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Bridging the Knowledge Gap: Understanding the Relationship of Corporate Finance and Defense Procurement

December 2020

Capt. Troy Anderson, USAF
TSgt Seth I Banks, USAF
Capt. Jessica L. Hayes, USAF

Thesis Advisors: Dr. Judith M. Hermis, Assistant Professor
Dr. Robert F. Mortlock, Professor

Graduate School of Defense Management

Naval Postgraduate School

Prepared for the Naval Postgraduate School, Monterey, CA 93943.

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ABSTRACT

The purpose of this study is to provide the acquisition workforce (AWF) with an understanding of industry operations and a tool for assessing a company's capability and capacity. This study utilizes publicly available financial information and defines how a number of ratios can be used to reduce asymmetrical information that occurs within a principal–agent relationship. We examine the defense industry's strategic level corporate financial objectives and incentives and seek to understand how this impacts the government's procurement decisions. Finally, we make recommendations on possible ways this information can be infused with current AWF training and strategies, as well as ways this information can be utilized in future policy and acquisition strategies.

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ABOUT THE AUTHORS

Capt Jessica Hayes is a Contracting Officer in the United States Air Force. She was commissioned through the Air Force ROTC program at the University of Kentucky in 2013. She served as a Contracting Officer for an operational tour and a systems assignment prior to being accepted into the Naval Postgraduate School in 2019. After graduation in December, she will be reporting to Wright Patterson AFB to serve on the Air Force Material Command (AFMC) staff.

TSgt Seth Banks is a Special Agent in the United States Air Force Office of Special Investigations (AFOSI). His previous duty station was Whiteman AFB, MO, where he conducted counterintelligence operations and worked criminal investigations including sexual assault, simple use, suicide, domestic abuse, and child pornography. Upon graduating from NPS, he will move to Dayton, OH, where he will investigate procurement fraud at Wright Patterson AFB.

Capt Troy Anderson is a Contracting Officer in the United States Air Force. Prior to his commission he served six years as an Air Force enlisted aircraft structural maintainer for the F-16 Fighting Falcon. In 2016 he was commissioned through the AFROTC program at California State University, Sacramento. He served as an operational support Contracting Officer prior to being accepted into Naval Postgraduate School in 2019. Upon graduating he will be reporting to the 771st Enterprise Sourcing Squadron at Wright Patterson AFB, OH.

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LIST OF ACRONYMS AND ABBREVIATIONS

ABI	Acquisition Business Intelligence
ACAT	Acquisition Category
AFIT	Air Force Institute of Technology
AG	Acquisition Gateway
AWF	Acquisition Work Force
B2G	Business to Government
BA	Boeing
BBA-19	Bipartisan Budget Act of 2019
BOD	Board of Directors
CFO	Chief Financial Officer
CMS	Contract Management Standard
COB	Chairman of the Board
COGS	Cost of Goods Sold
COR	Contracting Officer's Representative
CRS	Congressional Research Service
DASC	Deputy Assistant Secretary for Contracting
DAU	Defense Acquisition University
DCMA	Defense Contract Management Administration
DFARS	Defense Federal Acquisition Regulation Supplement
DOD	Department of Defense
DSO	Day's Sales Outstanding
EMD	Engineering and Manufacturing Development
FAR	Federal Acquisition Regulation
FPDS	Federal Procurement Data System
FSM	Functional Services Manager
FY	Fiscal Year
GAAP	Generally Accepted Accounting Principles
GAO	Government Accountability Office
GD	General Dynamics
GDP	Gross Domestic Product

GPMR	Gross Profit Margin Ratio
HHI	Herfindahl–Hirschman Index
ICR	Interest Coverage Ratio
IED	Improvised Explosive Device
JLTV	Joint Light Tactical Vehicle
LMT	Lockheed Martin Corporation
LOE	Lines of Effort
LRIP	Low-Rate Initial Production
MD&A	Management Discussion and Analysis
MDAP	Major Defense Acquisition Program
NAICS	North American Industry Classification System
NASDAQ	National Association of Securities Dealers Automated Quotations
NCMA	National Contract Management Association
NDAA	National Defense Authorization Act
NDS	National Defense Strategy
NOC	Northrop Grumman
NPMR	Net Profit Margin Ratio
NPS	Naval Postgraduate School
NYSE	New York Stock Exchange
OCF	Operating Cash Flow
OMB	Office of Management and Budget
OSK	Oshkosh Corporation
PD	Production and Deployment
PMR	Profit Margin Ratio
R&D	Research and Development
RAND	Research and Development Corporation
RDT&E	Research, Development, Test & Evaluation
RFP	Request for Proposal
ROA	Return on Assets
ROE	Return on Equity
RPO	Remaining Performance Obligations
RTX	Raytheon Technologies
SEC	Securities and Exchange Commission

SG&A	Selling, General, and Administrative
SOX	Sarbanes–Oxley Act
SRRB	Services Requirements Review Board
USA	United States Army
USD(A&S)	Under Secretary of Defense for Acquisition and Sustainment

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I. INTRODUCTION

The better the buyer understands how the seller thinks, the better the buyer will be.[1]

We explore how acquisition workforce (AWF) personnel across the Department of Defense (DOD) can improve business acumen[2] to make more informed procurement decisions. Specifically, we select a series of measures based on contractors' publicly available financial statements and explain the research-driven theoretical application of these measures to DOD procurement decisions. We then apply our proposed measures to the Joint Light Tactical Vehicle (JLTV) contract of the U.S. Army (USA) to demonstrate how knowledge of the financial and operational environment surrounding contractors prior to contract award may have resulted in a more efficient and effective procurement strategy. We conclude with recommendations on how the AWF can adapt and apply the proposed tools to facilitate procurement activities. However, financial analysis is just one of many tools the AWF may use to evaluate a defense contractor. After sharing the results, we aim to provide additional context to our findings and how the information applies to DOD procurement decisions. We hope that our recommendations will inform better award decisions and contribute to appropriate contract design, strategy, and payment structure. We offer a tool that may help the AWF minimize asymmetrical information[3] by gaining insight into the offeror's operations and financial health. Ultimately, this knowledge may assist the AWF to develop the most efficient terms and conditions for both the DOD and the contractor.

The DOD states that efficiency and effectiveness in procurement decisions can help facilitate the department's broader objectives. Given the size of defense procurements, this statement seems reasonable. For example, in 2020, the DOD spent one trillion dollars

[1] Quotation from Denean Machis, chief professional development officer of the National Contract Management Association. Source: National Contract Management Association (2020, para. 10).

[2] Werber et al. (2019) define *business acumen* as the ability to manage human, financial, and information resources strategically; business acumen is an understanding of industry behavior and trends that enables one to shape smart business decisions for the government.

[3] Eisenhardt (1989) describes *asymmetrical information* as a circumstance when the seller (agent) of a good or service possesses greater knowledge than the buyer (principal).

procuring goods and services. This amount represents 11% of total government spending for the same fiscal year (FY).[4] The DOD is a major customer (defined as a customer to whom sales comprise at least 10% of total gross revenues) for many private-sector firms, including entities like General Dynamics (GD), Northrop Grumman (NOC), Oshkosh (OSK), and Lockheed Martin (LMT). For example, LMT relies upon the federal government for approximately 80% of its sales and has been the largest recipient of federal spending for the past 5 years (General Services Administration [GSA], 2020; Securities and Exchange Commission [SEC], 2020a). In contrast, OSK, another prominent defense firm, relied on the federal government for approximately 25% of its sales in 2019 (SEC, 2014e). In addition to comprising a material and repetitive proportion of many contractors' total sales, the DOD, as an agency of the U.S. federal government, enjoys distinct advantages relative to other customers. These include the ability to reclaim previously disbursed revenues and the requirement for suppliers to provide cost estimates to the government before receiving revenue payments.[5] As Hansen and Hermis (2020) explain, "When Uncle Sam goes shopping, he enjoys virtually limitless bargaining power" (p. 15). Despite the enormousness of defense spending and the import of that spending to a large proportion of the private sector, the extent to which the AWF can exploit contractor-specific knowledge to enhance the efficacy and efficiency of procurements remains underexplored in prior literature. This manuscript is a first step toward filling this vacancy in scholarly literature.

Our interest in the role of business acumen in defense procurements arises from our work experience and our knowledge of the latest National Defense Authorization Acts (NDAAs). There has been a renewed interest in improving the DOD's procurement environment and in merging education and training with industry standards. Specifically, the 2018 NDAA called on the DOD to assess the overall knowledge of the acquisition workforce regarding training, business acumen, and knowledge of industry partners, including contractors (Werber et al., 2019). To this end, the under secretary of defense for

[4] Government spending figures are based on obligated amounts taken from www.usaspending.gov as of October 30, 2020 (usaspending, n.d.).

[5] These rules are part of the Federal Acquisition Regulations (FAR) and the cost accounting standards included therein (FAR 52.230-2, 2020).

acquisition and sustainment (USD[A&S]) commissioned the RAND Corporation to assess the skillset of the AWF in the areas outlined in the NDAA. After a six month study, RAND identified several areas where AWF knowledge required development. The report recommended educational reform to help the AWF better understand the expectations and outcomes of the procurement landscape. Due to the AWF's lack of understanding and standardization of business concepts and standards, assessing the overall health of the organizations was hard to determine. The RAND study promulgated standard definitions for the terms *business acumen*, *industry operations*, and *industry motivation* (see Figure 1). These findings pushed the DOD to begin merging current training with industry standards. This new approach will allow the AWF and industry partners to better communicate and make sound acquisition decisions. Based on the results of this study, the AWF has opportunities to further expand procurement capabilities by understanding the intricacies of industry.

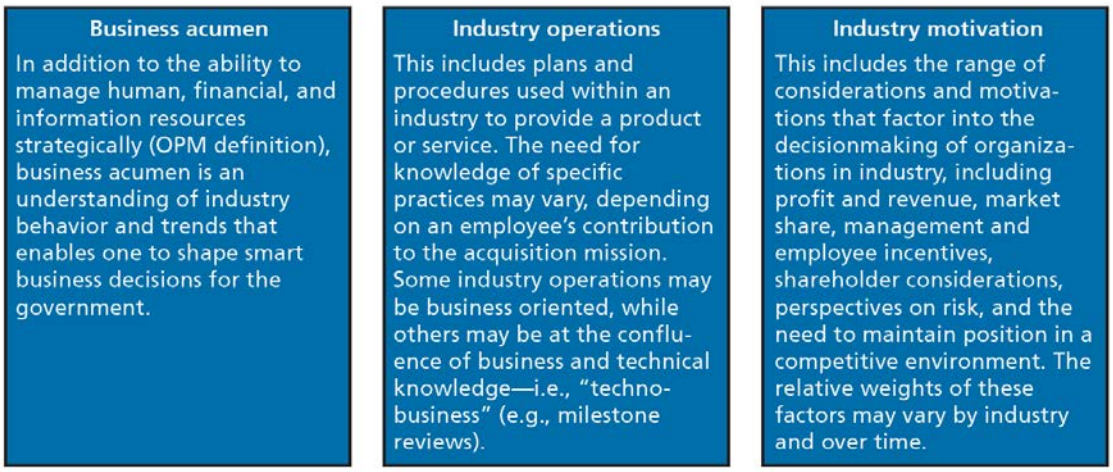

Figure 1. Definitions for Business Acumen, Industry Operations, and Industry Motivation. Source: Werber et al. (2019).

The USAF deputy assistant secretary for contracting, Major General Holt, continues to promulgate the importance of cultivating business acumen among the AWF. Specifically, Maj Gen Holt created a new acquisition enterprise with multiple embedded lines of effort (LOE) dedicated to addressing the shortcomings identified in the RAND report. LOE 1, entitled Building Mission Focused Business Leaders, requires AWF to understand the operational, financial, and industry-specific environment surrounding

defense contractors, with a particular focus on the role of capital market pressures in incentivizing certain firm behaviors.[6] Maj Gen Holt defines a *business leader* as a professional that understands how industry works in financial markets, what motivates corporate behavior, and where/how the AWF can influence that behavior (Air Force Installation Contracting Center 2020). Maj Gen Holt initiated a reform that will enable the AWF to understand a firm's motivations and incentives and how procurement decisions can more effectively address these implicit features of defense contracting. We partially answer this call by providing a management tool of theoretically robust measurements based on contractors' financial statement data. We also apply our proposed measures to a contemporary DOD procurement action to demonstrate how business acumen can enhance defense procurement.

A. RESEARCH QUESTIONS

This study addresses the following research questions:

- How does understanding a contractor's publicly available financial documents reduce information asymmetry?
- How can the AWF use a contractor's publicly available financial documents to make better procurement decisions to enhance outcomes?

B. METHODOLOGY AND IMPORTANCE OF RESEARCH

This research analyzes how to improve DOD procurement decisions through the lens of agency theory. We also analyze the need to reduce the amount of asymmetric information between the principal (government) and the agent (contractor). Asymmetric information between the principal and the agent results from differences in the information between the parties. In government acquisitions, there is a lot of information that can surround a particular requirement. The difference in this information can be deliberate or not deliberate. However, the goal of this study is to reduce the knowledge gap by exploring publicly available information about a company's operations. This study takes information

[6] The term *capital market pressures* refers to incentives surrounding the behavior of firms whose shares are traded on a U.S. stock exchange (known as *publicly traded firms*). Capital market pressures arise as a result of the separation of ownership and management of the firm. Capital market pressures sometimes incentivize distortionary behavior by, for example, encouraging firms to quickly complete work at the expense of quality so they can recognize revenue on their financial statements more quickly.

that is traditionally utilized by investors and applies theoretical applications to how that information provides insight into a company's internal operations. This understanding of a company's key business performance ratios not only educates the AWF on essential elements of business operations (such as cash flows, profit margins, and costs) but also allows for effective communication between government and industry partners. The AWF, traditionally, has not had to negotiate in the same way as industry. However, this study recognizes the need to understand industry motivations and negotiation language behind the financial ratios that we have chosen. In theory, this understanding will allow the AWF to be able to effectively target ways to assist a company with improving its publicly released ratios and allow for more effective negotiations, which results in a win–win for both parties. The firm benefits by releasing attractive financial statement information for investors, and the government can benefit in terms of cost, schedule, and performance.

C. ORGANIZATION OF REPORT

This study consists of six chapters. Chapter I is the introduction. Chapter II provides background information on the important principles of agency theory, the unique business-to-government (B2G) relationship, and the procurement environment. Chapter III provides a literature review on publicly traded companies' financial filings and various elements or ratios that are outlined throughout. Chapter IV provides the methodology in which we apply our research to a modern case study. Chapter V, the results, summarizes how knowledge of the financial and operational environment surrounding contractors prior to contract award may have resulted in more efficient and effective procurement decisions. Finally, Chapter VI provides recommendations on how the USAF AWF can adapt and apply the proposed tools to facilitate procurement activities and offers suggestions for areas for future research.

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II. BACKGROUND

Understanding the unique DOD procurement environment and the relationships within is critical to fully understanding the motives underlying DOD contractors' behavior. An economic concept known as *agency theory* plays a key role in understanding the operational context surrounding contracting firms. Agency theory refers to distortions in economic outcomes that occur when the party initiating a transaction (such as a purchase) is separate than the party responsible for executing under an agreement, such as a supplier. Agency problems arise because the initiator (principal) and the executor (agent) are separate economic actors, and each knows different information (Eisenhardt, 1989). Because of frictions like the cost of information acquisition, it is difficult for principals and agents to form contracts that fully reduce the extent of information asymmetry.

Agency theory manifests in contractor behavior in several ways that are of interest to the AWF. First, research demonstrates that firms facing capital market pressures, such as the pressure to meet shareholders' expectations of earnings, may engage in distortionary behavior like cutting research and development (R&D) funding to facilitate meeting external benchmarks based on reported numbers (Gunny, 2010). In addition to distorting optimal investment in desirable functions like research and hiring the best employees, contractors may plausibly respond to capital market pressures induced by agency problems by rushing the completion of contract work, at the expense of quality, to enable them to accelerate revenue recognition on their financial statements. Agency theory also subsumes optimal contractor behavior by creating incentives for firms to employ legal discretion in financial reporting to achieve targets in reported numbers.[7] A significant body of literature, too large to fully discuss, documents the relationship between market pressures and obfuscation of the firm's true underlying economic position. For example, Jones (1991) found that firms who face heightened regulatory scrutiny voluntarily reduce reported earnings to minimize the extent of attention they face, while J. Cohen et al.(2010) found

[7] The use of illegal discretion is considered financial reporting fraud and is not within the scope of this thesis.

that firms use advertising as a tool to temporarily inflate earnings and enable them to meet benchmarks.

