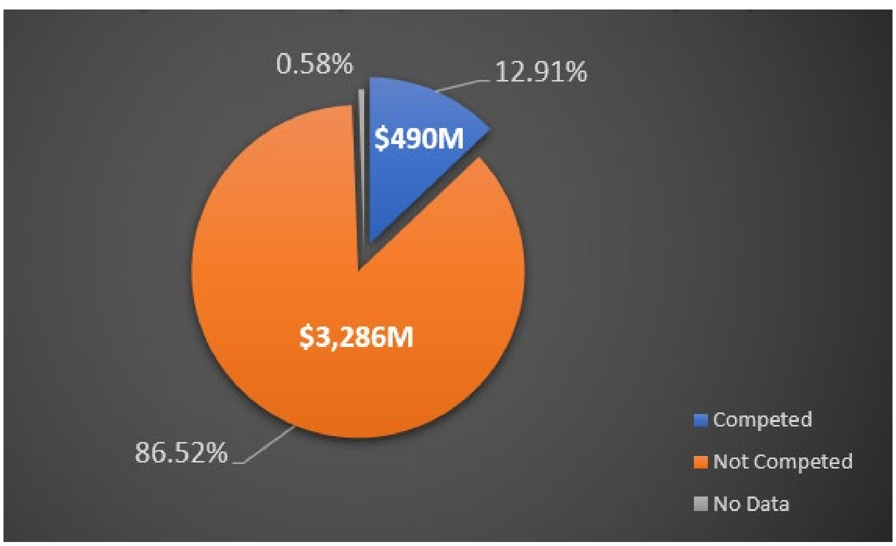

Figure 15. WSS Spare Competition by Dollar Amount

Among Repair contracts, 8.22% ($120 million) were competitive, 91.76% ($1,345 million) were noncompetitive, and 0.02% contained no data. Figure 16 depicts repair contract competition by dollar amount in millions.

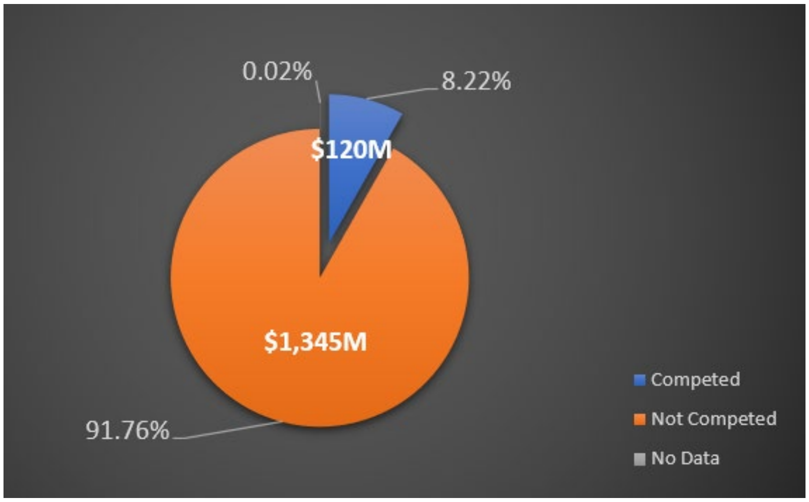

Figure 16. WSS Repair Competition by Dollar Amount

c. Among the contracts awarded, how many were competitive and noncompetitive by contract type for spare and repair contracts?

Overall, 10,595 contracts were competitive, 19,943 were noncompetitive and 178 contained no data. As depicted in Figure 17, of the 23,022 spares contracts awarded, only 9,796 were competitive, 13,056 were noncompetitive and 170 contained no data.

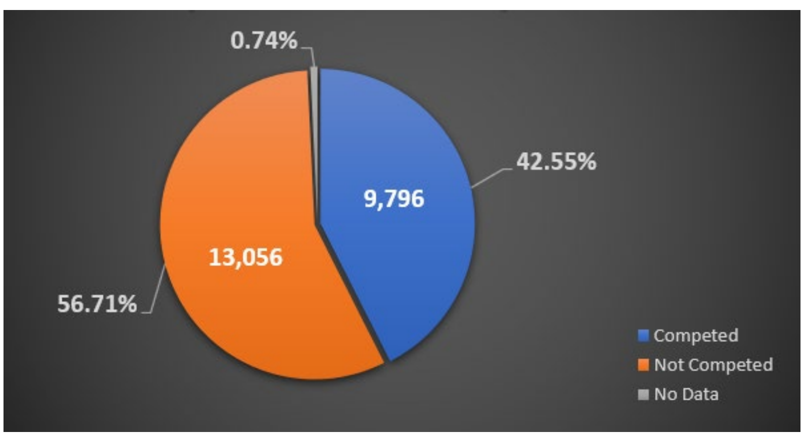

Figure 17. WSS Spare Contract Competition

As depicted in Figure 18, of the 7,694 repair contracts awarded only 799 were competitive, 6,887 were noncompetitive and 8 contained no data.

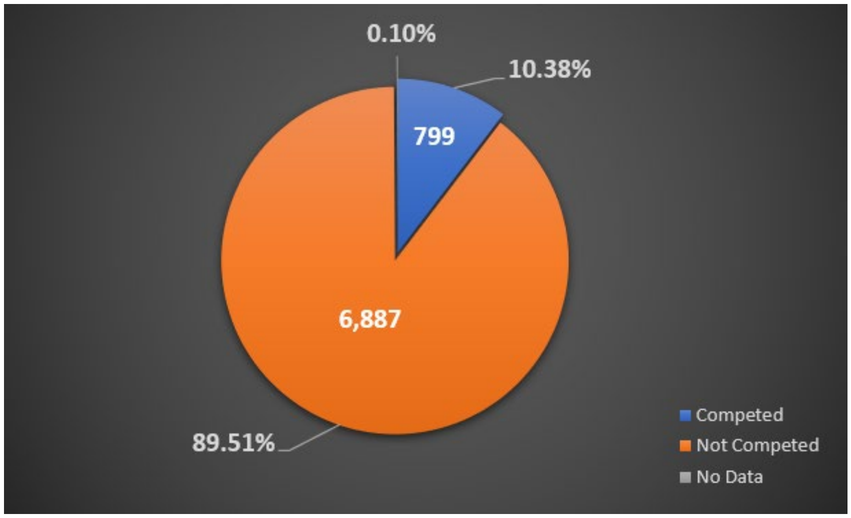

Figure 18. WSS Repair Contract Competition

d. *How many companies received awards during the period under review?*

As depicted in Figure 19, 1,262 companies received awards during the period. 461 companies received awards for repair contracts and 801 companies received awards for spares contracts.

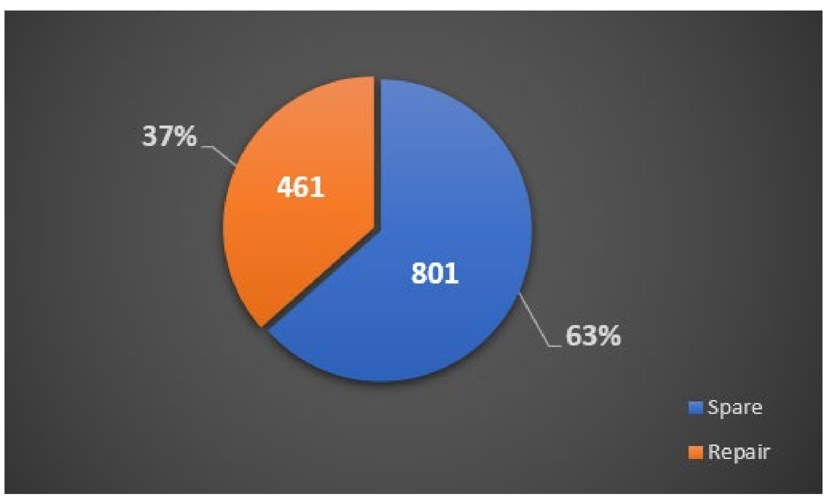

Figure 19. All Companies that Received Awards from WSS During FY19–FY20

e. Based on our spend analysis, which were the top ten contractors that WSS contracted with for repair and spare contracts during FY19–FY20?