Prior literature suggests that recipients of DOD contracts who are also subject to similar incentives (that is, all publicly traded contractors) face clear pressures to maximize the firm's stock price. Studies have also found that companies with increased profits will tend to buy back their shares in order to increase their overall share price; this increase in share price makes the company appear more attractive to investors and also benefits the chief executive officer (CEO) in the form of executive compensation plans (Morgan, 2019). To the extent that contractors face a trade-off between providing the best service and value under a given government procurement action and maximizing firm value, scholarly findings indicate that contractors are likely to engage in self-interested behavior at the expense of the DOD. However, the well-documented self-serving incentives of corporate entities represent an opportunity for the AWF; if the AWF can understand the contractor-specific incentives surrounding an individual procurement action, they can better design procurement contracts to balance DOD's need for timely, high quality, and value-driven acquisitions with the contractor's imperative to meet reporting goals. Financial statement ratio analysis, further discussed in Chapter V, is a powerful tool to help the AWF reach this goal.

Firms relying upon the public sector (government sales) for a greater portion of its sales engage in behavior substantially different from those depending on the private sector (commercial sales). Understanding the unique institutional environment in which defense-reliant contractors operate is a critical first step to cultivating the business acumen called for by the DOD's leaders. Generally, the DOD's bargaining power should be greater with those firms most reliant upon government business. We refer to this later as *dependency*.

In recent years, the government has begun to study its procurement process more as a business rather than a political process. Although the government does not rely on profit, the principles of reducing costs and gaining efficiencies are very important. Many studies have identified important truths about the unique B2G relationship. These studies have also identified ways the government can operate more like industry, educate its personnel similarly, and relate with industry partners. In the 2018 National Defense

Strategy, there is an emphasis on transitioning the government to adopt industry standards and perform procurement functions that align better with industry practice. This directive will allow for more common ground and understanding within the B2G relationships.

A. REGULATORY ENVIRONMENT

Prior literature identifies political pressures and accompanying differences in risk tolerance as the primary characteristics that distinguish contractors' engagements with the federal government, or B2G, from sales to private-sector partners—known as business-to-business or B2B (Josephson et al., 2019). First, political cycles may cause dramatic differences in federal defense spending. For example, management from firms pays close attention to the political climate on Capitol Hill. How much of the taxpayer's dollar is allocated to defense spending depends on which elected members are in power; this ultimately trickles down to the defense contractor. In 2016, the Obama administration passed a $585 billion defense budget (Department of Defense [DOD], 2015). Comparatively, the budget was $718 billion for FY2020 under President Trump (Office of Management and Budget [OMB], 2019). With the change in administration, defense spending has increased; however, this may not hold true in the future. Budget cuts are a common federal administrative tool that has adverse effects on defense industry partners. Funding instability exposes firms to risks including increased bureaucratic rules and regulations to control spending that flows down to contractors (Josephson et al., 2019). In addition, Josephson et al. found that political pressures also shape the nature of government procurements as the government's objective is to maximize value and adhere to socioeconomic policies (p. 54). In the DOD, these socioeconomic goals manifest in preferences for entities such as small businesses, veteran- or minority-owned businesses, and businesses owned by women.[8] The value- and welfare-maximizing objectives of B2G transactions contrast sharply with the profit-maximizing objectives of B2B transactions (Josephson et al., 2019

[8] "It is the policy of the Government to provide maximum practicable opportunities in its acquisitions to small business, veteran-owned small business, service-disabled veteran-owned small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns" (FAR 19.201, 2020, para. [a]).

A vast body of statutory regulation also shapes B2G activities. For example, federal procurements are subject to the Federal Acquisition Regulation (FAR), and DOD procurements are further regulated by Defense Federal Acquisition Regulation Supplement (DFARS). The FAR and DFARS outline the procedures governing the buyer (government's) behavior surrounding procurements of goods and services and are intended to unify and control the many procurement arms of executive agencies (Wilkinson et al., 2017). These heavily regulated relationships are intended to control behaviors and outcomes and place demands above typical industry operations (Josephson et al., 2019). For example, contractors to the DOD are subject to cost accounting standards (CAS) with many contracting strategies, which affects their cost accounting practices and is intended to provide the government with greater insight into contractors' cost estimation and cost formation policies. Additionally, another difference between B2B and B2G stems from differences in the "relationship-building tactics being heavily regulated" (Josephson et al., 2019, p. 54). The AWF personnel are restricted in the relationships with a contractor. AWF personnel are also not allowed to accept any gestures of gratitude from the contractor. However, in the B2B sector, building relationships is highly encouraged, as relationships are important to building a successful and strong supply chain.

B. CUSTOMER BARGAINING POWER: B2G RELATIONSHIP

Josephson et al. (2019) stated, "The government's purchasing footprint is enormous and cannot be duplicated in the commercial sector, whether in dollar value or the number of contracts" (p. 50). The DOD is no exception to this characterization. According to *www.usaspending.gov*, the DOD was obligated $926 billion for FY2019. This obligated amount represented approximately 4.3% of the U.S.'s gross domestic product (GDP) for 2019 (Bureau of Economic Analysis [BEA], 2020). This spending exceeded the total of the next top 10 countries in the world combined, including Brazil, Russia, India, China, Saudi Arabia, and South Korea (Tian et al., 2020). According to the GSA, the Big 5 contractors (i.e., Lockheed Martin, Boeing, General Dynamics, Raytheon Technologies,[9]

[9] On April 3, 2020, Raytheon Technologies Corporation announced the successful completion of the all-stock merger of equals transaction between Raytheon Company and United Technologies Corporation.

and Northrop Grumman) received approximately 14% ($129 billion) of the entire DOD budget for FY 2019.

The unique nature of federal contracting in general and defense contracting creates strong contractor-specific incentives to invest in the government, the contractors' major customer. This customer-specific dependency manifests in large contractor revenues derived from the DOD. For example, in calendar year 2019, Northrop Grumman, Lockheed Martin, and General Dynamics all derived at least 60% of gross sales from the DOD (SEC, 2019b, 2020a, 2020b). Prior literature finds that extensive engagement with major customers can result in behavior both beneficial and harmful. For example, Patatoukas (2012) found that suppliers who have large customers in the commercial (nongovernment) sector enjoy supply chain efficiencies generally unavailable to firms with a more diverse customer base. Anecdotally, firms that repeatedly engage with the same major customer, like DOD contractors, cultivate customer- and industry-specific knowledge that enhances the supplier's ability to perform well under procurement contracts. However, research also finds that the presence of a major customer can magnify agency problems and lead to distortionary behavior by contractors. For example, Hermis (2020) found that contractors exploit political networks to obtain contract pricing terms that shift the risk of cost overruns onto the federal government, while Brogaard and Pan (2020) found that firms also exploit network relationships to obtain additional contract modifications and extend completion times under existing contracts. Taken together, the regulatory environment and unique customer–supplier relationships found in the DOD imbue defense procurements with unique institutional characteristics and highlight the importance of business acumen among the AWF to enable the department to efficiently and effectively obtain required goods and services.

Research shows additional advantages to this unique B2G relationship. First, due to the highly regulated environment surrounding federal acquisitions (i.e., under the FAR and the U.S. Code [U.S.C.]), government tends to pursue longer-term contracts, which contributes to greater firm stability as it lowers a firm's uncertainty for demand (Cohen & Li, 2020). Second, defense contractors are less likely to default or declare bankruptcy than firms that rely upon commercial business (Goldman et al., 2013). Mills et al. (2013) stated, this advantage applies to larger firms in the product market that are experiencing success

due to many sole source procurement contracts. These same firms also experience more consistency in demand. Third, firms that rely upon large federal government agencies for sales encounter less competition overall (Mills et al., 2013). Fourth, the government offers cost reimbursement contracts, which is not an industry practice (Josephson et al., 2019). These types of contracts are typical for R&D as the requirement for the product and/or service is less defined than a commercial item (FAR 16.3, 2020). This arrangement reimburses costs for companies based upon work performance. The government bears the greater financial burden, as the objective may not be achieved due to insufficient knowledge (specifications) of the end-product. Also, the firm requires extensive oversight as the government relies on a "good faith effort" to stay within the estimated costs (Needham, 2009, p. 4). This contract allows and encourages companies to make technical specific investments without having to invest their own capital. It creates a win–win solution by furthering government objectives, developing a more capable industry, and furthering a firm's knowledge and experience at no cost to the defense contractor.

C. DEPENDENCY

A critical part to understanding the government's commercial partners leans upon understanding their commitment to government contracts. A company's revenue dependency is an important part of understanding how the company will behave and will assist in understanding the environment surrounding their financial statements. According to Josephson et al. (2019), this dependency can be measured in breadth (diversity of their portfolio) and depth (level of commitment to a specific agency). For example, of the five major companies mentioned above, the three defense contractors most dependent on government contracts by total sales were Northrop Grumman (NOC; 83%), LMT (71%), and General Dynamics (GD; 66%) (SEC, 2019b, 2020a, 2020b).

Companies with low breadth have a smaller variety customer base, while firms with high breadth have revenues streaming from a larger variety of agencies. This is important to understand as there are risks associated. This will change the way a company behaves and builds proposals in a B2G market. The breadth and depth of a company's affairs with the government can be evaluated in the publicly available financial information (Josephson et al., 2019).

III. LITERATURE REVIEW

Our recommendation of specific tools to cultivate the business acumen of AWF personnel draws on two streams of literature: economic literature addressing agency theory and finance and accounting literature addressing the ability of various financial statement measures to capture latent characteristics of the firm's operational environment. We analyze the impact of agency problems and information asymmetry on business incentives and outcomes and the use of financial reports and disclosures as a mechanism to mitigate the extent of asymmetric information between business parties.

A. AGENCY THEORY

Agency theory is an economic and social sciences theoretical model that attempts to inform the principal (government official) and agent (contractor) of the potential conflicts of interest before entering into a contractual agreement (Eisenhardt, 1989). For the purposes of this study, we view this theoretical framework primarily from the government's (i.e., principal's) perspective. If the government issues a request for proposal (RFP) for a product or service, private industry (i.e., the agent) assumes the government lacks this ability (Walker & Weber, 1984). This suggests that the agent may have greater expertise or capability in this arena than the principal. This knowledge gap represents one example of asymmetrical information (Eisenhardt, 1989). The principal's inherent inadequacy (i.e., information and capability gap) can be used against them when trying to negotiate cost, schedule, and performance metrics (Yukins, 2010). Specifically, this gap in knowledge and capability reveals a governmental vulnerability and provides a discretionary space for private industry to determine higher costs for time, labor, and materials. These circumstances are most dire when products and services are dynamic, highly technical, and require innovation. There is an overreliance on industry to define these specifications.

The type of contract will be determined by how well requirements are defined. After all, market research is conducted, and the government formulates a contract type using FAR 16.1, Selecting Contract Types (2020). Government thrives under circumstances when products are well-defined, exchanges between principal and agent are

certain, and contracts are written with specificity (Brown et al., 2013). Government also prefers performance-based contracts, competition from responsible firms, and a minimization of administrative costs (FAR 1.102, 2020, para. [b]). However, the government often finds itself in the marketplace for innovation (i.e., R&D). This environment is more unique and provides less requirement competition as requirements are less defined, exchanges between the principal and agent are uncertain, and contracts are incomplete due to the low specificity for the outcome (Brown et al., 2013). Therefore, it is more difficult for the government to offer well-informed and effective performance incentives to a firm when completion data is unclear or not available.

To better illustrate the forces involved within agency theory, Figure 2 summarizes the relationship components between the principal and the agent. The figure captures the conflicting objectives between the government and the contractor (i.e., competing motivations of public policy and cash flow). These objectives are identified through information such as the government's mission and the contractor's capability (Rendon, 2011). Competing objectives between government and industry are displayed through each's behavior and determine how contracts are planned and executed (Rendon, 2011).

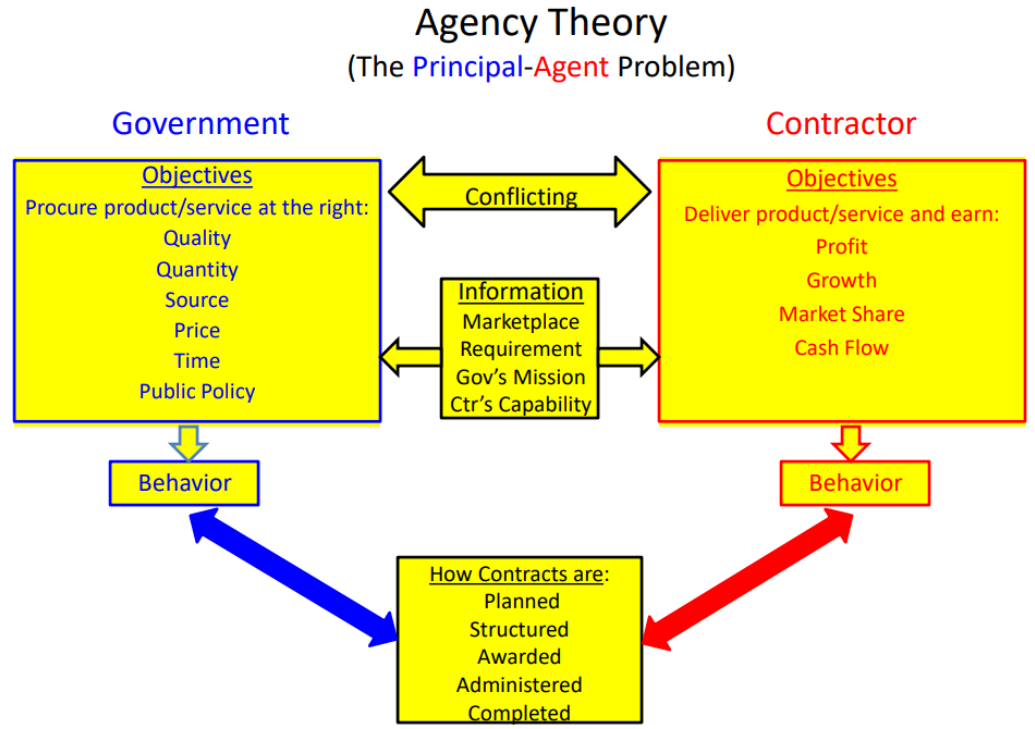

Figure 2. Components of Agency Theory. Source: Rendon (2011).

Apart from the government implementing pragmatic performance-based incentives, there are two additional risk mitigation practices that contracting professionals need to overcome. Agency theory discusses monitoring and bonding as methods to deter an agent's poor or malicious behavior. Monitoring is the practice of surveillance by a government official during the post-award phase of the contract (Brown et al., 2013). Depending on the size and type of the contract, a contracting officer's representative (COR) and/or the Defense Contract Management Administration (DCMA) is assigned to provide surveillance of the agent's progress throughout the life cycle of the contract (Wilkinson et al., 2017). Monitoring a firm's performance post-award is essential to deter the agent's potential selfish behavior (i.e., moral hazard) and foster the production of quality products and services that meet the contract requirements (Brown et al., 2013). The COR and/or the DCMA use the quality assurance surveillance plan to determine compliance with the performance work statement (DOD, 2020; Holmstrom, 1979). Second, bonding (i.e., governance rules) is a practice to reward or sanction those behaviors that complied with or violated the contract (Brown et al., 2013). Without these risk mitigation practices, there is no accountability (Yukins, 2010). Agents will be inclined to exploit their position for greater financial gain if given too much discretionary space.

Agency theory discusses residual loss, a cost that is difficult to mitigate and is the byproduct of conducting contractual agreements with entities outside of government (Hannes, 2007). Examples of this type of loss include substandard levels of effort by an agent's employees, leaks of confidential information to third parties, accidental relaying of misinformation, and opportunity costs such as hiring a less capable agent due to public policy requirements (Yukins, 2010).

Agency theory allows the principal to take an objective view of industry. The principal (government) must learn how to proactively understand the market before negotiations begin if it wants an equal footing with the agent during negotiations. This insight enables us to view a firm for what it is, not what we believe or want it to be. A better understanding of an agent's capabilities may allow the AWF to implement appropriate performance method strategies to achieve a more cost-effective outcome.

B. CAPABILITY VERSUS REPUTATION

Contributing to agency theory, federal acquisition literature describes the importance of contractor selection and management in relation to the agent's reputation. Known as part of the source selection process, contractor performance is evaluated based on adequate criteria to filter out subpar contract results. Evaluation factors are described in detail in Sections L and M of the solicitation as AWF professionals attempt to control the behaviors outlined in agency theory (Acquisition Gateway [AG], 2020). If used correctly, the selection step can identify the quality level industry can provide; however, understanding a company's performance capabilities should not be based solely on the company's reputation. The evaluation process can be enhanced by the AWF's knowledge of how a company may perform in the future by analyzing internal industry operations (AG, 2020). While not predictive in nature, certain indicators can describe the likelihood of performance outcomes (Randall, 2013). A contributing factor of performance is how a company structures its corporate governance. This governance is typically based on a firm's proxy statements and applicable SEC filings (Wang & San Miguel, 2012).

Publicly available information can provide key insights about a firm's overall capability to perform. As Williamson (1967) stated, "Capability, which is a measure of the contractor's existing capacity to undertake and complete a task, should be distinguished from his reputation. Reputation being the contractor's efficiency and quality of performance of work that the contractor has done previously" (p. 222). In other words, a firm should be defined by past performance and current capacity and capability, not reputation. For example, when a publicly traded company bids on a government contract, contracting officers need to determine if the firm has enough available resources to take on additional programs. Specifically, how would a contracting officer know if a firm has the capacity to accept new projects? Determining this capacity is established through metrics and ratios discussed later in this chapter. Analysis of a firm's financial documentation expands traditional market research techniques and helps the AWF make better procurement decisions.

C. PUBLICLY TRADED COMPANIES

This section discusses the U.S. business landscape, federal business regulations, and history. While this study promotes collecting financial information from any firm bidding on a government contract, we focus our efforts on publicly traded companies in U.S. markets. All the firms discussed in this study are bought and sold on the New York Stock Exchange (NYSE). If a firm wants to be traded on a U.S. exchange, it must fulfill the requirements outlined by the federal regulatory authority, the Securities and Exchange Commission (SEC). Some of these requirements include disclosure of quarterly and annual financial reports. These reports can be found on the federal government site *EDGAR* (electronic data gathering, analysis, and retrieval; SEC, n.d.).[10]

The digital and information age has evolved business practices toward a higher degree of accountability and transparency. Access to this information was not readily available 25 years ago. This section provides a brief overview of U.S. market regulations and mandatory financial filings.

The major accounting scandals of the dot-com bubble and financial crisis of 2007−2008 led to many reforms of how publicly traded companies operate within the United States. Two of these reforms include the Sarbanes−Oxley (SOX) Act and the Dodd−Frank Wall Street Reform and Consumer Protection Act (Easton et al., 2018). These two reforms changed the way publicly traded companies report their financial data and conduct business. This discussion emphasizes the implications resulting from the SOX Act. Also known as the Public Company Accounting Reform and Investor Protection Act, the SOX Act requires the chief financial officer (CFO) and chief executive officer (CEO) to be directly involved with the auditing process. Management takes personal responsibility for their company's annual (Form 10-K) and quarterly (Form 10-Q) reports by certifying these documents as being current, accurate, and complete (J. Cohen et al., 2010). J. Cohen et al. (2010) also indicated that "the CFO and CEO certification requirements of SOX have had a positive effect on the integrity of financial reporting" (p. 782).

[10] *EDGAR* is the electronic filing system created by the SEC to increase the efficiency and accessibility of corporate filings.

According to Palmrose and Scholtz (2004), to maintain positive public perception, distressed firms are more likely to restate, misstate or omit their financials than stable firms. This is an example of a potential red flag that an AWF member should acknowledge when building an acquisition strategy. A firm's restatement of financial documents indicates that the initial attempt was not satisfactory to the SEC. Through the research presented, we explore data and metrics found within financial disclosures that may indicate other concerns. This should encourage the government's AWF to view this publicly available information as having great potential to enable them to discern if a business is capable of performing or producing effectively. To harness usable practices of this data, the AWF must possess a basic understanding of key elements from these statements. A comprehensive coverage of all financial factors will not be covered in this research; however, key elements will be described in detail. In the following discussion, we have identified pertinent financial data, ratios, and information to help the AWF assess the overall health of a company. If future efficiencies are to be obtained, the AWF should be required to evaluate those firms achieving the competitive zone for contract award.

1. Financial Statements

Firms use financial reports to communicate their business activities with interested parties (e.g., shareholders). The SEC has recognized the Financial Accounting Standards Board (FASB) as being responsible for the standardization of financial accounting and reporting for public and private companies. These standards are called the Generally Accepted Accounting Principles (GAAP). These principles are the "authoritative guidance for accounting in the United States" (Stickney et al., 2010, p. 3). The reports produced on this guidance are published quarterly or annually and consolidate key accounting functions. There are four financial statements that contain accounting data that will be used in this study:

1. *Balance sheet* of what is owed or owned at a specific point in time.
2. *Income statement* describing funds earned or spent over a period of time.
3. *Statement of cash flows*, which describes the exchange of funds from within the firm to outside the firm over time.
4. *Statement of shareholder's equity* describing the interest changes of a company's shareholders over a period of time (Stickney et al., 2010).

Financial data elements contained in these statements will form the bulk of determining a firm's overall financial health.

2. Management Discussion and Analysis

In addition to these statements, annual Form 10-Ks contain a robust management discussion and analysis (MD&A) section mandated by the SEC (Stickney et al., 2010). Company management uses this section to show the public how their business is performing using the disclosed qualitative and quantitative data. This is a section where nonfinancial concerns may be addressed as well. Topics covered include liquidity and capital resources, cash requirements, and uses of cash. The MD&A informs the reader of management's operations outlook and how much cash flow is projected. The management sections attempt to provide current trends and uncertainties the business will face. This section helps inform the reader as to why there may have been material changes, negative cash flows, or external debt financing (Stickney et al., 2010).

Applicable to the government's AWF, according to the GSA for FY2019, the top five U.S. defense contractors discussed budget constraints, sales strategy, foreign and domestic economic challenges, and cash flows as they related to the companies' most lucrative programs. For example, LMT discussed future sales relating to its most lucrative programs, the F-35 and F-16 programs. Operating cash flow projections stemming from these programs help provide shareholders and potential investors with realistic expectations (SEC, 2020a).

More insights can be gleaned from these publicly available financial documents. Generated in the statement of cash flows, steady cash flows from operations are indicative of a financially healthy firm. Corporate operations produce cash inflows from providing goods or services and selling products. Another useful indicator is found in the income statement. The cost of goods sold is an inventory cost expensed by firms as they sell units (Stickney et al., 2010). The AWF can successfully use financial statements to enhance understanding of the relationship between statements and their effect on business deals, distinguish differences in profitability versus cash flow, and highlight acquisition policy impact on a firm's financials (Bowlds et al., 2015).

3. Rates and Ratios

Armed with data contained in the financial statements, acquisition professionals can use common metrics and ratios to produce greater insight into a firm's performance and environment. Specifically, interested parties (shareholders and investors) regularly use this data to assess a firm's liquidity, solvency,[11] and profitability to determine the firm's potential for growth, decline, and capability. We chose numerous measurements to help determine whether a firm has the capability and capacity to perform future government contracting. The metrics are derived from calculations taken from various data throughout the SEC filings. These calculations include debt to equity (D/E), gross profit margin (GPMR), net profit margin ratio (NPMR), interest-coverage ratio (ICR), operating cash flow (OCF), days-sales-outstanding (DSO), return on assets (ROA), return on equity (ROE), sales growth, sales contract backlog, Altman's Z-score test, and the Herfindahl–Hirschman Index (HHI) test. In this section, we attempt to explain and discuss the purpose and implications of each calculation. These implications should help guide the AWF to determine whether a contractor is responsible and capable of performing a certain government contract.

The D/E ratio is used to help determine a company's long-term solvency (Easton et al., 2018). It is a measure of how much a company borrows to leverage its assets. A company's total debt includes long-term and short-term loans (e.g., bonds payable to creditors) and capital expenditures (e.g., investing activity to upgrade facilities). Total equity primarily consists of retained earnings and common stock. Equity represents the value of an investor's stake in a company. The quotient of 1.0 implies the dollar amount of borrowed funds equals the amount of money owned by shareholders if all the company's assets were sold (2018). Discerning a true meaning for this diagnostic outcome comes from a comparison against the industry's historical standard.

The GPMR is a measure of a firm's efficiency. It describes how well a firm utilizes its resources to manufacture a product and/or provide a service. It is the revenue left over after subtracting the cost of goods sold (COGS; Stickney et al., 2010). The difference is

[11] Easton et al. (2018) define *solvency* as "a company's ability to meet its debt obligations, including both periodic interest payments and the repayment of the principal amount borrowed" (p. 4-37)

divided back into total sales to determine a firm's efficiency. For example, if a firm earns $10 and has expenses totaling $8, it has a GPMR of 20% (Easton et al., 2018). As stated earlier, this metric is best used when compared to other companies in the same industry.

NPMR, like GPMR, accounts for a firm's profitability after COGS. However, this calculation includes additional expenses, including a firm's payment toward interest and taxes to lenders and the Internal Revenue Service (Easton et al., 2018). For this reason, the quotient of NPMR is usually much lower than GPMR. This calculation may prove a better method than GPMR to realize a firm's profitability as it reveals a firm's true earnings (Easton et al., 2018.)

The ICR determines how well a firm can pay the cost of borrowing money. This is an especially important metric for shareholders and creditors. Within a bankruptcy proceeding, creditors are paid first, and owners are paid last. Thus, if a company is unable to pay the interest on the principal amount loaned by a creditor, the firm is demonstrating financial distress. Large publicly traded companies will find it difficult to attract future shareholders when this metric is unfavorable. The creditor is typically a bank or an individual bondholder. Dividing the firm's net income by this nonoperating expense will establish whether the firm is too leveraged. Once again, these metrics should be contrasted with an industry standard to provide an acceptable standard of risk.

Comparing OCF to total sales reveals a firm's ability to pay its operating expenses, pay off its short-term debt (current liabilities), and, ultimately, make a profit. Operating cash inflow is the result of subtracting sales from operating expenses. Thus, this metric also informs interested parties regarding how efficient a firm is at manufacturing its products. It is necessary to contrast this metric with the industry average to accurately judge a firm's performance (Easton et al., 2018).

The DSO metric is calculated by dividing accounts receivable (total invoices due during a set period) by total credit sales (invoices) and multiplying this figure by the number of days in sales. This metric helps management and investors answer many important questions: How long does it take the firm to receive a payment on an invoice after a sale is made? How quickly are customers paying their bills? Is there a problem within the firm's collections department? In turn, this may indicate whether a firm is

providing customer satisfaction. Last, the DSO metric can reveal weaknesses within a firm's customer base. Good customers will stay within their payment cycle.

ROA is calculated by dividing a firm's net income by its total assets. Investors can judge how management is efficiently using the company's assets to generate earnings. This metric is more helpful within industries that produce products (e.g., farm and heavy construction machinery) as opposed to services (e.g., health-care plans). As stated earlier, it is much more revealing to compare these metrics with firms within the same industry.

ROE is found by dividing net income and shareholder equity. Net income is the firm's profit after all expenses have been paid. Shareholders' equity represents what investors own in a firm after total assets are subtracted from total liabilities. ROE can be a more accurate way of calculating a firm's asset performance compared to ROA as this equation accounts for a firm's debt structure or liabilities.

Year-over-year sales growth rate is a general way of determining whether a firm is on a path of growth or decline. Sales (gross revenue) are compared quarterly and annually by dividing the current financial results by a previous quarter's or year's performance. A larger and more established company may have lower growth rates than startups as it has already captured a large portion of the market. This is important because higher growth firms are expanding.

The sales contract backlog and sales ratio reveal how well a company can keep up with customer demand. A contract backlog represents work still needing to be accomplished. A company with a high ratio implies the firm has numerous unfilled sales orders and/or unprocessed financial papers. This ratio may also give insight into a firm's manufacturing (production) and inventory level (supply chain management) efficiency (Easton et al., 2018).

4. Predictive Financial Indicators

In addition to financial ratios, financial literature offers several predictive measures to help identify whether a firm has the capability and capacity to perform a future contract.

Two measures have been identified for use in our research: Altman's Z-score[12] and the HHI.[13] Altman's Z-score is a predictive model that measures a firm's financial distress. The model has been proven to be quite reliable in predicting a firm's likelihood of filing for bankruptcy (Eidleman, 1995). It combines five financial ratios whose sum yields values leading to bankrupt, zone of ignorance, or nonbankrupt conclusions. The Z-score formula is as follows:

$$\mathbf{Z = 1.2X1 + 1.4X2 + 3.3X3 + 0.6X4 + 1.0X5}$$

- where **X1 = Working Capital/Total Assets**. This measures liquid assets in relation to the firm's size.
- where **X2 = Retained Earnings/Total Assets**. This is a measure of cumulative profitability that reflects the firm's age as well as earning power.
- where **X3 = Earnings Before Income Taxes/Total Assets**. This is a measure of operating efficiency separated from any leverage effects.
- where X4 = Market Value of Equity/Book Value of Debt. This ratio adds a market dimension.
- where **X5 = Sales/Total Assets**. This is a standard turnover measure (Eidleman, 1885, p.52).

Altman concluded that a Z-score range could be determined where certain threshold cutoffs indicate prediction outcomes. Established cutoffs are shown here:

Bankrupt	if the *Z score* is less than 1.81
Zone of ignorance	if the *Z score* is between 1.81–2.99
Nonbankrupt	if the *Z score* is greater than 2.99

Z-score predictions have been proven to accurately predict "72% of bankruptcies two years prior to the event" (Eidleman, 1995, p. 52). The application of the score could be beneficial in assessing a firm's financial condition prior to federal contract agreements.

Another predictive model, the HHI, measures industry concentration. The HHI is useful in that it illustrates the competitive environment for firms operating in a specific industry (Rhoades, 1993). When a sensitivity analysis is applied, the HHI can also be used

[12] Altman's Z-score is not accurate for new firms. Firms' low earnings will tend to produce a low Z-score. The score is also limited due to the absence of cash flows in the calculation.

[13] The HHI is limited as the calculation does not account for complexities in some markets.

as an effective assessment tool to evaluate new entrants into an existing market (Brezina et al., 2016). Competition can be beneficial when seeking to obtain lower prices; however, fierce competition incentivizes firms to behave perfunctorily. HHI is also valuable in assessing a proposed merger to identify new concentration levels. The index accounts for the number of firms in a market, as well as concentration, by incorporating the relative size (that is, market share) of all firms in a market. It is calculated by squaring the market shares (MS) of all firms (i) in a market and then summing the squares. (Rhoades, 1993, p. 188)

The equation is as follows:

$$HHI = \sum_{i=1}^{n} (MS_i)^2$$

The index can result in three levels of market concentration (Department of Justice & Federal Trade Commission, 2010). These levels and their corresponding ranges are

Unconcentrated:	HHI is below 1,500
Moderately Concentrated:	HHI is between 1,500–2,500
Highly Concentrated:	HHI is above 2,500

Implications of an HHI market concentration may also be an indicator of antitrust violations.

5. Executive Compensation

Assessing an executive's compensation may provide additional context to the strategic behaviors of a firm. The definitive proxy statement (DEF 14A) informs shareholders how the board of directors (BOD) oversees the company's management. This document also communicates relevant information pertaining to facts and circumstances surrounding decisions requiring a shareholder vote, discusses executive pay, and reveals the past and present compensation provided to top executives (SEC, 2017).