The top ten repair contractors received 3,165 awards. The results in Figure 20 show that the top ten contractors made up more than 41% of all repair contracts during the period.

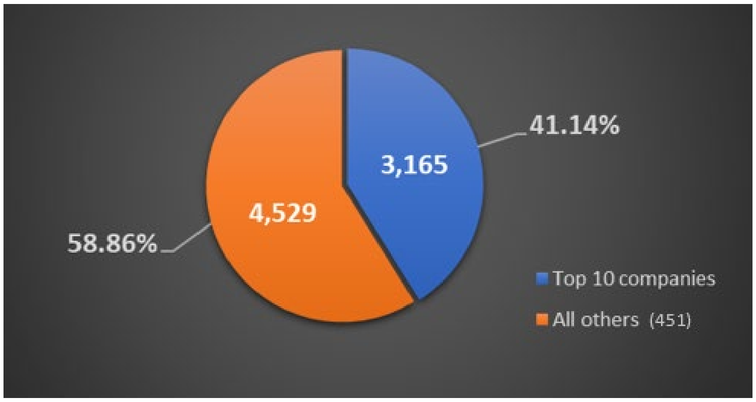

Figure 20. WSS Repair Contractor Awards by Frequency

The top ten spare procurement contractors received 10,508 awards. By contrast, the results in Figure 21 show that the top ten defense contractors made up more than 45% of all spare procurement contracts during the period.

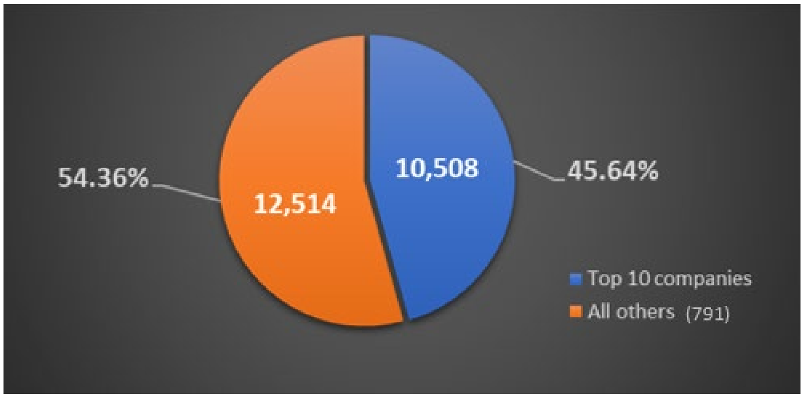

Figure 21. WSS Spare Contractor Awards by Frequency

f. What were the top ten NIINs awarded on a sole-source basis by CLIN frequency?

Table 1. Top Ten Repair and Spare NIINs by CLIN Count

Top 10 Repair NIINs by CLIN Count		Top 10 Spare NIINs by CLIN Count	
NIIN	**Frequency**	**NIIN**	**Frequency**
015452661	3170	014645007	41000
015907641	2124	015652623	38149
015217940	1421	015761575	13720
015279209	1383	014431619	13455
013195337	1000	014431618	13004
015240821	1000	015652614	11868
016811341	900	012244914	10897
015709387	861	014431622	10826
015780858	712	015373063	9058
013539209	648	011738392	7500

g. What were the top ten NIINs awarded on a sole-source basis by the number of contract awards?

Table 2. Top Ten Repair and Spare NIINs by Contract Awards

Top 10 Repair NIINs by Contract Award		Top 10 Spare NIINs by Contract Award	
Repairs	**Contract Awards**	**Spares**	**Contract Awards**
016242970	141	015761575	1367
016242971	101	014935907	195
016242972	81	016242970	133
014959197	60	016159774	101
016243522	45	016242971	101
015900033	40	016159773	85
016451998	38	015761387	82
016467972	38	016242972	81
012308172	27	015762199	79
016801199	27	014938783	71

C. THE TOP FOUR NIINS

The following four NIINs were the items that were most frequently bought with a non-competitive contract action. We focused on these NIINs in our discussion and attempt to answer our research questions focusing specifically on them. See Tables 3 and 4.

Table 3. Top Two Non-Competitive Spares by Number of Contract Awards

NIIN	Total Dollar Amount	Awards
015761575	$3,601,436.30	1367
014935907	$2,605,579.60	195

NIIN 01-576-1575, or national stock number (NSN) 5820-01-576-1575, (transmitter, radio) was the most frequently procured non-competitive spares part. Its federal supply classification (FSC) code, 5820, indicates the part is associated with radio and television communication equipment, except airborne (ISO Group, 2021). The NIIN was procured on 1367 separate contract actions under the same basic ordering agreement (BOA) from the same contractor, for a total amount of $3,601,436.

NIIN 01-493-5907, or NSN 5855-01-493-5907, (thermal imaging system) was the second most frequently bought spare parts by frequency of contract actions. Its FSC code, 5855, indicates the part is associated with night vision equipment (ISO Group, 2021). The NIIN was procured on 195 separate contract actions under the same BOA from the same contractor, for a total amount of $2,605,579. All the contract actions for both NIINs fall under the category not competed under simplified acquisition procedures (SAP).

The contracting officers reference the AMC and AMSC in the DFARS before making an acquisition decision. The AMC and its associated AMSC help the contracting officer decide on the procurement option available to them for the spare part under consideration. The AMC is a single-digit numeric code. It is assigned by each DOD activity after it has completed technical review on a specific part to determine if is it suitable for breakout. These codes are used by contracting officer and government employees in making acquisition decisions (Appendix). Similarly, the DOD activity also allocates an

AMSC, which is a single-digit alpha code that gives information on a parts manufacturing, engineering, and technical data. This information is used to make acquisition decisions (see Figure 22 and the Appendix).

The most frequently purchased spare, NIIN 01-5761-575, had an AMC/AMSC of 3Z, while NIIN 01-493-5907 had AMC/AMSC of 3R. The AMC 3 indicates that the spare item is to be directly acquired from the original equipment manufacturer for the second and subsequent time. The AMSC of Z indicates that the part is available as a commercial-off-the-shelf product, and it is a non-developmental item. Therefore, it can be procured using available commercial catalogs or price lists. The government can assign these catalogs a technical manual number for use by government employees. Additionally, the item can have AMC of 3, 4, or 5 if only one prime contractor is available as a supplier. However, if multiple contractors are available, AMCs 1 or 2 are applicable (). In the case of the item from our dataset, the AMC of 3 was assigned meaning there was only one source available.

Similarly, an AMSC of R indicates that the Navy does not own the data rights and cannot procure this part from additional contractors. Purchasing the data rights has been determined to be uneconomical. In addition, the government decided reverse engineering this item is not economical. This code applies because the government did not acquire the intellectual property during the initial procurement award. Therefore, AMCs 3, 4, or 5 are valid if only one source has the intellectual property rights or data to make this item. However, if there are multiple contractors with the data rights to fabricate this part, AMCs 1 or 2 are applicable (Appendix). Again, in our case, the item in our dataset was assigned AMC of 3 indicating that there was only one source on file.

Table 4. Top Two Non-Competitive Repairs by Number of Contract Awards

NIIN	Total Dollar Amount	Awards
016242970	$12,212,000.00	141
016242971	$8,800,000.00	101

NIIN 01-624-2970, NSN 5865-01-624-2970, (receiver, countermeasures) was procured on 141 separate contract actions under the same BOA from the same contractor, for a total of $12,212,000.