Significant literature exists on how firms attempt to maximize firm performance and shareholder wealth through executive compensation (Devers et al., 2007). The BOD and/or compensation committees typically manage the executive's compensation portfolio to influence their behavior. As mentioned previously, there are many levers at the BOD's

disposal to influence an executive's behavior. Depending on the health of the company and its industry, the BOD attempts to channel their executive's focus to minimize losses (i.e., risk averse) or maximize gains (i.e., risk prone; Devers et al., 2007). For example, awarding an executive with significant stock options (option awards) should encourage greater risk. In turn, an executive who takes on greater risk encourages stock price volatility as there is a potential for greater share growth. However, once there is significant stock ownership within the company, an executive may become risk averse as there is a desire for stability (Devers et al., 2007, p. 1030). Incentive pay (option pay) should also diminish risk aversion. Datta et al. (2001) found that incentive pay "positively influenced the acquisition of high-growth targets" (p. 1028).

Compensation theory is the attempt to understand executive behavior under various incentive compensation packages. How can the BOD ensure their executives maintain appropriate "goal alignment and risk preference" (Devers et al., 2007, p. 1025)? Different theories help to answer this question including agency theory, behavioral theory, and economic theory. A 2020 meta-analysis concluded larger companies with independent BODs do enhance the linkage between company performance and CEO compensation (Blanes et al., 2020). Current research, however, has yet to determine consistent findings as there are many variables to consider when conducting "complicated theoretical and mathematical models that are incapable of accounting for human perception and biases" (Devers et al., 2007, p. 1040).

While there are inconsistent findings, the BOD does not arbitrarily compensate their CEOs. There is significant literature tying company priorities to executive compensation. The BOD utilizes many levers to award and steer their executives. Attempting to understand CEO motivation should be considered regardless of its uncertain impetus. Consulting an executive's compensation plan is another variable highlighting a firm's major priorities (Harris & Bromiley, 2007).

6. Cash Flows

Cash flows help company managers, investors, and analysts assess a firm's performance, liquidity, financial flexibility, and operating capability. Metrics in determining performance include a firm's ability to reinvest in current and future projects,

issue dividends, repurchase company stock, pay debtors, and meet equity obligations (Figlewicz & Zeller, 1991; Richardson et al., 2018).

The government has different capabilities when determining how a firm should be paid and/or financed. For the purposes of this research, we focus on fixed price contracts as our case study uses a firm-fixed price contract. Firms can only be financed when using fixed price contracts. These methods include "progress payments, advance payments, performance-based payments, commercial item purchase financing, private financing, and government loan guarantees" (Feldman, 2016, p. 449). Contracting officers engage with industry seeking to minimize risk. FAR 32.106 (2020), Order of Preference, outlines five methods the government may use to provide financing for a contractor. The government's first choice will be to fund a program through private financing without government guarantees. Second, the contracting officer can provide "customary contract financing," which requires special approval and typically involves performance-based payments (FAR 32.113, 2020). Third, the government can provide industry with loan guarantees. Fourth, FAR 32.501-2 (2020) allows the government to provide a firm "unusual contract financing," which requires special approval and deviates from FAR Part 32 (2020), Contract Financing. Finally, FAR 32.402 (2020) allows the government to authorize "advance payments" to any type of contract provided that various stipulations are met and this method is used sparingly.

As previously mentioned, the contractor is motivated by guaranteed long-term cash flows providing financial stability. However, each firm has different needs depending on the type of contract and the firm's unique financial circumstance. The government does not offer custom performance-based incentives to accommodate industry. FAR 16.4 (2020), Incentive Contracts, offers incentives based upon government-interpreted contractor motivations. Merely providing increased cash flows may not produce best value and/or customer satisfaction.

Without adequate industry knowledge, acquisition professionals may improperly implement award incentives. A 2006 Government Accountability Office (GAO) report noted, "The power of monetary incentives to motivate excellent contractor performance and improve acquisition outcomes is diluted by the way DOD structures and implements

incentives" (Hutton, 2005, p. 2). These misdirected incentives can have an enormous impact when recognizing how much the DOD spends on acquisitions. The FY2017 defense budget obligated more money than all federal agencies combined, amounting to $320 billion (Schwartz et al., 2018). The procurement of the F-35 Joint Strike Fighter represents one example of the effects of knowledge gaps widening between government and industry. In a 2017 article, Grazier contended that the wedge is created when defense contractors create complex support systems dependent only on themselves. In large-scale acquisitions like the F-35, incentives can be perverted when a defense contractor holds the government hostage (Grazier, 2017). As the sole producer of the F-35, Lockheed Martin has built itself into a $1.9 billion repair service contract that generates a revenue stream that will continuously feed these key ratios (Reim, 2020). This contract outcome displays the importance of cash flow impact from government contracts.

The relevance of publicly traded companies' financial documents in federal procurement cannot be understated. To explore this, these six factors related to financial documents—paired with information we obtained in the literature review—are applied to a real-world DOD acquisition in the form of a case study. Although this study experienced some limitations, the information gathered and presented can be applied to any acquisition intending to contract with publicly traded companies. This approach to understanding more about industry operations through their financial ratios will ultimately lead to reduced amounts of asymmetric information—subsequently leading to better discussions, strategies, and procurement outcomes.

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IV. DATA AND METHODOLOGY

We chose a case study to illustrate the potential impact business acumen may have throughout the acquisition life cycle. As the AWF learns how to calculate and interpret meaningful financial data, the DOD should produce more favorable contract outcomes. We hope the AWF will use our case study analysis as a framework for future market research methods. The data and methodology in this chapter should favor the procurement environment by decreasing asymmetrical information between principal and agent.

This section represents our effort to practically apply agency theory and the knowledge obtained from multiple firms' publicly available financial information. We chose to focus on a major defense acquisition program (MDAP) with an Acquisition Category (ACAT) 1 designation. Companies competing for these types of contracts are usually large and publicly traded. Due to the dollar value placed on these types of contracts, there is usually an abundance of financial literature available, especially for those publicly traded companies involved.

A. METHODOLOGY

Our analysis was conducted using numerous calculations to assess the financial health, capability, and capacity of both companies. To utilize all the calculations, the SEC Form 10-K and definitive proxy statement (DEF 14A) were examined. Most variables used for the calculations were gathered from each firms' financial statements while the executive compensation packages were viewed within the DEF 14A statement.

The calculations include D/E ratio, GPMR, NPMR, ICR, OCF, DSO, ROA, ROE, sales growth, sales contract backlog, HHI test, and Altman's Z-score test. Also, executive compensation is illustrated as a percentage of a firm's sales.

As shown in Figure 3, the calculations were divided into subcategories including profitability and performance, operational efficiency, solvency and stability, market competitiveness, and company priorities.

GPMR, NPMR, OCF ratio, ROE ratio, and sales growth rate are categorized together to determine profitability and performance. The DSO, ROA, and sales backlog

determine a firm's operational efficiency. The D/E ratio, ICR, and Altman's Z-score represent a firm's solvency and stability. The HHI attempts to assess the competitiveness of both companies within the defense industry for Military Armored Vehicle, Tank, and Tank Component Manufacturing. Finally, the structure behind executive compensation represents a firm's priorities. These combined categories are business factors that equip the AWF to tailor the acquisition strategy for current conditions.

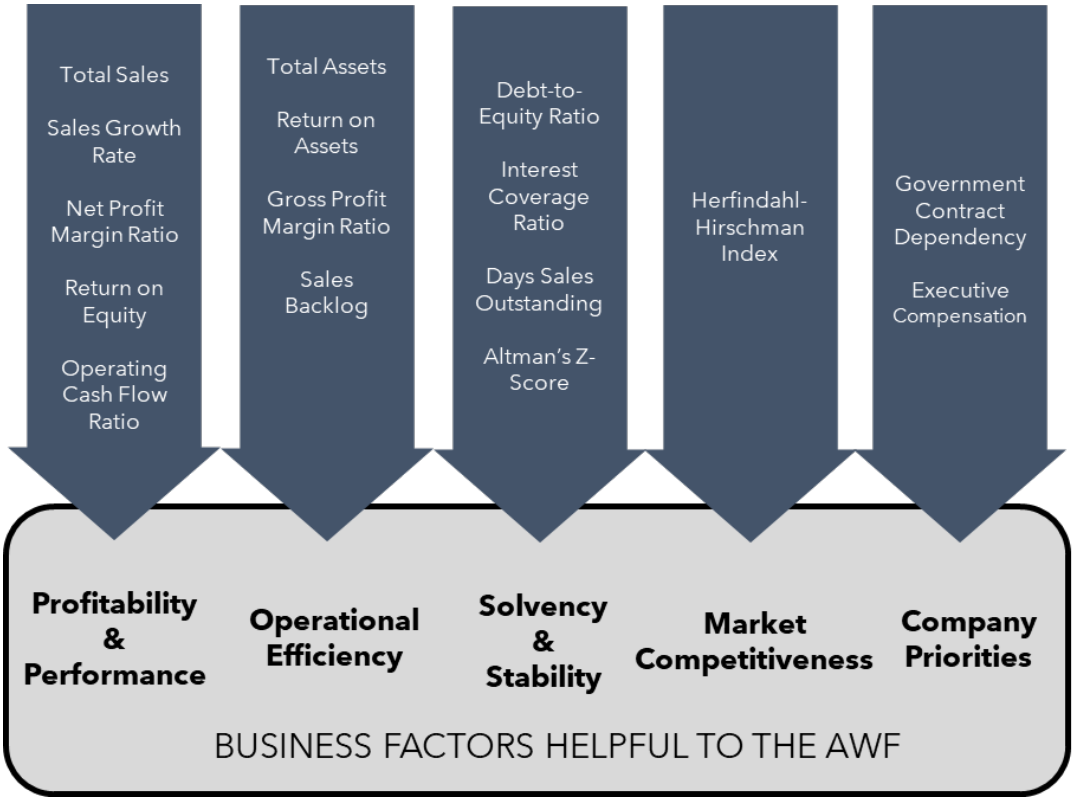

Figure 3. Financial Ratios and Metrics by Category

B. CASE STUDY: INTRODUCTION

The Army began the Joint Light Tactical Vehicle (JLTV) program in 2008 within the Technology Development (TD) phase. The program has evolved through the Engineering and Manufacturing Development (EMD) phase and into the Production and Deployment (PD) phase. On August 25, 2015, Oshkosh won a the most recent JLTV contract for $6.7 billion low rate initial production (LRIP) and obligated to manufacture 16,901 JLTV vehicles for the Army and Marines (Feickert, 2020).

The JLTV is a multiuse vehicle capable of supporting various operations including reconnaissance, patrols, raids, and convoys (Behler, 2019). The introduction of improvised explosive devices (IEDs) in the Iraq and Afghanistan theaters pushed the military to adapt a transport vehicle with greater protection, mobility, and reliability. The JLTV's predecessor, the Humvee (High Mobility, Multipurpose Wheeled Vehicles [HMMWVs]), was proving insufficient and costly. According to the Congressional Research Service (CRS), from 2006 to 2020, 45% of the 4,577 deaths in overseas contingency operations resulted from roadside bombs (Mann & Fisher, 2020).

The JLTV program is an MDAP and one of the Army's largest contracts. While this is an Army program, all DOD branches have appropriated funds to acquire the JLTV. For example, the USAF plans to replace its entire 3,270 HMMWV fleet with JLTVs (Feickert, 2020). The program is designated an ACAT 1D program as total expenditures exceed the category's threshold of $3.065 billion. ACAT 1D programs require an approval authority by a defense acquisition executive (DAE). Thus far, there have been many contracts awarded to support development, testing, and manufacture of the JLTV. Contracts were awarded for the Technology Development (TD) phase, the Engineering and Manufacturing Development (EMD) phase, and for the low-rate initial production (LRIP). These contracts have spanned more than 10 years and included more than 10 different companies. In April 2019, the Army's 3rd Infantry Division at Fort Stewart, GA, received 300 JLTVs and became the first unit outfitted (Feickert, 2020). On June 21, 2019, the Army approved OSK to begin full-rate production (FRP) of the JLTV (Judson, 2019). Currently, the U.S. and British military are set to procure more than 50,000 JLTV vehicles before the 2042 contract expiration (Feickert, 2020). Total expenditures for this program are expected to surpass an original estimate of $28 billion.

OSK and Lockheed Martin (LMT) have been competing for the JLTV contract against numerous other defense contractors since 2008 during the TD phase. OSK and LMT were both part of the latest competition to manufacture the JLTV. We gathered relevant data from the latest JLTV program RFP (December 12, 2014) to its contract award (August 25, 2015). This contract was the largest to date and required its winner to conduct full-rate production of 49,100 JLTVs.

We chose this contract for its size and media interest, abundance of financially available information (i.e., offerors are publicly traded firms), and the Army's continued efforts to find best value for the JLTV program. To understand additional context to this particular contract, we discuss OSK's and LMT's sales, stock, and major programs below.

C. COMPANY BACKGROUNDS

OSK's common stock has been publicly traded on both the NASDAQ stock exchange and the NYSE since 1985 (Davidson & Watt, 2020). It operates in four market segments: access equipment; defense; fire and emergency; and commercial. OSK is best known for manufacturing specialty vehicles including fire trucks, towers, snowplows, the mine resistant ambush protected all-terrain vehicle (M-ATV), and aerial scissor lifts. In 2014, OSK's sales were most reliant upon its access equipment (51%) while defense accounted for 25% (SEC, 2014e). According to the GSA for FY2014, the DOD obligated $540 million to OSK. This places it 59th among all DOD companies and 93rd among all federal departments by dollars obligated.

OSK's rival, LMT, has traded its common stock on the NYSE since merging with Martin Marietta in March 1995. As of FY2014, LMT operates in five business segments including aeronautics, information systems and global solutions, missiles and fire control, mission systems and training, and space systems (SEC, 2015a). LMT is known for various defense programs including the C-130, F-35, C-5, Sikorsky S-92, and F-16. In 2014, LMT garnered 79% of its sales from the federal government (59% from the DOD), 20% from foreign military sales, and 1% from U.S. commercial customers (SEC, 2015a). Its largest business segments were aeronautics (32%) and space systems (18%). According to the GSA for FY2014, the DOD obligated $25 billion to LMT. This places it first among all DOD companies and first among federal departments by dollars obligated.

D. DATA

We used data from both companies' filings to achieve a sufficient understanding of their financial condition prior to the JLTV program LRIP contract award on August 25, 2015. Publicly traded companies are regulated by the SEC and are required to file various financial documents including Form 10-K, Form 10-Q, and DEF 14A. These documents

provide a comprehensive summary of a firm's financial performance for select periods of time to demonstrate transparency and accountability to its shareholders.

Most information used within this research was captured from both firms' 2013 and 2014 annual reports (Form 10-K), taken from the SEC website—*EDGAR* (SEC, n.d.). These documents provided the most relevant contextual and financial data available leading up to the August 25, 2015, JLTV program contract award.

Most of our analysis include variables taken from the income statement, balance sheet, and statement of cash flows. Figures from the income statement include: Net sales (revenue), cost of goods sold (COGS), gross profit, interest expense, net earnings, assets, total liabilities, and total shareholder's equity. Figures from the balance sheet included accounts receivable, inventories, current assets, total assets, total liabilities, and total shareholders' equity. Figures used from the statement of cash flows included cash provided by operating activities and backlogged contracts.

Finally, the DEF 14A reveals comprehensive information about executive compensation and facts and circumstances surrounding decisions requiring a shareholder vote (SEC, 2017). Figures used from this document included executive base salary, stock awards, bonuses, option awards, non-equity incentive plan compensation, pension values, and other compensation.

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V. RESULTS

We discuss each of the measurements within all five categories to determine as many insights as possible. An additional financial analysis of ten different companies provides context to the industry which benchmarks OSK and LMT's measurements. Limitations to this study were listed in section B. In our last section, we provide our opinion as to the most notable insights and which firm was most deserving of the JLTV contract.

A. FINANCIAL ANALYSIS

The financial analysis assessments below attempt to provide greater context to whether OSK and LMT have the capacity and financial capability for contract award. Financial ratios taken from a firm's financial statements are often regarded as one of the most informative sources about a firm's business operations (El Hennaway & Morris, 1983). The government does not educate and train the AWF on the significance of financial analysis. Thus, this method for ascertaining a firm's capability and capacity is seldom used. It is customary for the AWF to evaluate a firm based upon factors outlined in FAR 15.304.[14] These factors include technical excellence, price, past performance, compliance with solicitation requirements, management capability, personnel qualifications, and prior experience. Our research aims to evaluate publicly available financial information to help determine the capability and capacity of a firm. For example, there are financial literature and metrics available that indicate a firm is technically capable of manufacturing a good and/or service; however, the firm may not have the capacity to execute the contract in a reasonable amount of time.

There are many variables to consider when assessing a firm for contract award. Figure 4 comprises the structure of this research. These components include the source of publicly available financial information (inputs), chosen calculations (process), and generated measurements (outputs). Each calculation provides a different measurement of

[14] "The quality of the product or service shall be addressed in every source selection through consideration of one or more non-cost evaluation factors such as past performance, compliance with solicitation requirements, technical excellence, management capability, personnel qualifications, and prior experience" (FAR 15.304, 2020, para. [c][2]).

a firm's financial standing. Based upon the implications of each calculation, results were assigned to the following categories: Profitability and performance, operational efficiency, solvency and stability, market competitiveness, and company priorities.

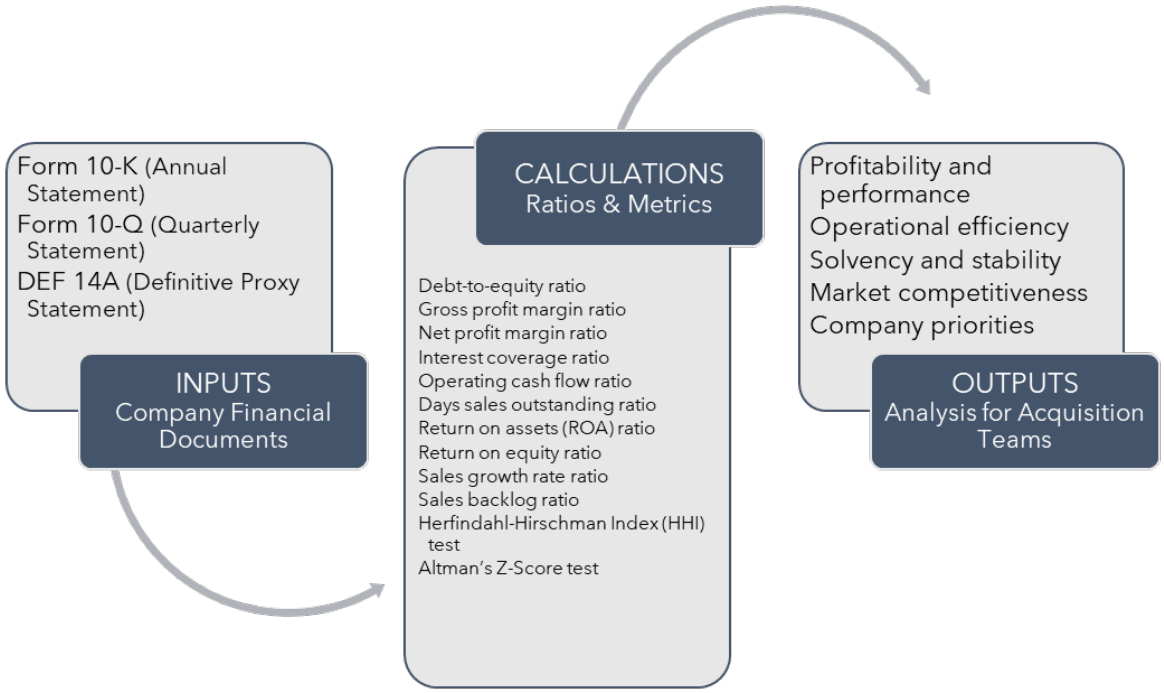

Figure 4. Financial Calculation Inputs and Outputs

The measurements grouped within profitability and performance attempt to illustrate a firm's potential for continued growth. Essentially, this category seeks to understand how much cash is available for the firm to take on new projects and/or reinvest in ongoing operations. Operational efficiency attempts to reveal how well a firm utilizes its assets and manufacturing processes. It also informs the reader how quickly it accomplishes its sales orders. Solvency and stability measures how quickly a firm receives payment for services and/or products rendered as well as its ability to cover any outstanding debt. Market competitiveness consists of one calculation, the HHI, which attempts to determine whether a firm operates within a low, moderate, or highly concentrated market. Last, the measurements found in the company priority category seek to understand a firm's dependency and management motivation.

While each metric used to evaluate a firm is informative, it is important to conceptualize the capability and capacity of a firm by understanding how each metric's implications work together holistically. Three tables are used to best illustrate OSK's and LMT's performance for FY2013 and FY2014. Executive compensation, industry averages, and government dependency are also captured to illustrate some of the external environmental variables to consider. Below the tables, OSK's and LMT's measurements are discussed in greater detail within the respective categories.

Table 1 is a direct comparison between OSK and LMT for FY2013 and FY2014. This comparison was created to illustrate the disparity in size. For example, LMT reported total sales and assets approximately 7 and 8 times greater than OSK. This table provides only an illustration to discuss executive compensation as a factor in determining company priorities.

Table 1. OSK and LMT Metrics, 2013–2014. Adapted from SEC (n.d.).

1	2014		2013	
	2	3		
Metric	**OSK**	**LMT**	**OSK**	**LMT**
		Profitability & Performance		
Sales, Total	$6,808	$45,600	$7,665	$45,358
Sales Growth (a)	-11.18%	0.53%	-6.30%	-3.87%
Net Profit Margin Ratio	4.54%	7.93%	4.15%	6.57%
Return on Equity	15.11%	86.90%	16.06%	120.27%
Operating Cash Flow Ratio	2.50%	8.48%	5.71%	8.52%
		Operational Efficiency		
Assets, Total	$4,586	$37,073	$4,765	$36,188
Return on Assets	6.74%	9.75%	6.74%	9.75%
Gross Profit Margin Ratio	17.37%	11.52%	15.55%	9.23%
Sales Backlog	26.13%	177.11%	35.82%	178.52%
		Solvency & Stability		
Debt-to-Equity Ratio	1.25	9.90	1.19	6.36
Interest Coverage Ratio	7.05	16.45	7.66	12.87
DSO: A/R to Sales (b)	52.3	47.1	37.8	46.9
Altman's Z-Score	3.16	3.17	3.30	3.33
		Market Competitiveness		
Herfindahl-Hirschman Index			3,848	
		Company Priorities		
Government Dependency (c)	25%	79%	36%	82%
Executive Compensation (d)	CEO		CEO	
Salary	$1,066,539	$1,497,692	$1,021,924	$1,368,654
Stock Awards	$2,100,565	$8,896,120	$3,503,031	$8,160,021
Bonus	$0	$0	$0	$0
Option Awards	$1,400,246	$0	$1,500,289	$0
Non-Equity Incentive Plan	$1,522,472	$7,060,860	$1,937,417	$5,979,710
Pension Value Change	$892,973	$15,817,715	$583,558	$9,409,264
All other Compensation	$413,104	$415,055	$421,209	$238,150
Total Compensation	**$7,395,899**	**$33,687,442**	**$8,967,428**	**$25,155,799**
Total Compensation vs. Sales	0.107%	0.07%	0.117%	0.06%

Key:
1. 15 metrics evaluated
2. OSK (Oshkosh)
3. LMT (Lockheed Martin)

(a) Year-over-year sales growth: 2012-13 & 2013-2014
(b) DSO (days-sales-outstanding)
(c) % of sales from USG contracts
(d) Data taken from DEF 14A

Table 2 provides additional context to assess LMT and OSK. Eight peer companies were identified using beta.sam.gov (General Services Administration [GSA], 2020) and Mergent Online® (FTSE Russell, n.d.) for comparison. We took 13 measurements in four of the five categories for each of these firms to illustrate additional disparity among similar firms. These companies have held federal government contracts and competed in the government and/or commercial sector. Financial data used to produce this table were

obtained through methods outlined in Chapter IV. Competitors for this comparison include Boeing, United Technologies, Lockheed Martin, General Dynamics, BAE Systems, Northrop Grumman, Raytheon, PACCR Inc., Navistar International, and Oshkosh.

Table 2. Industry Metrics, 2013–2014. Adapted from SEC (n.d.).

2014

0	Profitability & Performance 1	2	3	4	5	Operational Efficiency 6	7	8	9	Stability 10	11	12	Priorities 13
Company	Sales	Growth	NPMR	ROE	OCF	Assets	ROA	GPMR	Backlog	D/E	ICR	DSO	Gov. Sales
BA	$90,762	4.56%	6.0%	62.9%	9.76%	$99,198	5.49%	15.4%	536.67%	7.38	22.44	31.1	30%
UTX	$65,110	3.80%	9.6%	21.2%	11.27%	$91,289	6.81%	27.1%	147.14%	1.80	11.08	14.7	20%
LMT	$45,600	0.53%	7.9%	86.9%	8.48%	$37,073	9.75%	11.5%	176.75%	9.90	16.45	47.1	79%
GD	$30,852	-0.25%	0.0%	0.1%	12.08%	$35,355	7.16%	12.6%	234.70%	1.99	45.22	47.9	58%
BAESY	$25,918	-16.14%	4.5%	40.1%	4.02%	$30,827	3.80%	8.4%	221.19%	9.54	6.01	62.5	17%
NOC	$23,979	-2.84%	8.6%	28.6%	10.81%	$26,572	7.79%	13.3%	159.30%	2.67	11.33	42.7	85%
RTN	$22,826	-3.86%	9.9%	23.2%	9.57%	$27,900	8.09%	13.9%	147.07%	1.16	14.92	79.7	70%
PCAR	$17,792	10.36%	7.6%	20.1%	11.94%	$20,618	6.59%	11.9%	31.47%	2.05	36.21	207.0	N/A
NAV	$10,806	0.29%	-0.1%	N/A	N/A	$7,443	N/A	-5.1%	20.36%	N/A	N/A	88.4	1%
OSK	$6,808	-12.59%	4.5%	15.1%	2.50%	$4,586	6.74%	17.4%	27.76%	1.31	7.05	52.3	25%

2013

Company	Sales	Growth	NPMR	ROE	OCF	Assets	ROA	GPMR	Backlog	D/E	ICR	DSO	Gov. Sales
BA	$86,623	5.69%	5.3%	30.8%	9.44%	$92,663	4.95%	15.4%	487.93%	3.97	17.00	27.6	34%
UTX	$62,626	7.85%	9.1%	19.2%	11.98%	$90,594	6.31%	27.6%	147.16%	1.72	10.27	12.7	19%
LMT	$45,358	-4.02%	6.6%	120.3%	10.02%	$36,188	6.57%	9.2%	182.11%	6.36	12.87	46.9	82%
GD	$30,930	-0.20%	0.0%	0.0%	10.06%	$35,494	6.64%	11.9%	148.35%	1.45	42.90	51.6	62%
BAESY	$30,102	3.27%	0.9%	5.1%	-0.61%	$32,587	0.89%	3.8%	234.87%	4.76	1.16	61.0	23%
NOC	$24,661	-2.26%	7.9%	18.4%	10.07%	$26,381	7.40%	12.7%	150.17%	1.48	12.15	39.7	86%
RTN	$23,706	-2.99%	8.5%	18.0%	10.03%	$25,967	7.75%	12.4%	142.09%	0.94	13.99	75.0	72%
PCAR	$15,948	-0.02%	7.3%	17.7%	14.90%	$20,725	5.65%	14.9%	25.08%	2.12	17.10	225.0	N/A
NAV	$10,775	-52.68%	-0.1%	N/A	0.93%	$8,315	N/A	-9.0%	16.71%	N/A	N/A	79.1	5%
OSK	$7,665	-6.21%	4.1%	16.1%	5.71%	$4,765	6.67%	15.5%	37.05%	1.26	7.66	37.8	36%

Key:
All $ figures are in millions
N/A: two negative variables
0. Identified by ticker symbol
1. Total Sales for year
2. Sales Growth from 2013-14
3. Net Profit Margin Ratio
4. Return on Equity
5. Operating Cash Flow Ratio
6. Total Assets
7. Return on Assets Ratio
8. Gross Profit Margin Ratio
9. Sales Backlog Ratio
10. Debt-to-Equity Ratio
11. Interest Coverage Ratio
12. Days Sales Outstanding
13. Sales from U.S. Government

Company Ticker Symbols
Boeing (BA)
United Tech. (UTX)
Lockheed Martin (LMT)
General Dynamics (GD)
BAE Sys. (BAESY)
Northrop Grumman (NOC)
Raytheon (RTN)
PACCAR Inc. (PCAR)
Navistar Inter. (NAV)
Oshkosh (OSK)

Table 3 averages all the measurements used in Table 2 and provides an industry standard for further comparison. This table seeks to illustrate an additional layer of context to further support the implications provided from each measurement. We discuss each category in greater detail below.

Table 3. Industry Averages, 2013–2014. Adapted from SEC (n.d.).

	2014			2013		
1 Metric	2 Industry	3 OSK	4 LMT	Industry	OSK	LMT
Profitability & Performance						
Sales, Total	$34,045	$6,808	$45,600	$33,839	$7,665	$45,358
Sales Growth (a)	-1.61%	-12.59%	0.53%	-5.16%	-6.21%	-4.02%
Net Profit Margin Ratio	5.87%	4.5%	7.9%	3.53%	4.1%	6.6%
Return on Equity	33.13%	15.1%	86.9%	27.28%	16.1%	120.3%
Operating Cash Flow Ratio	8.94%	2.50%	8.48%	8.25%	5.71%	10.02%
Operational Efficiency						
Assets, Total	$38,086	$4,586	$37,073	$37,368	$4,765	$36,188
Return on Assets	6.91%	6.74%	9.75%	5.87%	6.67%	6.57%
Gross Profit Margin Ratio	12.65%	17.4%	11.5%	11.45%	15.5%	9.2%
Sales' Contract Backlog	170.24%	27.76%	176.75%	157.15%	37.05%	182.11%
Solvency & Stability						
Debt-to-Equity Ratio	3.78	1.31	9.90	2.41	1.26	6.36
Interest Coverage Ratio	18.97	7.05	16.45	15.01	7.66	12.87
DSO: A/R to Sales (b)	67.3	52.3	47.1	65.6	37.8	46.9
Company Priorities						
Government Dependency (c)	43%	25%	79%	47%	36%	82%

Key:
All $ figures are in millions
1. 13 Metrics
2. Average of 10 firms identified as competitors
3. OSK (Oshkosh)
4. LMT (Lockheed Martin)
(a) Year-over-year sales growth: 2012-2013 & 2013-2014
(b) DSO (days-sales-outstanding): Accounts Receivable / Total Sales x 365
(c) % of sales from USG contracts;

1. Profitability and Performance

Sales growth, NPMR, ROE, and OCF calculations best express a firm's profitability and performance.

Sales growth rate is a metric used to determine whether a firm is growing or in decline. Total sales of a firm's previous year are divided into the current year. In 2014, the industry average was −1.61% while LMT and OSK had a sales growth rate of 0.53% and −11.18%, respectively. OSK, LMT, and many of the firms presented in this research cited sequestration[15] for the decline in sales (SEC, 2014e, 2015a).

[15] The Budget Control Act of 2011 (Budget Control Act) established limits on discretionary spending, which provided for reductions to spending of $487 billion over a 10-year period that began October 1, 2012. The Budget Control Act contains automatic spending reductions (sequestration), which went into effect on March 1, 2013. The Budget Control Act includes an additional reduction of defense spending by $500 billion over the next nine-year period (SEC, 2015a).

NPMR is the most fundamental indicator in determining a firm's profitability and performance. It measures if a firm can cover costs of production and garner excess cash for future opportunities. Table 3 shows that the industry average for 2014 was 5.87%. OSK and LMT performed near this standard with 4.5% and 8%, respectively (SEC, 2014e, 2015a). Given the size difference between these companies, 8% of LMT sales equals more than $3.5 billion. NPMR is a more comprehensive measure as this calculation divides net profit into other significant expenses including COGS, operating expenses, other expenses, interest, and taxes (Easton et al., 2018). Once again, higher NPMRs indicate the company is profitable and solvent, which means they will be able to sustain operations for a DOD contract. Both firms have a reasonable NPMR relative to size (Wang, 2013).