NIIN 01-624-2971, NSN 5865-01-624-2971, (modulator, radio transmitter) was procured on 101 separate contract actions also on the same BOA and from the same contractor as the first NIIN, for a total of $8,800,000. Both NIINs have an FSC code 5865 which indicates these parts are associated with electronic countermeasures, counter-countermeasures, and quick reaction capability equipment (ISO Group, 2021). They are used in support of aviation platforms.

These observations help to answer our first research question, why is NAVSUP-WSS operating in a sole-source environment? NAVSUP-WSS operates in a sole-source environment partly because of policy guidance as laid out in DFARS PGI 217 special contracting method (see Figure 22). When NAVSUP-WSS's contracting officers are preparing a spare or repair part requirement for solicitation, they reference the AMC or Repair Method Code (RMC) in deciding to either compete or not to compete. This is often the case for routine and subsequent procurement. Both top two spare NIINs identified in our spend analysis were on subsequent procurement contracts, the NIINs had previous procurement history.

Both non-competitive repair NIINs had an RMC of "3D." The following is a breakdown of the 3D RMC. The number 3 indicates that the item under consideration for procurement needs to be directly acquired from the original equipment manufacturer on the second or subsequent occasion. The letter D in the code indicates that the data required to procure that part is not available to support competitive contracting. Additionally, the government has determined that it is not economical to procure the data rights, nor is it economical to adequately reverse engineer the part to support competitive solicitation. As a result, AMC of 3, 4, or 5 is applicable.

As was discussed in Chapters II and IV, the initial procurement environment for most government acquisition occurs in a competitive environment at the beginning of the acquisition life cycle if multiple contractors have the capability to compete for the initial acquisition. However, WSS works in the operations and sustainment phase of the acquisition life cycle and at this point the government is traditionally only dealing with one company. Therefore, most of WSS contracts are awarded to sole-source contractors and most of its contract actions are contract modifications within scope which CICA classifies as sole-source (DOD, 2014). Additionally, once any contract is awarded it moves to the post award phase of the contracting life cycle and any modification done in this phase is conducted in a sole-source environment.

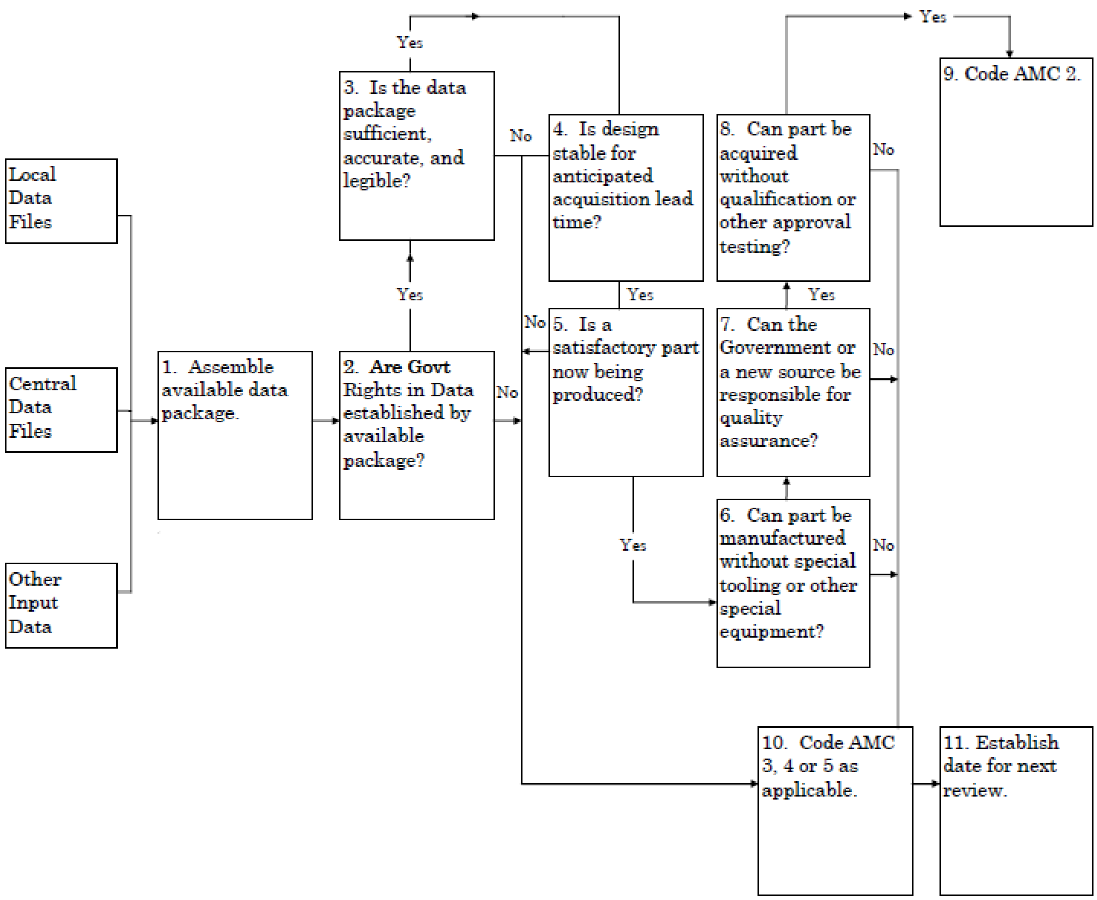

Figure 22. Limited Screening Decision Process Summary Flow Chart for AMC 2–5. Source: DFARS PGI 217 (2021).

D. IMPLICATIONS OF THE FINDINGS

In Chapter II we discussed some of the barriers to competition and focused particularly on the Defense Department. We also discussed the contracting life cycle and

Levenson (2014) which described reasons why most DOD contracts begin with competition but turn into a sole-source environment once a single contractor wins the award. Our research results contribute to that body of knowledge. All the contracting actions in the dataset used for this research were subsequent procurement actions. There were no initial contracts in our data.

The AMC and RMC codes for our top two spares and repair non-competitively procured NIINs allowed the contracting officers to proceed with sole-source contracting. The government did not find it economic to procure the data rights at the time the initial procurements were made. Additionally, the government has not determined whether it is economical to reverse engineer the parts. As a result, the single contractor who won the initial contract for these NIINs has locked in all subsequent procurement in a sole-source environment (see Figure 22 and the appendix).

Our study shows that over the period from 2018 to 2020, approximately 91% of repair contracts awarded at NAVSUP-WSS were sole-sourced, thus placing the organization in a predominantly sole-source environment. This situation makes the government more dependent on contractors and places the government at a negotiating disadvantage with the defense industry. NAVSUP-WSS contracting actions are therefore influenced by the resource dependency theory as was discussed in Chapter II. The sole-source contractor has an advantage over the government and controls when it submits a bid, counters an offer, starts production, and when it delivers supplies and/or services to the government. Next, we discuss Kraljic's supply matrix as it applies to the NAVSUP-WSS contracting environment.

E. APPLICATION OF KRALJIC'S MODEL

In this section, we apply Kraljic's supply matrix to explain our observation of the relationship of acquisition and supply chain risks as it relates to NAVSUP-WSS's contracting operation.

Following Kraljic's model for organizations to develop a comprehensive strategy unique to their specific situation, we present the following supply matrix for NAVSUP-

WSS. We developed this following the framework of Kraljic's supply matrix as previously discussed in Chapter II. See Figure 23.