ROE measures how effectively management has utilized capital invested by shareholders. Net income is divided into shareholders' equity and expressed as a percentage (Easton et al., 2018). In 2014, the industry average was 33.13% while LMT and OSK produced positive returns of 86.9% and 15.1%, respectively (SEC, 2014e, 2015a). For every shareholder dollar, LMT and OSK created $0.87 and $0.15, respectively (SEC, 2014e, 2015a). A shareholder becomes more profitable when the quotient is higher. While LMT's ROE is significantly higher than OSK's and the industry average, its shareholders' equity is significantly smaller. For example, OSK's sales, assets, net income, and shareholders' equity are $6.8, $4.6, $0.3, and $2.0 billion, respectively (SEC, 2014e). LMT's sales, assets, net income, and shareholders' equity are $45.6, $37.0, $3.6 and $4.2 billion, respectively (SEC, 2015a). Thus, LMT's dividend and divisor are not proportionate relative to OSK. As we learn later, LMT finances most of its operations aggressively through debt.

The OCF ratio is expressed as a percentage of sales and measures the firm's ability to generate cash to pay suppliers, employees, and shareholders; to fund operating expenses; and to invest in capital assets. OCF are funds generated directly from a firm's business activities. When companies have more cash flow, there is increased opportunity for growth as funds are reinvested to bolster the company's resources (i.e., plant, property, and equipment). This metric is represented as a quotient by dividing operating cash flows (balance sheet) by total sales (income statement). In 2014, the industry average was 8.9% while OSK and LMT were 2.5% and 8.5%, respectively (SEC, 2014e, 2015a). Both firms

emphasized operating cash flows as being the "primary source of funding for our operations, capital expenditures, debt service, and repayments, dividends, share repurchases, and postretirement benefit plan contributions" (SEC, 2020a, p. 47). Alternatively, excess cash flow may also be used by executives to engage in empire building (i.e., short-term investments that do not have a clear connection to maximizing performance on customer contracts, such as buying corporate jets; Gul & Tsui, 1998; Jensen, 1996; Lang et al., 1991; Richardson, 2006).

2. Operational Efficiency

ROA, GPMR, and sales contract backlog are measurements used to determine a firm's operational efficiency.

ROA is calculated by dividing net income into total assets. The quotient is a measure of a firm's ability to utilize its resources efficiently. This metric is represented as a percentage of profit for every $1 of assets. The industry average for those 10 companies was 6.91%. In 2014, LMT and OSK measured 10% and 7%, respectively (SEC, 2014e, 2015a). OSK and LMT create enough income relative to the amount of resources they use to create their products and/or services.

GPMR is expressed as a percentage of remaining profit after subtracting manufacturing and sales costs. A higher GPMR generally indicates a firm is more efficient at turning sales into a measure of profitability. The average GPMR for these 10 companies is 12.7%. In 2014, LMT and OSK had a GPMR of 11.5% and 17.4%, respectively (SEC, 2014e, 2015a). Both firms appear to meet and/or exceed this standard. Various implications can be drawn from this measurement. First, while we might conclude that OSK is more efficient than LMT at processing its products, we acknowledge that LMT's business includes a wide variety of products and services that OSK's business does not (e.g., airplanes and missiles.) For example, a firm specializing in manufacturing missiles and airplanes (LMT) may be more expensive to operate than a company that specializes in all-terrain vehicles and access equipment (OSK). Second, the discrepancy in GPMRs could indicate that OSK is managing input costs more efficiently than LMT. Last, high GPMRs may alternatively indicate that the company is cutting corners regarding product inputs.

AWF personnel should also consult other efficiency ratios to determine capability and capacity.

Sales contract backlog measures a firm's ability to meet demand by dividing unfulfilled sales orders by annual total sales. The quotient is viewed as a percentage to help the interested party understand a firm's future potential earnings, current capabilities, and/or the capacity to take on additional projects. In 2014, the industry average was 170% while LMT and OSK were at 177% and 28%, respectively (SEC, 2014e, 2015a). Similar figures were present in 2013. LMT's sales backlog may be perceived as efficient and lucrative. LMT is obligated to manufacture goods and/or provide a service for 1.7 years' worth of sales. Alternatively, the customer (e.g., AWF) could suspect that a firm with this much sales backlog is having trouble keeping up with demand.[16] As mentioned earlier, LMT is responsible for many major DOD programs including the F-35, C-130, and F-16 (SEC, 2015a). There was no discussion within LMT's 2013 and 2014 SEC Form 10-K mentioning the JLTV. It is possible an AWF member could conclude that LMT was preoccupied with more important and lucrative programs. OSK's metrics may represent a negative outlook as future earnings are less certain due to a lack of orders still needing to be fulfilled. The disparity between these firms may be the length of time it takes a firm to deliver its goods and/or services. Does the manufacturing of all-terrain vehicles and access vehicles (OSK) take longer than airplanes (LMT)? Second, a firm with a smaller backlog may be viewed as having potentially greater capacity to meet future orders. As mentioned in the previous section, OSK discussed the JLTV contract in depth for both 2013 and 2014 within its SEC Form 10-K. These metrics must be consulted with other quantitative and qualitative information to gain an accurate posture for each contractor.

3. Solvency and Stability

D/E ratio, ICR, DSO, and Altman's Z-score are measures of a firm's solvency and stability.

The D/E ratio divides total liabilities into its shareholder equity. A quotient greater than 1 indicates that the firm is relying more on debt to fund operations. The higher the

[16] The new industry average for this metric is 130% if we discount Boeing.

quotient, the more perceived risk a firm is to a creditor. A quotient below 1 indicates a lower risk to a creditor. Generally, a firm prefers to use internal funds, debt, and then equity to finance its operations (Murray & Goyal, 2003). Generally, high debt levels increase distress due to periodic interest payments and increased probability of bankruptcy (Gilson, 2000; Kato, 2010; Opler, 1994). This pressure may detract from a firm's ability to execute on client contracts as highly leveraged firms must prioritize lenders over customers and shareholders. In 2014, the industry average was 3.78 while OSK and LMT were 1.31 and 9.90, respectively (SEC, 2014e, 2015a). More established firms may present a higher quotient for this ratio compared to those firms with fewer assets. Large amounts of borrowing is required to carry LMT's assets which may explain LMT's high quotient. While D/E ratio can indicate financial distress, it is more likely to be indicative of the company's size. Large companies generally perform more efficiently on customer contracts because, all else equal, they have efficiencies of scale and scope not available to smaller contractors (Patatoukas, 2012).

The ICR divides a firm's operating income by the interest incurred over the year from borrowed funds. Generally, lenders are assured that their interest payments and principal will be paid if a firm's quotient is 1.5 or higher. If the quotient is 1.4 or lower, current lenders become apprehensive that a firm may become financially unstable. In 2014, the industry average was 19.0, while LMT and OSK were 16.4 and 7.0, respectively (SEC, 2014e, 2015a). These results indicate both firms can adequately pay the interest expense on their debt.

The DSO ratio divides a firm's year-end accounts receivable into its total sales, then multiplies it by 365 (i.e., days in the reporting period). The calculation measures the number of days, on average, that it takes for a firm to receive payment after performing a service and/or delivering a good (Easton et al., 2018). In 2014, the industry average was 67.3 while LMT and OSK were at 47.1 and 52.3, respectively (SEC, 2014e, 2015a).[17] Both firms receive payment consistent with the industry average.

[17] In Table 2, if the average is conducted without PACCR Inc., the average DSO for 2014 was 51.8 days.

Altman's Z-score is a "failure prediction model" utilizing five financial calculations to determine a firm's financial viability (Altman, 1983). It is a multi-variate equation which includes the following calculations: Working capital divided by total assets, retained earnings divided by total assets, earnings before interest and tax divided by total assets, market value of equity divided by total liabilities, and sales divided by total assets. Various weights are multiplied to each of these calculations and then all are added together. A firm with a Z-score below 1.8 is in the *bankrupt zone*, a Z-score between 1.8–3.0 is in the *gray zone*, and a Z-score score above 3.0 is in the *safe zone* (Altman, 1983).[18] In 2014, LMT and OSK had a Z-score of 3.17 and 3.16, respectively. Both firms fell within the safe zone.

These are important calculations, as unstable and insolvent firms have incentives to engage in distortionary behavior that may directly or indirectly reduce the performance on DOD contracts (Harris & Bromiley, 2007). Also, excess cash flow is critical for firms to participate in value-maximizing projects, including investing in cutting-edge production technologies and hiring quality employees (Jensen, 1996; Richardson, 2006). The above calculations did not indicate deficiencies within either firm. Both LMT and OSK have enough cash on hand and sufficient solvency to invest in necessary processes and procedures to enable efficient performance on DOD contracts. Furthermore, both firms expressed measurements near or better than the industry standards illustrated in Table 3.

4. Market Competitiveness

The AWF must ensure there is adequate competition to establish price reasonableness.[19] The defense industrial base is shrinking due to mergers and acquisitions. It has become less competitive and more oligopolistic. The HHI assists the AWF to understand the industrial landscape of a particular contract. The JLTV program attracts a limited number of bidders. Including the correct number of companies for this industry was a challenge. We compared firms using the federal government's North American Industry

[18] Altman (1983) describes the *bankrupt zone* (X<1.8) as indicative of scores for firms of past bankrupt companies. *Gray zone* (1.8–3.0) is a firm with a score that is "typifying a questionable fate" (p. 38). A firm in the *safe zone* (X>3.0) is considered to have metrics that are healthy and solvent.

[19] According to FAR 6.102 (2020), "Contracting officers shall provide for full and open competition that are best suited to the circumstances of the contract action and consistent with the need to fulfill the Government's requirements efficiently."

Classification System (NAICS)[20] code of 336992: Military Armored Vehicle, Tank, and Tank Component Manufacturing. Table 4 represents those firms and the HHI analysis.

Table 4. Herfindahl-Hirschman Index. Source: GSA (2020).

Vendor Name[a]	Dollars Obligated	Market Share	Market Share Squared
1. Lockheed Martin Corp.	$ 37,175,375,556	57.05%	3254.70
4. General Dynamics Corp.	$ 12,017,722,203	18.44%	340.03
5. Northrop Grumman Corp.	$ 9,168,802,601	14.07%	197.96
9. BAE Systems PLC	$ 4,694,163,942	7.20%	51.84
41. Atlantic Diving Supply Inc.	$ 894,220,710	1.37%	1.88
51. Rolls-Royce Holdings PLC	$ 667,535,128	1.02%	1.04
25. Oshkosh Corp.	$ 540,546,643	0.83%	0.69
DOD Dollars Obligated	$ 65,158,366,784	HHI Score	3,848

[a]Vendor number represents ranking among the applicable top 2013 defense contractors in dollars obligated.

The companies listed in Table 4 were chosen based on the following criteria:

- Publicly Traded Company[21]
- Listed the NAICS code of 336992 on *www.sam.gov*
- Ranked in the top 100 defense contractors for FY2013

Although the list is not all inclusive, when combined, these companies can summarize industry competition for purposes of market research.

Outlined in Table 4, the HHI for the examined industry was calculated by identifying each company's market share based on the total dollars obligated to the DOD in FY2013. After squaring each market share component, the resulting sum and Herfindahl score was found to be 3,848. This score is above the 2,500-point limit, indicating that the market is concentrated for this specific industry. As illustrated in the case study, LMT controls a 57% market share in the production of armored vehicles, tanks, and tank

[20] A NAICS code is a classification within the North American Industry Classification System. It was a system developed for use by federal statistical agencies for the collection, analysis, and publication of statistical data related to the U.S. economy.

[21] A company is publicly traded when its securities trade on public markets and the company discloses certain business and financial information regularly to the public (Easton et al. 2018).

component manufacturing; however, the winning offeror, OSK, only controls less than 1% of the market share.

Although the HHI can provide valuable insight, especially when combined with other statistical measures, there are limitations to its application. First, many of the firms compete within different industries. Thus, the firms' sales do not reflect any one market segment. Second, due to the breadth (i.e., numerous core competencies[22]) of larger firms, it is difficult to narrow the field of firms capable of competing for a particular contract. For example, LMT's sales are predominantly from its aeronautics and space system segments, and it does not have a market segment designated for Military Armored Vehicle, Tank, and Tank Component Manufacturing (SEC, 2015a). Third, due to the complexity of each contract, prime contractors may partner with numerous subcontractors who would otherwise be rivals. These three limitations greatly disable the interested party from gaining an accurate market concentration metric for a particular industry.

Despite the limitations mentioned above, the HHI should be included within the AWF's routine market research.[23] It is the contracting officer's responsibility to understand the commercial landscape well enough to determine what potential firms should be considered for a particular contract. This calculation is best utilized during the pre-award phase to determine those firms with core competencies directly related to the contract requirements. Implementing this measurement into the market research checklist establishes greater awareness of the commercial landscape.

5. Company Priorities

In addition to the financial measurements provided above, there are additional insights within the SEC Form 10-K and DEF 14A. An analysis of these documents from FY2013 and FY2014 may help provide additional context to assess whether OSK and LMT

[22] A *core competency* is a concept in management theory introduced by C. K. Prahalad (1993). It can be defined as "a harmonized combination of multiple resources and skills that distinguish a firm in the marketplace"; core competencies are, therefore, the foundation of companies' competitiveness.

[23] Regarding market research, FAR 10.002 (2020) states, "On an ongoing basis, take advantage (to the maximum extent practicable) of commercially available market research methods in order to effectively identify the capabilities of small businesses and new entrants into Federal contracting that are available in the marketplace" (para. [2][vi]).

had the capability and capacity for the 2015 JLTV contract award. Specifically, the MD&A and business segment discussion in the 10-K and the executive compensation in the DEF 14A provide implications as to each firms' management priorities. These factors include dependency on federal government contracts, discussion of important programs, and how the BOD compensates the CEO.

Both LMT and OSK had significant ties to the federal government prior to the JLTV contract award on August 25, 2015. Table 3 illustrates how dependent OSK and LMT were on federal government contracts relative to net sales for FYs 2013–2014. In 2014, the industry average was 43% compared to OSK's and LMT's 25% and 79%, respectively. This amounted to $36 billion and $1.7 billion in net sales for LMT and OSK, respectively. This is a significant portion of sales for both companies, especially during a period of sequestration. Average sales for the industry went down −1.6% and −5.2% for FY2013 and FY2014. This contract was very important during a time of declining sales.

LMT's market segments include aeronautics, information systems and global solutions, missiles and fire control, mission systems and training, and space systems. These segments suggest that LMT's core competencies do not pertain to the manufacturing of up-armored all-terrain vehicles. Yet, LMT has been competing for this contract since the technology development phase in 2006 (Feickert, 2020). Its most popular and lucrative programs include the F-35 Lightning II Joint Strike Fighter, C-130 Hercules, F-16 Fighting Falcon, F-22 Raptor, and the C-5M Super Galaxy (SEC, 2020a). OSK's core competencies, however, directly pertain to this contract. OSK's business segments include access equipment (e.g., towing vehicles and scissor lifts), defense (e.g., tactical trucks, trailers, and supply parts), fire and emergency (e.g., fire trucks, snowplows, and ambulatory vehicles), and commercial (e.g., concrete mixers and garbage trucks). Despite not having the DOD as its primary customer, OSK is responsible for major defense programs like the mine resistant ambush protected (MRAP) vehicle, the heavy-expanded-mobility tactical truck (HEMTT), and the M-ATV. In June 2009, the DOD awarded OSK a sole source contract worth approximately $1 billion to manufacture more than 2,000 M-ATVs to better protect troop movement in the Afghanistan and Iraq theaters (Lipscomb, 2011). The stark contrast between OSK and LMT with regards to government dependency and core competencies may highlight LMT's need to bid on major contracts outside of its expertise

and capability. Furthering this discussion, LMT did not mention the JLTV contract once within the Form 10-K for FY2013 and FY2014. OSK, however, discussed the JLTV contract in detail for both years. While this would be considered a lucrative contract for OSK, LMT's F-35 program represented 20% ($9.2 billion), 17% ($7.7 billion), and 16% ($7.2 billion) of the firm's net sales for each of the FYs ending in 2013, 2014, and 2015, respectively (SEC, 2020a). After consulting both companies' MD&As and business segment narratives, OSK appeared most favorable to win the contract.