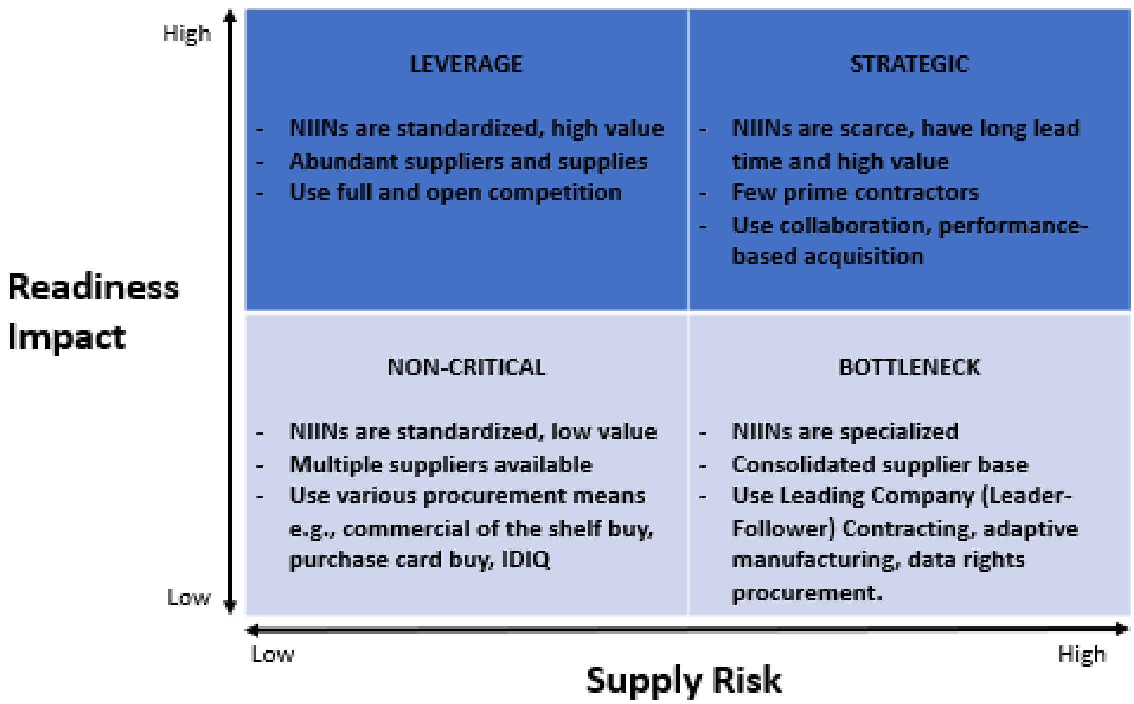

Figure 23. Supply Matrix for NAVSUP-WSS. Adapted from Kraljic (1983).

The strategic quadrant has NIINs with high supply risk factors and high readiness impact. These are NIINs critical to mission success. Very few prime contractors dominate this market. The government should establish partnerships and pursue collaborative relationships such as performance-based logistics with prime contractors. It should also focus on continually searching for innovative supplies.

The leverage quadrant has NIINs with a high readiness impact but low supply risk factor. These are NIINs supported by multiple contractors and those NIINs have substitutes. The government is in a better position in the resource dependency relationship. For such NIINs, full and open competition should be promoted.

The bottleneck quadrant is the exact opposite of the leverage quadrant. NIINs here have high supply risk factors but a low immediate impact on readiness. The defense industrial base has consolidated for these NIINs and the government must promote innovative ideas to improve the environment before these NIINs start impacting readiness.

The non-critical quadrant presents the least amount of difficulty to the government. NIINs here have a low-risk factor and low impact on readiness. The NIINs are commercially available. The government should use commercial off-the-shelf procurement, purchase card, and contracting vehicle such as IDIQs. Our review of the spend analysis results led us to our recommendations which are detailed in the next section.

Our research shows that over 91% of repair contracts awarded at NAVSUP-WSS were sole-source. In effect, NAVSUP-WSS is operating under the bottleneck quadrant. Products in this quadrant have limited suppliers and present high supply risk. Although profitability (in this case readiness) may not be affected, the government is in a weaker position in its resource dependency relationship with the suppliers. Suppliers have all the power and can dictate prices and schedule terms during contract negation. NAVSUP's strategy is to be tailored to safeguard supply continuity and reduce the supply risk associate with readiness. (See Figure 23).

We observed that the top two NIINs frequently awarded used IDIQ contracting vehicles. NAVSUP could also focus on reducing its dependence on a few suppliers. The more capable suppliers are available, the better the chance to reduce cost, improve delivery schedules, and supply security (Gangurde & Chavan, 2016). We make actionable recommendations in the following section for possible methods of reducing dependency on sole source suppliers.

Some NAVSUP-WSS operations fall under the strategic quadrant where there is a high risk to both supply chain and readiness. The government seeks a win-win collaboration to balance the power in its resource dependency relationship with suppliers. Ideally, the government would prefer to be operating under the leverage quadrant. Here, the government has the upper hand in the resource dependency relationship and can leverage that power to foster more competition.

F. RECOMMENDATIONS FOR INCREASING COMPETITION

Focusing on the top four NIINs, we developed a supply matrix for NAVSUP-WSS following the framework of Kraljic (1983). In Chapter II, we discussed the various methods for creating and maintaining a competitive environment in the DOD. These included conducting thorough market research, promoting small business, involving key industry partners, articulating requests for proposals, employing open systems architecture, securing data rights, and utilizing intellectual property to enable future competition. Additional ways to increase competition include using dual sourcing, competitive multi-sourcing with distributed awards, reverse engineering, reverse auctioning, indefinite delivery indefinite quantity (IDIQ) contracts, indirect competition, technology and artificial intelligence, additive manufacturing, and leader company contracting.

We now present our recommendations for the top four NIINs that were identified in our spend analysis. This research recommends four approaches to NAVSUP-WSS for increasing competition in its sole-source environment. The following describe the four recommendations together with the advantages and disadvantages of adopting each method.

(1) Acquire the Intellectual Property and Data Rights

This method is a good candidate for increasing competition for all the top four NIINs identified in our spend analysis given the large number of quantities purchased and the nature and complexity of the items. The top two repair NIINs are countermeasure receiver and radio transmitter modulator. Both are electronic components used in countermeasures and quick reaction capability equipment. Similarly, the top two spares include a radio transmitter used in communication equipment and a thermal imaging system used in night vision equipment. Acquiring the intellectual property and data rights for these NIINs will allow NAVSUP-WSS to compete those NIINs with multiple contractors who make similar electronic components but not these specific NIINs.

Purchasing intellectual property is expensive and the Navy should conduct cost benefits analysis to determine how much is currently being spent on the parts during the sustainment phase. Then conduct the cost benefit analysis on how much the Navy will save from acquiring the intellectual property and data rights during the initial acquisition. The Navy should also identify intellectual property and data rights that have already been acquired by different organizations within the Navy, other services and agencies within DOD that can be procured in a timely manner by exercising contract options that contain data rights to support competition. A RAND report concluded that better access to intellectual property associated with a system has the largest effect on operational and sustainment performance and cost (Camm et al., 2021).

The advantages of acquiring intellectual property or data rights include being able to offer the item for competitive bidding later during the sustainment phase. The government owning the data rights will also enable it to follow some of our other recommendations.

The main disadvantage of acquiring the intellectual property or data rights is the financial cost. Additionally, some contractors may not be willing to sell their data rights. More cost benefit analysis is needed on purchasing the entire data rights from the original equipment manufacturer (OEM) or purchasing data rights on an as needed demand basis to ascertain if the method is economical for the government (Camm et al., 2021).

(2) Pursue Reverse Engineering

The Navy should also investigate the feasibility of reverse engineering these NIINs. Reverse engineering is favorable where the government does not have access to intellectual property or data and the prime contractor is not interested or capable of support the NAVSUP-WSS's demand for the NIINs. The Dutch Royal Navy and the Belgian Navy have successfully utilized 3D scanning and reverse engineering to manufacture, repair, and replace critical ship parts (Ponomareva, 2017). Both navies had a problem of not possessing the drawings or data on file for the parts requiring repair. They utilized an Artec 3D scanner to scan the part and create a 3D image. The image was then used to reverse engineer the required repair parts (Ponomareva, 2017).