As discussed in the literature review, the BOD does not arbitrarily reward their executives. Compensation plans are a means to retain executive talent and mitigate any risk those plans may encourage. Donnelly, OSK's chairman of the board (COB), wrote, "our compensation programs effectively create a proper balance between appropriate risk-taking and competitive compensation" (SEC, 2014g, p. 63). There are two assumptions pertaining to compensation packages that provide the framework to align risk preference within an organization. First, the difference of risk attitudes between executives and shareholders are different. Generally, shareholders are considered risk-neutral as they prefer greater risk due to their personnel having greater diversity (e.g., diversification within a financial portfolio, separate employment; Devers et al., 2007). Alternatively, executives are risk averse as their personal wealth is directly tied to their employer (Devers et al., 2007). Second, large company returns come when large risks are taken (Devers et al., 2007). These assumptions force the BOD to match a firm's strategic objectives with an executive's perception of personal and firm risk.

Table 1 reveals that the BOD prefers to compensate their executives most through stock awards and non-equity incentive plans (i.e., cash bonuses). Both methods can provide incentive for greater risk-taking and the execution of a firm's long-term strategy. The greatest difference between these two incentives are direct ownership of the firm (i.e., stock awards). Consequently, executives who receive aggressive non-equity incentive plans may be the most inclined to behave with the most risk aversion (Devers et al., 2007).

B. LIMITATIONS

Publicly traded companies make up most of the defense business sector; however, a portion of defense spending still goes toward privately held firms. These private

companies would not be able to be evaluated as outlined in this study unless their financial and managerial accounting data can be obtained, and that information is often held closely. The most significant limitation in the case study assessment was the narrow scope of financial statements that are publicly available. For future use, this means all evaluations conducted are constrained to those companies that are publicly traded. Limitations also exist in the timing of a publicly traded company's financial reporting periods. Quarterly and annual statements may not reflect the most relevant financial condition of a firm when the government is seeking a contractual relationship. Due to the periodic nature of financial reporting, there may be a limited understanding of a firm's financial status leading up to and including the negotiation process.

Additionally, in a quantitative analysis such as this study, the conclusions made heavily depend on the accuracy of reported financial data. Trust is placed in business entities for financial reporting not to be misrepresented in any way. As noted in our accounting research, it is not unheard of for a company to have misrepresented information on the financial statements, either by mistake or deliberately. Regardless, the AWF could assess a company based on information that is not entirely correct; however, this analysis aspect is largely uncontrollable.

Another encountered limitation is that the company's assessed financial ratios and metrics are only one component of a company's annual and quarterly financial statements. Numerical reporting is not the only data contained in the financial statements. There are multiple pages of textual information that offer significant information toward understanding the company's landscape and operating environment. For example, the MD&A presents components of a company's internal affairs. Specifically, it could offer textual details regarding the political, environmental, or internal operations of the company if deconstructed and analyzed. These seemingly mundane details could offer the AWF further clarifications into a company's condition beyond what is provided in the numerical data in financial statements. When paired with financial data and properly analyzed, this data could reveal extensive insights to frame defense acquisitions.

Limitations also existed in the comparative analysis components of the study. Choosing companies to collectively assess can change depending on market conditions and

acquisition type. Lists of top defense contractors, as well as industry standards like NAICS codes, can be subjective. The financial ratios and metrics calculate and fluctuate drastically depending on the companies selected for evaluation.

A potential solution for addressing the limitations of HHI would be using a similar NAICS code that corresponds to a less defense-centric product. This would make the equation more reliable than just comparing companies that *could* do the work versus the ones that are registered for this type of work. For instance, the NAICS of 336112, Light Truck and Utility Vehicle Manufacturing, is considered the industry equivalent of the assessed NAICS 336992. All companies listed under 336112 have the potential of competing in a contract like the JLTV.

C. SUMMARY/FINDINGS

Financial ratio analysis is regarded as one of the most informative sources to gain insight about a company's affairs (El Hennaway & Morris, 1983). Our research aims to explore this concept to improve AWF decision-making by decreasing asymmetrical information between government and its industry partners. We use the JLTV contract as a case study to illustrate the use of financial analysis as a methodology for the AWF's market research. This analysis was conducted using publicly available information derived from annual statements and definitive proxy statements (DEF 14A) found on *sec.gov*. Calculations were conducted on OSK, LMT and peer firms for individual comparison and creation of several industry standards. Some of the more notable findings from these measurements are summarized below and used to help determine if LMT and OSK are (1) responsible,[24] (2) capable, and (3) capacity to perform the JLTV contract.

While comparing OSK and LMT measurements provide some insight, it is also necessary to compare them to an industry standard. Firms competing within various industries may have unique implications due to varying business operations. This was a limitation we tried to mitigate by analyzing eight similar competitors. These firms are

[24] According to FAR 9.104-1 (2020), "The FAR outlines seven criteria to determine if a firm is responsible. These criteria include (a) have adequate financial resources to perform the contract, or the ability to obtain them and (b) be able to comply with the required or proposed delivery or performance schedule, taking into consideration all existing commercial and governmental business commitments."

publicly traded, regularly conduct business with the federal government, and are among the largest in the industry. All measurements were placed into each of the five respective categories to help organize our assessment: profitability and performance, operational efficiency, solvency and stability, market competitiveness, and company priorities.

First, profitability and performance metrics inform the interested party as to how fast a firm is growing (or declining) and whether its past performance is consistent. Generally, higher numerical values in this category are positive. Availability of cash from operating activities indicates growth opportunity and/or the ability to pay off interest payments. For the selected years, OSK and LMT displayed encouraging metrics. While sales declined for the industry due to federal government sequestration, OSK and LMT maintained profitability (NPMR).

Second, the operational efficiency measurements inform how well a firm utilizes its resources (assets) to provide its services and/or manufacture its products. For example, a large sales backlog may provide implications as to whether a firm has the capacity to take on additional contracts (capacity). Backlog represents the dollar value of firm orders for which work has not been performed. There are two general assumptions one can make from a firm with a large sales backlog. First, while a firm with a large unfulfilled backlog may have the capability to perform a service and/or manufacture a product, it may not have the resources available to meet its deadlines. The industry standard for both years (2013 and 2014) reveals a sales backlog of 157% and 170% for FYs 2013 and 2014, respectively. This indicates to investors that there is a "long-term visibility of revenues," which brings "confidence in the future prospects for the business" (BAE Systems, 2015, p. 8). A firm with excessive sales backlog may have implications for product delivery and capacity. The industry carries a significant sales backlog (170%). This highlights OSK as being abnormal. One could perceive OSK as having limited prospects due to this disparity.

Third, solvency and stability factors such as D/E ratio, ICR, and the Altman's Z-score attempt to measure the reliability of a firm. The most notable metric from this category was LMT's D/E ratio of 9.9 for FY2014. It varied greatly from the industry standard and OSK. By leveraging too much of its business using debt, LMT may run the

risk of defaulting. However, LMT shows an excellent metric for the ICR (16.45) and operating cash flow. Taken together, LMT can handle its unique D/E metric.

Fourth, we understood the fifth category, market competitiveness, by utilizing the HHI. This metric revealed that the Military Armored Vehicle, Tank, and Tank Component Manufacturing industry was highly concentrated. If an industry/market is highly concentrated, there is limited competition available. More pressure is on the AWF to tailor a contract to find best value.

Finally, to ascertain company priorities, we discussed executive compensation and federal government dependency. After reviewing OSK's and LMT's executive compensation plans, it was determined that the BODs place the greatest incentive on stock options and non-equity incentives, not salary. While literature on this topic progresses and shows complexity, placing a greater value on incentives outside of salary encourages risk averse behavior in CEOs. Examples of these types of behaviors include mergers, acquisitions, and increased projects (Devers et al., 2007). Government dependency showed us raw implications. LMT is greatly dependent upon federal contracts to continue its prosperity. During times of sequestration, LMT may bid on contracts outside of its core competencies, as we witnessed with the JLTV.

The "strongest evidence" of knowledge gaps within the AWF lie within "industry financial practices, such as financial management–related operations, corporate financial documents, and industry accounting understanding" (Werber et al., 2019, p. XIV). Our research efforts were directly aimed at narrowing this gap as we sought answers to our research questions. The first research question posed, "How does understanding a contractor's publicly available financial documents reduce information asymmetry?" has been answered by identifying, defining, and describing various financial measurements regarding a firm's operations—which correlate to outcomes on federal procurements. This study offers a preview into business practices and urges the AWF to become more aware of industry motivations and priorities.

The National Defense Authorization Act (NDAA) for FY2018 encourages the AWF to become trained and educated based on globally recognized professional credentials and standards (NDAA, 2017). This initiative will also bridge the information

and knowledge gap between the AWF and the DOD's industry partners. The gap will continue to narrow as the AWF becomes literate in business acumen. Procurement decisions will improve through the acquisition life cycle as the AWF evolves to think more like our private sector business partners.

"How can the AWF use a contractor's publicly available financial documents to make better procurement decisions to enhance outcomes?" Of the five categories, company priorities was the most revealing. After consulting each firm's government dependency (reliance on federal government contracts) and sales backlog, and after reading each firm's business and MD&A sections (Form 10-K), we determined that LMT was not the appropriate choice for the JLTV contract. This opinion has several caveats, as LMT may have had the capability and prototype to be competitive. We argue against awarding LMT the contract for several reasons. First, LMT was outside of its core competency and lacked past performance. At the time of award, it did not have any programs within the specific industry: Military Armored Vehicle, Tank, and Tank Component Manufacturing. Second, given the company's declining sales, their significant reliance on federal government contracts, and the fact that it was a period of federal government sequestration, LMT was bidding on contracts outside of its scope. Last, LMT's sales backlog indicates that LMT's business operations are preoccupied. It promotes the perception that the firm is pushing its way into a market where it does not belong. For example, LMT's F-35 program has cost the government $400 billion as of March 2016 (Sullivan, 2016). This is LMT's most lucrative program, which still requires completion. This aircraft is among the many unfulfilled orders in LMT's sales backlog and represents a Nunn–McCurdy breach.[25] This particular contract favored OSK, and the Army selected the correct firm for contract award.

We demonstrated how procurement officials can use financial information to narrow the knowledge gap; however, this question was not able to be fully answered by the case study we chose. There are some theoretical applications, including agency theory, that need to be considered when the AWF is making procurement decisions. Furthermore, the federal government acquisitions education framework, including financial

[25] Section 2433 of Title 10 of the U.S.C., commonly referred to as the Nunn–McCurdy Act (1982), requires DoD to notify Congress whenever a major defense acquisition program's unit cost experiences cost growth that exceeds certain thresholds.

documentation analysis, is in its infancy. The categories and measurements observed cannot be viewed in isolation; however, when compounded, they are insightful to those that can interpret their meaning. Furthermore, there are more data sources that provide critical financial information than Form 10-K and DEF 14A documents. The key is in the ability to interpret financial data, which we hope the AWF can surmise from our research. The information found and the conclusions made from this case study will be different for any new or current evaluation for another acquisition. We could not determine the Army's contract award would have been different based on our observations alone. However, more information regarding a contractor's financial health was found to be better than none at all. We have proven this assessment can be conducted through our case study; however, this analysis was retroactive. If the AWF understands and practices this type of analysis, better outcomes are sure to be had on current and future acquisitions

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VI. RECOMMENDATIONS AND AREAS FOR FUTURE EFFORT

In the following chapter, we apply context to our findings section by describing how these results impact the AWF and contract design. We make recommendations within contract execution and provide actions the AWF can make to develop education and training. We end this study by providing areas for further research in the acquisition career field.

A. RECOMMENDATIONS FOR AWF DEVELOPMENT

Performing financial analysis to understand more about the DOD's industry partners is a valuable tool that can enhance the acquisition process and influence better public procurement policies regarding development initiatives. This research illustrates that there is value in infusing the AWF with external business knowledge. In this section, we discuss various ways the AWF's training and development can improve to further meet the intent of our research.

First, the DOD's current education and training offers limited opportunities to learn about our industry partners. We discovered that the DOD offers a few courses providing specific industry knowledge. These courses include two DAU courses: (1) Acquisition Management (ACQ) 315: Understanding Industry and (2) Business, Cost Estimating, and Financial Management (BCF) 205: Contractor Business Strategies (O'Donnell, 2018). Although these courses may be beneficial to the AWF, annual attendance capacity is limited to approximately 1,300 persons (Werber et al., 2019). While these courses offer a capacity of 1300, that doesn't necessarily mean that all vacancies are filled. While these courses have had great reviews, the material is not disseminated across the AWF population. Increasing the number and capacity of these types of courses will further develop AWF competencies.

Our research identifies gaps in knowledge and provides a roadmap to narrow the gap. There are policies and instructions made available to the AWF, but the policies and instructions do not offer tools and solutions for how to improve. For example, services acquisition instructions state that the Services Requirements Review Board (SRRB) should review "contractor issues" in relation to risks during successful execution and completion

of the acquisition (DOD, 2020), but the board does not clarify what kinds of issues exist and where those issues may originate. Our research specifically outlines where issues may originate as components of agency theory. The instruction also fails to describe the industry knowledge level of the functional services manager (FSM), the key position responsible for all resourcing and oversight of the services acquisition process (DOD, 2020). The infusion of concepts derived from our research into AWF knowledge requirements will help connect meaningful concepts for positions like the FSM to actionable decision responses.

The following are some initiatives to help the AWF culture shift from business advisors to mission-focused business leaders[26] who function as developed acquisition professionals leading with in-depth knowledge of how industry thinks and operates (Air Force Installation Contracting Center [AFICC], 2020). The first important enhancement that will assist this culture shift is the recent change to a national certification process. The AWF training and development is changing as the DOD moves away from Defense Acquisition Workforce Improvement Act (DAWIA) certification and transitions to mirror industry standards utilizing National Contract Management Association (NCMA)'s Contract Management Standard (CMS) and the Program Management Professional (PMP) certification. These new standards include a section on understanding the offeror's involvement in the acquisition process (Herrington, 2020)—that is half of the procurement process. Emphasizing, broadcasting, and supporting this change across the DOD's acquisition functions will begin to shift the culture.

Another solution proposed by the 2018 Professional Services Council (PSC) survey that needs promotion is industry rotations, which provide in-depth, hands-on experience working alongside providers of defense services (Professional Services Council & Grant Thornton Public Sector [PSC & GTPS], 2018). Industry rotations programs like the Air Force's Education with Industry should continue to be supported and expanded as mission requirements allow. The survey also revealed the effectiveness of Reverse Industry Days

[26] Mission-focused business leadership focuses on transitioning our acquisition workforce from *business advisors* to *business leaders*. Cultivating strong mission focused business leaders will help acquisition professionals make better decisions, which generates a tremendous amount of momentum aligning us to a common purpose (AFICC, 2020).

to help bridge the government–industry relationship gap. These day-long seminars are designed to allow industry to teach the government what is important to them and often showcase their capabilities (PSC & GTPS, 2018). Initiatives such as these can create knowledgeable leaders within the AWF.

B. RECOMMENDATIONS FOR CONTRACT EXECUTION

Before we begin our discussion on our recommendations for contract execution, it is important to understand that our research team sees contract management as an art. Contracts should be tailored and carefully designed to reduce principal–agent problems while also encouraging a win–win outcome. Our team believes that AWF professionals can better craft procurement strategies by incorporating knowledge and tools to reduce asymmetric information. Contract management requires tailoring contracts to reach the acquisition objectives. In this section, our team outlines four major recommendations on how the information gathered though the financial analysis relates to government procurement on a contract execution level.

As we mentioned in the results section, our team has organized various financial ratios into five different categories. Each of these categories tell us something different about a company's operations and financial health. Therefore, each of these categories provides knowledge that informs various AWF decisions. The categories are profitability and performance, operational efficiency, solvency and stability, market effectiveness, and company priorities. The conclusions within each of these categories may offer insights to sharpen the AWF's strategic approach to a particular procurement activity.