The advantage of reverse engineering is that once successful, the drawing can be shared on other contracts. This creates competition for supplying the NIIN to meet the government demand. Reverse engineering also increases parts availability (Ponomareva, 2017).

The disadvantage of reverse engineering is that this is a trial-and-error method. The product may not accurately meet the government needs. There is also an initial cost required to set the reverse engineering system up. An item could also be reverse engineered but may not meet the form, fit, and function test to be useful for any repair. This is especially important on systems where a small defect could prove very deadly. Additional cost benefit analysis of reverse engineering for select repair and spare NIINs is required.

(3) Adopt Additive Manufacturing

Additive manufacturing and 3D printing have great potential to increase parts availability and readiness. Additive manufacturing will enable the Navy to make high usage, low tech parts. Extensive research continues in this field. Already, a multidisciplinary team at Naval Postgraduate School created lab courses, coordinated with the Center for Additive Manufacturing (Naval Postgraduate School [NPS], 2021), to provide Sailors with the opportunity to learn how to design, test, reverse engineer, and print some standard repair and consumable parts that Sailors use frequently onboard naval vessels.

Although not one of the top four NIINs analyzed, 01-464-5007 was the most frequently purchased item during FY19–FY20, 01-464-5007 is a rubber tile aircraft part that is used as a floor or wall covering. WSS purchased more than 41,000 units noncompetitively during the period under review, the unit price was $227 and the overall cost during FY19–FY20 was $9,307,000. This item was purchased competitively on September 23, 2019, for 31,500 units the contract was awarded to the same contractor but at a reduced unit price of $222.22. However, this type of item being low tech, high volume, and low cost is a good candidate for 3D printing and additive manufacturing to increase competition and reduce cost.

The advantages of utilizing 3D printing and additive manufacturing are that they increase availability and competition for small inexpensive consumables such as nuts and bolts. The method is economical at various organizational levels within the Defense Department and can be utilized in numerous settings to include onboard naval vessels.

The disadvantage of additive manufacturing is that the material for making 3D items may not be the same as the material the original item was made from. The research on additive manufacturing is ongoing. There is also an initial capital investment required to stand up an additive manufacturing facility.

(4) Apply Leader Company Contracting

Apply the leader company contracting method to select NIINs to increase defense contractor competition and supply chain resilience for specific items of particular significance and importance to the government. As previously discussed, the top two repair NIINs are electronic components and the top two spare NIINs are a radio transmitter and a component for night vision equipment. A contractor capable of making similar components could be made a follower to the prime contractor to develop its capability to manufacture these NIINs. This will work well if the government owns the data right and if the prime contractor is willing to be a leading company under an LCC contract. Leading company contracting comes with a cost, therefore, cost benefit analysis is required. Leader company contracting could also be applied to high dollar value or critical spares and repairs that exist in the sole-source environment thus releasing the resource bottleneck and constraints for NAVSUP-WSS most critical items. LCC will help develop a second source, control cost, and assure supply over time (Thompson & Rubenstein, 1979).

The advantages of LCC include increased contractor competition and supply chain resiliency, reduced supply chain risk and delivery time, geographic dispersion of suppliers and economies in production. LCC also has the potential to maximize the utilization of scarce or special tools and equipment and can eliminate the issues with the availability and use of proprietary data. Finally, it can promote uniformity, standardization, compatibility, and improve reliability and parts interchangeability (U.S. Legal, 2021).

The primary disadvantages of LCC include cost and the challenge of convincing a sole-source contractor to use its competitive advantage to develop another contractor. LCC should only be used in situations where the other methods for increasing competition are not obtainable. Nelson (1980) reviewed how the leader-follower contracting technique was used at the joint cruise missile project office (JCMPO) and found that leader-follower is not adequate in addressing the competitiveness of the aviation industry. There is a general antitrust concern among government contractors (Polk, 1999).

G. SUMMARY

In this chapter, we presented the results of our spend analysis. Our result enabled us to answer the research questions we set out to accomplish. Our results and discussion also contributed to the body of knowledge on how to improve competition in a predominantly sole-source environment. NAVSUP-WSS is meeting its mission of keeping the fleet readiness high while operating in a challenging sole-source environment. To improve upon this, we submitted our supply matrix for NAVSUP-WSS following Kraljic's framework but unique to NAVSUP-WSS. We also discussed options available to increase competition. In the next chapter, we pull all these concepts together as we summarize our research, draw our conclusion, and identify areas for further research.

VI. SUMMARY AND AREAS FOR FURTHER RESEARCH

This chapter provides our research summary and areas for further research, as well as areas for further research. This research delved into the contracting operations at NAVSUP-WSS demonstrating why the organization operates predominantly in a sole-source environment. We also detailed the supply chain risk that sole-source resource dependency presents within the Navy supply system.

A. SUMMARY

The DOD spent more than $360 billion on contracts in each fiscal year since 2018, which constitutes about half of the entire DOD budget (McGregor, 2021). About 52% is spent on services contracts, 40% on goods, and 8% on research and development (McGregor, 2021). Similarly, the Department of the Navy (DON) spent more than $171.5 billion—32% on operations and maintenance, 29% on procurement, 28% on military personnel, 10% on research and development, and 1% on infrastructure. More specifically, from FY19 through FY20 NAVSUP-WSS spent more than $5.2 billion on spare parts and repair services. NAVSUP-WSS awarded more than 30,700 contracts in that period. Of those contracts 75% (23,022) were spare procurement contracts and 25% (7,694) were repair contracts. In total more than 80% of NAVSUP WSS contracts are awarded under sole-source conditions. For the spare contracts only 12.9% were awarded under full and open competition in terms of total dollar spent and for repair contracts only 8.2% were awarded under full and open competition in terms of total dollars spent.

Much of what NAVSUP-WSS buys is purchased in a sole-source environment. The top four NIINs identified in this research were all procured non-competitively. The government prefers open competition because it facilitates fair and reasonable pricing. Our problem statement declares that having only one source of supply places the government at a negotiating disadvantage with industry and shifts the bargaining power away from the government in favor of the defense contractor. In addition, sole-source contracting increases supply chain risk and decreases supply chain resiliency by creating a bottleneck within the Navy supply chain.

We accomplished this research and met the purpose of our research by answering the following questions:

(1) Why is NAVSUP-WSS Operating in a Sole-Source Environment?

First, NAVSUP-WSS is operating in a sole-source environment partially because of its mission and to some extent due to DFAR policies. NAVSUP-WSS also works in the operations and sustainment phase of the acquisition life cycle and at this point the government is traditionally only dealing with one company. Therefore, most of WSS contracts are awarded under sole-source conditions. The weapon systems that WSS supports have already been procured by the Navy and Marine Corps. NAVSUP-WSS must keep these systems operating at their highest levels of readiness. Contracting officers working at NAVSUP-WSS make acquisition decisions by referencing the acquisition method code and acquisition method suffix codes for spares procurement. They also follow the repair method code and repair method suffix codes for making repair part repurchase decisions in accordance with DFARS. Our research identified that the top two non-competitively procured spares and repairs both had AMC/RMC codes of 3 instructing the contracting officers to procure from original equipment manufacturer for the second and successive time. Following this guidance WSS is required to purchase spares or repair services from the actual equipment manufacturer and not an additional source of supply.

(2) What Is the Current NAVSUP-WSS Strategy for Increasing Defense Contractor Competition?

NAVSUP-WSS has instituted multiple programs to increase competition. These include small business office engagement, small business set-asides, industry day events, encouraging contractors to participate, streamlining source selection and approval processes, and NSS-Supply. We also discovered that even when NAVSUP-WSS can qualify a second source it does not always translate to an increase in receiving competitive bids from the additional source or being able to provide the source with necessary data rights to conduct repairs.

(3) How Can NAVSUP-WSS Increase Defense Contractor Competition in a Predominantly Sole-source Environment?

As a result, in answering research question three, we make a recommendation for the government to procure data rights, pursue reverse engineering, adopt additive manufacturing, and implement FAR 17.4 leader company contracting. We also provided some advantages and disadvantages associated with using any of the four recommendations. NAVSUP-WSS and the Navy stand to benefit from conducting further analysis to determine what makes economic sense. The next section details areas for further research.

B. AREAS FOR FURTHER RESEARCH

This section details the areas we identified that deserve further research and targeted study to gain additional awareness of where NAVSUP-WSS, the Navy, and the DOD can increase competition within the defense industry.

Our first area for further research is to expand the data range and spend analysis beyond just two fiscal years to gain better insight into where the organization can increase efficiency and contractor competition. The data range could also be expanded to include all NAVSUP-WSS expenditures and not be limited to spare and repair contracts. The NIIN analysis could also be expanded beyond the top four NIINs that we analyzed in our research. Additionally, the spend analysis study could be expanded beyond WSS to include other organizations within the DOD and the federal government.

Our subsequent area for further research is to conduct a study of the market research for sole-source items of particular interest, cost, or criticality for the Navy, DOD, and other military services. The goal of the market research study would be to determine if another government agency had previously procured the parts or service. This research could also identify intellectual property and data rights that have already been acquired by different organizations within the Navy, other services, or agencies within the DOD that can be procured in a timely manner by exercising contract options that contain data rights to support competition. Government wide requirement pooling, and market research may also identify additional cost saving opportunities, efficiencies and alternative contractors who possess the capability to satisfy government requirements on a larger scale.

Our final area for further research is to conduct a study of DOD and interagency networking capabilities for the purpose of pooling acquisition requirements throughout all levels of government contracting. Leveraging existing contract vehicles can greatly increase efficiency and decrease acquisition costs.

APPENDIX. PGI 217.75 ACQUISITION OF REPLENISHMENT PARTS

The material contained within this appendix is from DFARS PGI217.75 (2021).

PGI 217.75 ACQUISITION OF REPLENISHMENT PARTS

1-103.1 Acquisition method code (AMC).

A single digit numeric code, assigned by a DOD activity, to describe to the contracting officer and other Government personnel the results of a technical review of a part and its suitability for breakout.

1-103.3 Acquisition method suffix code (AMSC).

A single digit alpha code, assigned by a DOD activity, that provides the contracting officer and other Government personnel with engineering, manufacturing, and technical information.

2-201.1 Acquisition method codes.

The following codes shall be assigned by DOD activities to describe the results of the spare parts breakout screening:

(a) ***AMC 0***. The part was not assigned AMC 1 through 5 when it entered the inventory, nor has it ever completed screening. Use of this code is sometimes necessary but discouraged. Maximum effort to determine the applicability of an alternate AMC is the objective. This code will never be used to recode a part that already has AMC 1 through 5 assigned, and shall never be assigned as a result of breakout screening. Maximum effort to determine the applicability of AMC 1 through 5 is the objective.

(b) ***AMC 1***. Suitable for competitive acquisition for the second or subsequent time.

(c) ***AMC 2***. Suitable for competitive acquisition for the first time.

(d) ***AMC 3***. Acquire, for the second or subsequent time, directly from the actual manufacturer.

(e) ***AMC 4***. Acquire, for the first time, directly from the actual manufacturer.

(f) ***AMC 5***. Acquire directly from a sole source contractor which is not the actual manufacturer.

2-201.2 Acquisition method suffix codes.

The following codes shall be assigned by DOD activities to further describe the acquisition method code. Valid combinations of AMCs/AMSCs are indicated in paragraphs (a) through (z) of this subsection and summarized in Exhibit I.

(a) ***AMSC A***. The Government's right to use data in its possession is questionable. This code is only applicable to parts under immediate buy requirements and for as long thereafter as rights to data are still under review for resolution and appropriate coding. This code is assigned only at the conclusion of limited screening, and it remains assigned until the full screening process resolves the Government's rights to use data and results in assignment of a different AMSC. If one source is available, AMCs 3, 4, or 5 are valid. If at least two sources exist, or if the data is adequate for an alternate source to qualify in accordance with the design control activity's procedures, AMCs 1 or 2 are valid.

(b) ***AMSC B***. This part must be acquired from a manufacturing source(s) specified on a source control or selected item drawing as defined by the current version of DOD-STD-100. Suitable technical data, Government data rights, or manufacturing knowledge are not available to permit acquisition from other sources, nor qualification testing of another part, nor use of a second source part in the intended application. Although, by DOD-STD-100 definition, altered and selected items shall have an adequate technical data package, data review discloses that required data or data rights are not in Government possession and cannot be economically obtained. If one source is available, AMCs 3, 4, or 5 are valid. If at least two sources exist, AMCs 1 or 2 are valid.

(c) ***AMSC C***. This part requires engineering source approval by the design control activity in order to maintain the quality of the part. Existing unique design capability, engineering skills, and manufacturing knowledge by the qualified source(s) require acquisition of the part from the approved source(s). The approved source(s) retain data rights, manufacturing knowledge, or technical data that are not economically available to the Government, and the data or knowledge is essential to maintaining the quality of the part. An alternate source must qualify in accordance with the design control activity's procedures, as approved by the cognizant Government engineering activity. The qualification procedures must be approved by the Government engineering activity having jurisdiction over the part in the intended application. If one source is approved, AMCs 3, 4, or 5 are valid. If at least two sources are approved or if data is adequate for an alternate source to qualify in accordance with the design control activity's procedures, AMCs 1 or 2 are valid.

(d) ***AMSC D***. The data needed to acquire this part competitively is not physically available, it cannot be obtained economically, nor is it possible to draft adequate specifications or any other adequate, economical description of the material for a competitive solicitation. AMCS 3, 4, or 5 are valid.

(e) ***AMSC E***. (Reserved)

(f) ***AMSC F***. (Reserved)

(g) ***AMSC G***. The Government has rights to the technical data, the data package is complete, and there are no technical data, engineering, tooling or manufacturing restrictions. (This is the only AMSC that implies that parts are candidates for full and open competition. Other

AMSCs such as K, M, N, Q, and S may imply limited competition when two or more independent sources exist yet the technical data package is inadequate for full and open competition.) AMCs 1 or 2 are valid.

(h) ***AMSC H***. The Government physically does not have in its possession sufficient, accurate, or legible data to purchase this part from other than the current source(s). This code is applicable only to parts under immediate buy requirements and only for as long thereafter as the deficiency is under review for resolution and appropriate recoding. This code is only assigned at the conclusion of limited screening, and it remains assigned until the full screening process resolves physical data questions and results in assignment of a different AMSC. If one source is available, AMCs 3, 4, or 5 are valid. If at least two sources exist, AMCs 1 or 2 are valid.

(i) ***AMSC I***. (Not authorized)

(j) ***AMSC J***. (Reserved)

(k) ***AMSC K***. This part must be produced from class 1 castings and similar type forgings as approved (controlled) by procedures contained in the current version of MIL-STD-2175. If one source has such castings and cannot provide them to other sources, AMCs 3, 4, or 5 are valid. If at least two sources have such castings or they can be provided to other sources AMCs 1 or 2 or valid.

(l) ***AMSC L***. The annual buy value of this part falls below the screening threshold established by DOD components and field activities. However, this part has been screened for additional known sources, resulting in either confirmation that the initial source exists or that other sources may supply the part. No additional screening was performed to identify the competitive or noncompetitive conditions that would result in assignment of a different AMSC. This code shall not be used when screening parts entering the inventory. This code shall be used only to replace AMSC O for parts under the established screening threshold. If one source is available, AMCs 3, 4, or 5 are valid. If at least two sources exist, AMCs 1 or 2 are valid.

(m) ***AMSC M***. Manufacture of this part requires use of master or coordinated tooling. If only one set of tooling exists and cannot be made available to another source for manufacture of this part, AMCs 3, 4, or 5 are valid. When the availability of existent or refurbishable tooling is available to two or more sources, then AMCs 1 or 2 are valid.

(n) ***AMSC N***. Manufacture of this part requires special test and/or inspection facilities to determine and maintain ultra-precision quality for its function or system integrity. Substantiation and inspection of the precision or quality cannot be accomplished without such specialized test or inspection facilities. If the test cannot be made available for the competitive manufacture of the part, the required test or inspection knowledge cannot be documented for reliable replication, or the required physical test or inspection facilities and processes cannot be economically documented in a TDP, valid AMCs are 3, 4, or 5. If the facilities or tests can be made available to two or more competitive sources, AMCs 1 or 2 are valid.

(o) ***AMSC O***. The part was not assigned an AMSC when it entered the inventory, nor has it ever completed screening. Use of this code in conjunction with AMC 0 is sometimes necessary but discouraged. Maximum effort to determine the applicability of an alternate AMSC is the objective. Only AMC O is valid.

(p) ***AMSC P***. The rights to use the data needed to purchase this part from additional source(s) are not owned by the Government and cannot be purchased, developed, or otherwise obtained. It is uneconomical to reverse engineer this part. This code is used in situations where the Government has the data but does not own the rights to the data. If only one source has the rights or data to manufacture this item, AMCs 3, 4, or 5 are valid. If two or more sources have the rights or data to manufacture this item, AMCs 1 or 2 are valid.

(q) ***AMSC Q***. The Government does not have adequate data, lacks rights to data, or both needed to purchase this part from additional sources. The Government has been unable to economically buy the data or rights to the data, although the part has been undergoing full screening for 12 or more months. Breakout to competition has not been achieved, but current, continuing actions to obtain necessary rights to data or adequate, reprocurement technical data indicate breakout to competition is expected to be achieved. This part may be a candidate for reverse engineering or other techniques to obtain technical data. All AMSC Q items are required to be reviewed within the timeframes cited in 2–203(b). If one source is available, AMCs 3, 4, or 5 are valid. If at least two sources exist, AMCs 1 or 2 are valid.

(r) ***AMSC R***. The Government does not own the data or the rights to the data needed to purchase this part from additional sources. It has been determined to be uneconomical to buy the data or rights to the data. It is uneconomical to reverse engineer the part. This code is used when the Government did not initially purchase the data and/or rights. If only one source has the rights or data to manufacture this item, AMCs 3, 4, or 5 are valid. If two or more sources have the rights or data to manufacture this item, AMCs 1 or 2 are valid.

(s) ***AMSC S***. Acquisition of this item is restricted to Government approved source(s) because the production of this item involves unclassified but militarily sensitive technology (see FAR Subpart 6.3). If one source is approved, AMCs 3, 4, or 5 are valid. If at least two sources are approved, AMCs 1 or 2 are valid.

(t) ***AMSC T***. Acquisition of this part is controlled by qualified products list (QPL) procedures. Competition for this part is limited to sources which are listed on or are qualified for listing on the QPL at the time of award (see FAR Part 9 and DFARS Part 209). AMCs 1 or 2 are valid.

(u) ***AMSC U***. The cost to the Government to breakout this part and acquire it competitively has been determined to exceed the projected savings over the life span of the part. If one source is available, AMCs 3, 4, or 5 are valid. If at least two sources exist, AMCs 1 or 2 are valid.

(v) ***AMSC V***. This part has been designated a high reliability part under a formal reliability program. Probability of failure would be unacceptable from the standpoint of safety of personnel and/or equipment. The cognizant engineering activity has determined that data to define and control reliability limits cannot be obtained nor is it possible to draft adequate specifications for this purpose. If one source is available, AMCs 3, 4, or 5 are valid. If at least two sources are available, AMCs 1 or 2 are valid.

(w) ***AMSC W***. (Reserved)

(x) ***AMSC X***. (Not authorized)

(y) ***AMSC Y***. The design of this part is unstable. Engineering, manufacturing, or performance characteristics indicate that the required design objectives have not been achieved. Major changes are contemplated because the part has a low process yield or has demonstrated marginal performance during tests or service use. These changes will render the present part obsolete and unusable in its present configuration. Limited acquisition from the present source is anticipated pending configuration changes. If one source is available, AMCs 3, 4, or 5 are valid. If at least two sources exist, AMCs 1 or 2 are valid.

(z) ***AMSC Z***. This part is a commercial/nondevelopmental/off-the-shelf item. Commercial item descriptions, commercial vendor catalog or price lists or commercial manuals assigned a technical manual number apply. If one source is available, AMCs 3, 4, or 5 are valid. If at least two sources are available, AMCs 1 or 2 are valid.

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8.15. Repair Method Code/Repair Method Suffix Code (RMC/RMSC). Two single digit numeric codes, assigned by a contract repair screening activity, used in conjunction to provide PCOs approved repair sources, determined and justified based on the availability and adequacy of resources required to effect timely repair and high quality workmanship. The RMC identifies engineering, manufacturing, and technical data used in the repair process and the RMSC represents the results of a technical review and denotes the method used in repairing the item. Refer to AFMCI 21–149 for more detail.

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A9.2.6.4.5.1. **RMC R0**—The part was not assigned RMC 1 through 5 when it entered the inventory, nor has it ever completed screening. Use of this code is sometimes necessary, but discouraged. Maximum effort to determine the applicability of an alternate RMC is the objective. This code will never be used to recode a part that already has RMC 1 through 5 assigned, and shall never be assigned as a result of breakout screening. Maximum effort to determine the applicability of RMC 1 through 5 is the objective.

A9.2.6.4.5.2. **RMC R1**—Suitable for competitive repair for the second or subsequent time.

A9.2.6.4.5.3. **RMC R2**—Suitable for competitive repair for the first time.

A9.2.6.4.5.4. **RMC R3**—Repair, for the second or subsequent time, directly from the actual manufacturer.

A9.2.6.4.5.5. **RMC R4**—Repair, for the first time, directly from the actual manufacturer.

A9.2.6.4.5.6. **RMC R5**—Repair directly from a sole source contractor which is not the actual manufacturer.

A9.2.6.4.5.7. **Repair method suffix codes**. The following codes shall be assigned to further describe the repair method code. Valid combinations of RMCs/RMSCs are indicated below. When two or more RMSCs apply, the most technically restricted code will apply. A part need not be coded as noncompetitive based on an initial market survey which only uncovers one interested source. If the government has sufficient technical data in its possession to enable other sources to repair an acceptable part, and there are no technical restrictions on the part which would preclude other sources from repairing it, the part should be coded competitive.

A9.2.6.4.5.7.1. **RMSC A**. The Government's right to use data in its possession is questionable. This code is only applicable to parts under immediate contract repair requirements and for as long thereafter as rights to data are still under review for resolution and appropriate coding. This code is assigned only until determination of the Government's rights to use data results in assignment of a different RMSC. If one source is available, RMCs 3, 4, or 5 are valid. If at least two sources exist, or if the data is adequate for an alternate source to qualify IAW the design control activity's procedures, RMCs 1 or 2 are valid.

A9.2.6.4.5.7.2. **RMSC B**. This part must be repaired by a source(s) specified on a source control or selected item drawing as defined by the current version of ASME Y14.100, *Engineering Drawing and Related Documentation Practices*. Suitable technical data, Government data rights, or manufacturing knowledge is not available to permit repair by other sources. Although, by ASME Y14.100 definition, altered and selected items shall have an adequate technical data package, data review discloses that required data or data rights are not in Government possession and cannot be economically obtained. If one source is available, RMCs 3, 4, or 5 are valid. If at least two sources exist, RMCs 1 or 2 are valid.

A9.2.6.4.5.7.3. **RMSC C**. This part requires engineering source approval by the design control activity in order to maintain the quality of the part. Existing unique engineering skills, and repair knowledge by the qualified source(s) require repair of the part by the approved source(s). The approved source(s) retain repair knowledge, or technical data that are not economically available to the Government, and the data or knowledge is essential to maintaining the quality of the part. An alternate source must qualify IAW the design control activity's procedures, as approved by the cognizant Government engineering activity. The qualification procedures must be approved by the Government engineering activity having jurisdiction over the part in the intended application. If one source is approved, RMCs 3, 4, or 5 are valid. If at least two sources are approved or if data is adequate for an alternate source to qualify IAW the design control activity's procedures, RMCs 1 or 2 are valid.

A9.2.6.4.5.7.4. **RMSC D**. If the data needed to complete contract repair is not physically available, it cannot be obtained economically, nor is it possible to draft adequate specifications or any other adequate, economical description of the repair for a competitive solicitation. RMCS 3, 4, or 5 are valid.

A9.2.6.4.5.7.5. **RMSC E**. (Reserved).

A9.2.6.4.5.7.6. **RMSC F**. (Reserved).

A9.2.6.4.5.7.7. **RMSC G**. The Government has rights to the technical data, the data package is complete, and there are no technical data, engineering, tooling or repair restrictions. This is the only RMSC that implies that parts are candidates for full and open competition. Other RMSCs such as K, M, N, Q, and S may imply limited competition when two or more independent sources exist yet the technical data package is inadequate for full and open competition. RMCs 1 or 2 are valid.

A9.2.6.4.5.7.8. **RMSC H**. The Government physically does not have in its possession sufficient, accurate, or legible data to contract repair with other than the current source(s). This code is applicable only to parts under immediate repair requirements and only for as long thereafter as the deficiency is under review for resolution and appropriate recoding. This code is only assigned until resolution of the physical data questions result in assignment of a different RMSC. If one source is available, RMCs 3, 4, or 5 are valid. If at least two sources exist, RMCs 1 or 2 are valid.

A9.2.6.4.5.7.9. **RMSC I**. (Not authorized).

A9.2.6.4.5.7.10. **RMSC J**. (Reserved).

A9.2.6.4.5.7.11. **RMSC K**. This part must be produced from class 1 castings and similar type forgings as approved (controlled) by procedures contained in the current version of SAE-AMS2175*, Castings, Classification and Inspection Of*. If one source has such castings and cannot provide them to other sources, RMCs 3, 4, or 5 are valid. If at least two sources have such castings or they can be provided to other sources RMCs 1 or 2 or valid.

A9.2.6.4.5.7.12. **RMSC L**. The annual repair budget value of this part falls below the screening threshold established by local policy. However, this part has been screened for additional known sources, resulting in either confirmation that the initial source exists or other sources may repair the part. No additional screening was performed to identify the competitive or noncompetitive conditions that would result in assignment of a different RMSC. This code shall not be used when screening parts entering the inventory. This code shall be used only to replace RMSC O for parts under the established screening threshold. If one source is available, RMCs 3, 4, or 5 are valid. If at least two sources exist, RMCs 1 or 2 are valid.

A9.2.6.4.5.7.13. **RMSC M**. Repair of this part requires use of master or coordinated tooling. If only one set of tooling exists and cannot be made available to another source for repair of this part, RMCs 3, 4, or 5 are valid. When the availability of existent or refurbish-able tooling is available to two or more sources, then RMCs 1 or 2 are valid.

A9.2.6.4.5.7.14. **RMSC N**. Repair of this part requires special test and/or inspection facilities to determine and maintain ultra-precision quality for its function or system integrity. Substantiation and inspection of the precision or quality cannot be accomplished without such specialized test or inspection facilities. If the test cannot be made available for the competitive repair of the part, the required test or inspection knowledge cannot be documented for reliable replication or the required physical test or inspection facilities and processes cannot be economically documented in a TDP, valid RMCs are 3, 4, or 5. If the facilities or tests can be made available to two or more competitive sources, RMCs 1 or 2 are valid.

A9.2.6.4.5.7.15. **RMSC O**. The part was not assigned an RMSC when it entered the inventory, nor has it ever completed contract repair screening. Use of this code in conjunction with RMC 0 is sometimes necessary but discouraged. Maximum effort to determine the applicability of an alternate RMSC is the objective. Only RMC O is valid.

A9.2.6.4.5.7.16. **RMSC P**. The rights to use the data needed for contract repair of this part from additional source(s) are not owned by the Government and cannot be purchased, developed, or otherwise obtained. It is uneconomical to reverse engineer this part. This code is used in situations where the Government has the data but does not own the rights to the data. If only one source has the rights or data to repair this item, RMCs 3, 4, or 5 are valid. If two or more sources have the rights or data to manufacture this item, RMCs 1 or 2 are valid.

A9.2.6.4.5.7.17. **RMSC Q**. The Government does not have adequate data, lacks rights to data, or both needed to contract repair of this part from additional sources. The Government has been unable to economically buy the data or rights to the data. Breakout to competition has not been achieved, but current, continuing actions to obtain necessary rights to data or adequate, repair technical data indicate breakout to competition is expected to be achieved. This part may be a candidate for reverse engineering or other techniques to obtain technical data. If one source is available, RMCs 3, 4, or 5 are valid. If at least two sources exist, RMCs 1 or 2 are valid.

A9.2.6.4.5.7.18. **RMSC R**. The Government does not own the data or the rights to the data needed to contract repair of this part from additional sources. It has been determined to be uneconomical to buy the data or rights to the data. It is uneconomical to reverse engineer the part. This code is used when the Government did not initially purchase the data and/or rights. If only one source has the rights or data to repair this item, RMCs 3, 4, or 5 are valid. If two or more sources have the rights or data to repair this item, RMCs 1 or 2 are valid.

A9.2.6.4.5.7.19. **RMSC S**. Repair of this item is restricted to Government approved source(s) because the repair of this item involves unclassified but militarily sensitive technology (ref. FAR 6.3, *Competition Requirements—Other than Full and Open Competition*). If one source is approved, RMCs 3, 4, or 5 are valid. If at least two sources are approved, RMCs 1 or 2 are valid.

A9.2.6.4.5.7.20. **RMSC T**. (Reserved).

A9.2.6.4.5.7.21. **RMSC U**. The cost to the Government to breakout this part and repair it competitively has been determined to exceed the projected savings over the life span of the part. If one source is available, RMCs 3, 4, or 5 are valid. If at least two sources exist, RMCs 1 or 2 are valid.

A9.2.6.4.5.7.22. **RMSC V**. This part has been designated a high reliability part under a formal reliability program. Probability of failure would be unacceptable from the standpoint of safety of personnel and/or equipment. The cognizant engineering activity has determined that data to define and control reliability limits cannot be obtained nor is it possible to draft adequate specifications for this purpose. If one source is available, RMCs 3, 4, or 5 are valid. If at least two sources are available, RMCs 1 or 2 are valid.

A9.2.6.4.5.7.23. **RMSC W**. (Reserved).

A9.2.6.4.5.7.24. **RMSC X**. (Not authorized).

A9.2.6.4.5.7.25. **RMSC Y**. The design of this part is unstable. Engineering, manufacturing, or performance characteristics indicate that the required design objectives have not been achieved. Major changes are contemplated because the part has a low process yield or has demonstrated marginal performance during tests or service use. These changes will render the present part obsolete and unusable in its present configuration. Limited repair by the present source is anticipated pending configuration changes. If one source is available, RMCs 3, 4, or 5 are valid. If at least two sources exist, RMCs 1 or 2 are valid.

A9.2.6.4.5.7.26. **RMSC Z**. This part is a commercial/non-developmental/off-the-shelf item. Commercial item descriptions, commercial vendor catalog or price lists or commercial manuals assigned a technical manual number apply. If one source is available, RMCs 3, 4, or 5 are valid. If at least two sources are available, RMCs 1 or 2 are valid.

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