First, all of the categories contain information that the AWF can utilize when evaluating proposals. Taken together, most of the ratios can be used to highlight and depict the capability and capacity of potential offerors. As we discussed earlier, a contractor should be evaluated on their capabilities and their capacity to take on additional work and not just their reputation (Williamson, 1967). In other words, the AWF should not rely on past experience as the only means for determining capability. Understanding what obligations the contractor already has, and how well the company is doing financially, is also an important factor in accessing a company's capability and capacity. In FAR Part 9 (2020), Contractor Qualifications, there are discussions about the ways the AWF finds a

contractor to be a responsible source (meaning the contractor has the capability to perform). However, based on observations in the field, contractors have never used a real-time, in-depth financial analysis to make responsible decisions. As an example, financial ratios within the solvency and stability category (sales backlog, debt to income, etc.) can be used to identify when there should be concerns about a company's ability to perform. For example, in the financial ratio analysis that we performed for LMT and OSK, we found that LMT had a sales backlog greater than 100%. This means that they have a large proportion of previous obligations yet to be fulfilled. This could be one indicator that LMT may not have the capacity to take on a new contract or have the ability to prioritize a new requirement.

Does the AWF keep offering new work to a contractor if they are already struggling to deliver on previous contract awards? This is not a new question to consider. However, when there is limited cross talk between acquisition teams, financial analysis could be another resource for indicating that a firm is overstretched. The conclusion may not be a new solution but may indicate the need to trigger policies that the DOD already has in place. For example, if the AWF continues to see that a certain market is stretched too thin (indicated by the HHI metric), it may be important for the AWF to encourage more business to enter the market or to encourage more competition (hence, the Competition in Contracting Act[27]). The DOD may need to investigate current policies, find ways to decrease the barriers to entry, and assist companies with gaining access to the DOD market.

Second, in the category of solvency and stability, the financial ratios—like Altman's Z-score or debt-to-income ratios—could indicate when a contractor is under financial distress. These ratio indicators could identify when additional oversight of the contractor may be required. This oversight could be essential for controlling costs, keeping on schedule, ensuring quality products and services, or even preventing fraud. These indicators that allude to a company being in financial distress could affect the contract award decisions but could also clue in the AWF to evaluate the DOD's internal capacity to monitor and oversee the contractor appropriately. These indicators may lead a contracting

[27] The Competition in Contracting Act was enacted by congress in 1984 with the intent increasing the number of vendors to encourage competition. Benefits of the act include an increase in contracted savings through lower prices driven by competition (CICA, 1984).

officer to reach out to other departments, like the Defense Contract Audit Agency, to assist with audits to ensure proper oversight and overall contractor accountability.

Third, principal–agent problems, along with our analysis of the category profitability and performance, have indicated that there may be holes in our DOD procurement policies. As the AWF become more in tune with industry operations, the DOD can create more effective policies that incentivize contractors to behave in the best interest of the government. For example, the DOD can create a policy to incentivize the contractor to invest additional capital in a way that enhances a company's operations and furthers future technology (which benefits the DOD), instead of investing that capital to buy back stock.

Fourth, the FAR can be restrictive and may not allow contracting officers the flexibility necessary to customize incentives or negotiate better contract terms (Pritchard & Krieger, 2016). As one example, within firm-fixed price contracts, enhanced progress payments and liquidation rates could be an added incentive for industry to perform better (Pritchard & Krieger, 2016). Right now, per FAR 32.5 (2020), Progress Payments Based on Costs, there are only two types of progress payments: customary progress payments and unusual progress payments. A policy change would be needed within the FAR to take advantage of this new negotiating and payment tactic. The current U.S.C. does not prohibit this new methodology.

Figure 6 summarizes the possible outcomes that could come from understanding a company's financial information. This information will vary from contractor to contractor and will vary across different acquisitions. However, procurement strategies can only be improved by knowing more about the partnering company. We have discussed many of the possible outcomes above.

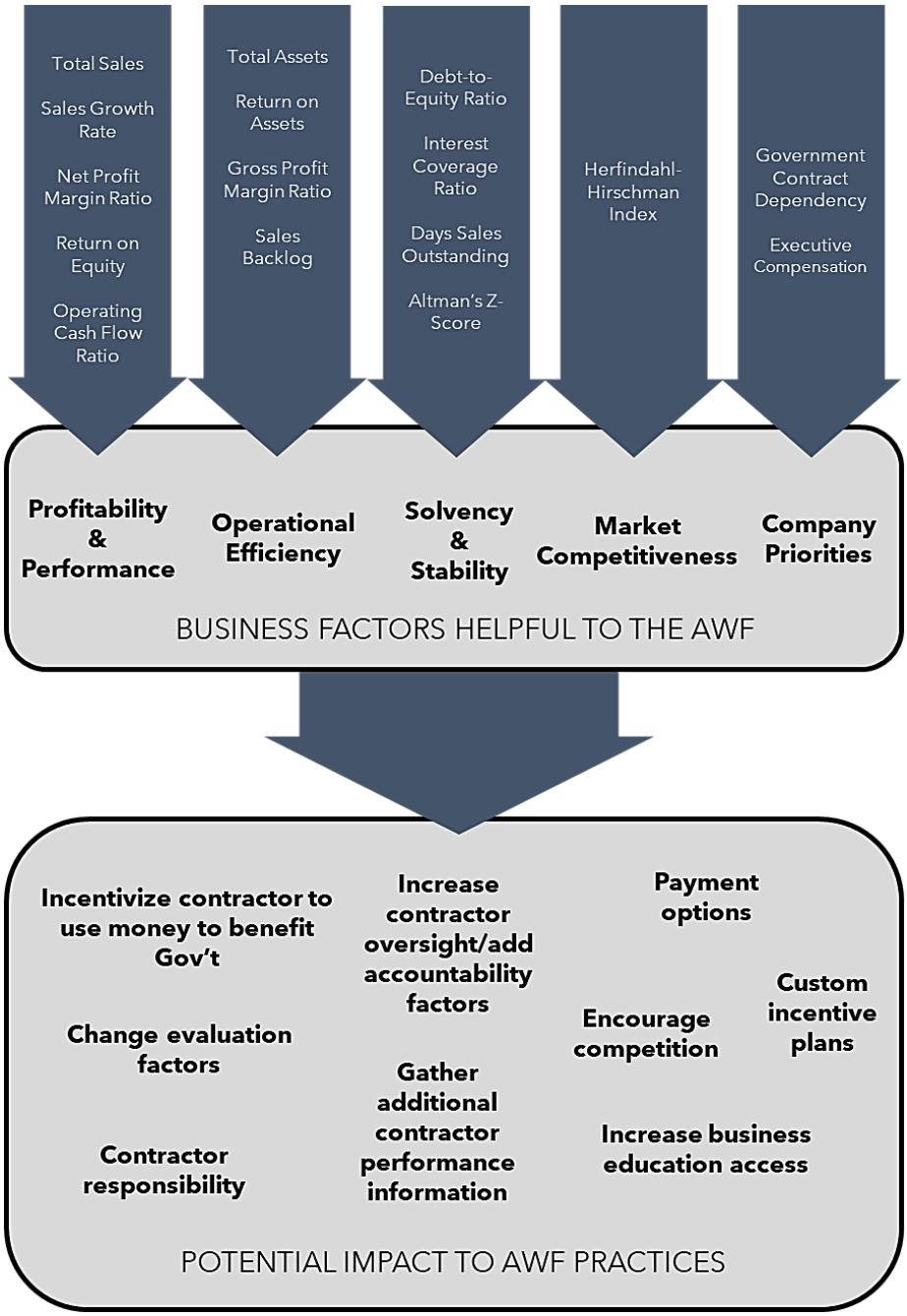

Figure 5. Potential Impact to AWF Practices

Ultimately, as the AWF becomes increasingly attune with how DOD's industry partners operate, the more we can bridge these gaps in knowledge, business acumen, contract operations, and procurement policies. Our research mission was to highlight ways that the AWF could use publicly available financial information in a way that could assist with real-time evaluations of contractor responsibility (capability and capacity) and with

properly designing contracts that incentivize the contractor in a way that is most advantageous to all parties. This would mean that each acquisition would be unique in nature, but the AWF would be able to evaluate and negotiate terms and conditions that create a win–win solution for both the government and the contractor. Our research is just a first step toward filling the knowledge gap and attempting to make reasonable recommendations. Further research and case study analysis could reveal more significant observations that lead to further recommendations for the AWF procurement procedures.

C. AREAS FOR FURTHER RESEARCH

This study is the first iteration of translating contractor financial statements, typically used for investors, into information that would be useful to the AWF. One area for further research would be to employ the methodology used in this study to other cases and outcomes of DOD acquisitions. This continued case study analysis would be used to validate our observations and verify correlation between financial knowledge and outcome of negotiation events. We identified a select group of ratios that would assist the AWF in understanding a company's financial position. However, the quarterly and annual statements include a majority of textual content that would be helpful in understanding other environmental concerns and providing clarity and direction for some of the ratios. Further research would identify how textual analysis can transcribe and analyze the financial statements and quarterly shareholder conference calls for applicable information.

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APPENDIX A: JLTV AWARD DATA 1 OF 2 (AUGUST 25, 2015)

Transaction Information

Award Type:	Definitive Contract	**Prepared Date:**	08/12/2015 09:55:55	**Prepared User:**	PADDS.W56HZV@CS.ARMY.MIL
Award Status:	Final	**Last Modified Date:**	05/17/2017 16:27:31	**Last Modified User:**	PADDS.W56HZV@KO.ARMY.MIL
Closed Status:	No	**Closed Status Date:**		**Closed By:**	

Document Information

	Agency	*Procurement Identifier*	*Modification No*	*Trans No*
Award ID:	9700	W56HZV15C0095	0	1
Referenced IDV ID:				
Reason For Modification:				
Solicitation ID:	W56HZV14R0039			

	Agency Identifier	*Main Account*	*Sub Account*	*Initiative*
Treasury Account Symbol:	21	2035		Select One

Dates		**Amounts**	
Date Signed:	08/25/2015	Action Obligation:	$114,669,605.25
Period of Performance Start Date:	08/25/2015	Base And Exercised Options Value:	$114,669,605.25
Completion Date:	08/27/2018	Base and All Options Value (Total Contract Value):	$116,737,257.03
Est. Ultimate Completion Date:	08/27/2018	Fee Paid for Use of Indefinite Delivery Vehicle:	$0.00

Purchaser Information

Contracting Office Agency ID:	2100	Contracting Office Agency Name:	DEPT OF THE ARMY
Contracting Office ID:	W56HZV	Contracting Office Name:	W4GG HQ US ARMY TACOM
Funding Agency ID:	2100	Funding Agency Name:	DEPT OF THE ARMY
Funding Office ID:	W56HZV	Funding Office Name:	W4GG HQ US ARMY TACOM
Foreign Funding:	Not Applicable		

Contractor Information

SAM Exception: ... Remove Exception

DUNS No:	079467211	**Street:**	2307 OREGON ST
Vendor Name:	OSHKOSH DEFENSE, LLC	Street2:	
DBAN:		**City:**	OSHKOSH
		State:	WI Zip: 549037062
		Country:	UNITED STATES
		Phone:	(800) 392-9921
		Fax No:	
		Congressional District:	

Show Details

Business Category

Organization Type	CORPORATE NOT TAX EX
State of Incorporation	WI
Country of Incorporation	USA

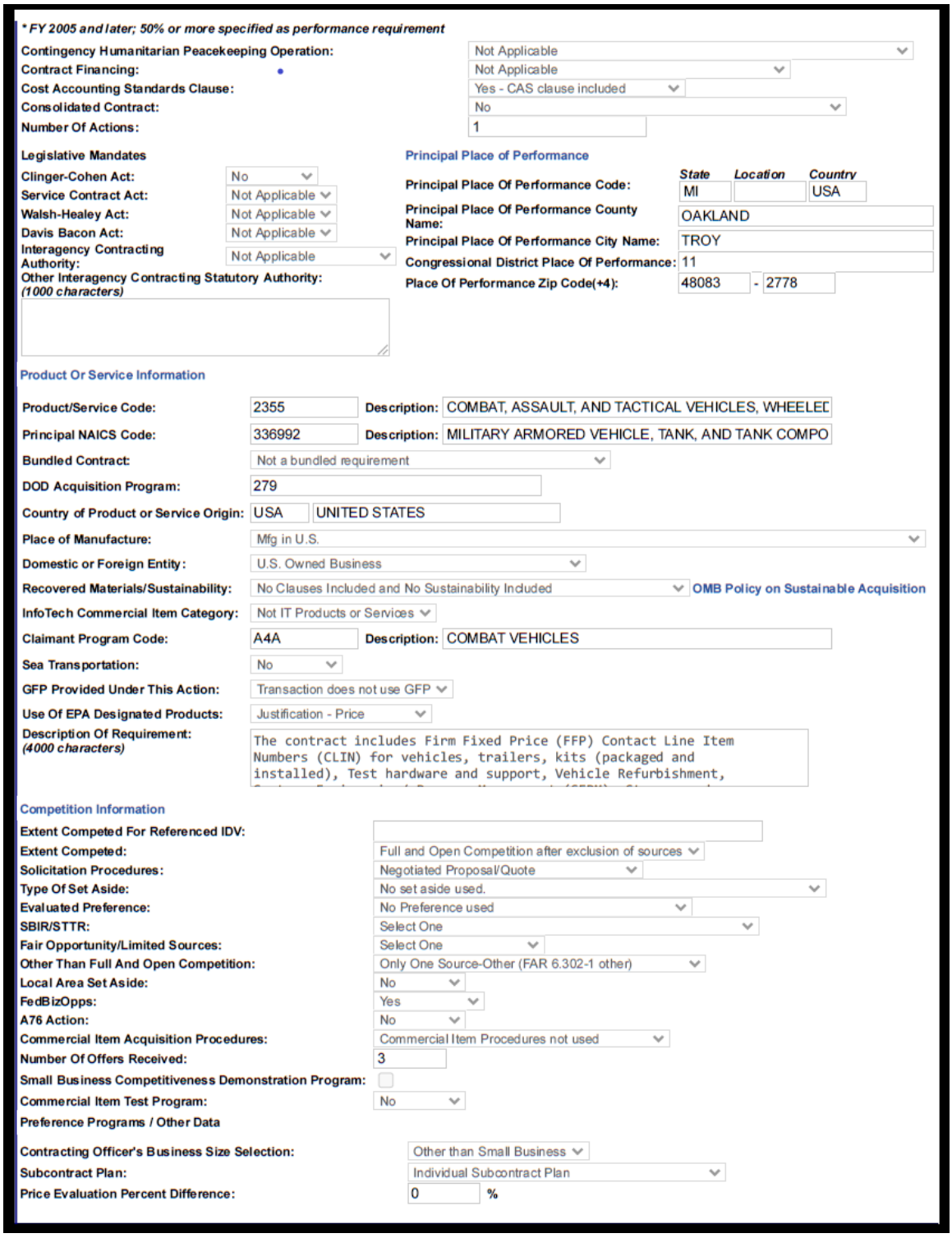
Business Types
✓ Corporate Entity, Not Tax Exempt
Line Of Business
✓ Manufacturer of Goods
Relationship With Federal Government
✓ All Awards
Organization Factors
✓ For Profit Organization
✓ Limited Liability Corporation

Contract Data

Type of Contract:	Firm Fixed Price
Inherently Governmental Functions:	
Multiyear Contract:	No
Major Program:	
National Interest Action:	None
Cost Or Pricing Data:	No
Purchase Card Used As Payment Method:	No
Undefinitized Action:	No
Performance Based Service Acquisition:	Not Applicable

**** FY 2004 and prior; 80% or more specified as performance requirement***

APPENDIX A (CONTINUED): JLTV AWARD DATA 2 OF 2 (AUGUST 25, 2015)



** FY 2005 and later; 50% or more specified as performance requirement*

Contingency Humanitarian Peacekeeping Operation:	Not Applicable
Contract Financing:	Not Applicable
Cost Accounting Standards Clause:	Yes - CAS clause included
Consolidated Contract:	No
Number Of Actions:	1

Legislative Mandates

Clinger-Cohen Act:	No
Service Contract Act:	Not Applicable
Walsh-Healey Act:	Not Applicable
Davis Bacon Act:	Not Applicable
Interagency Contracting Authority:	Not Applicable
Other Interagency Contracting Statutory Authority: *(1000 characters)*	

Principal Place of Performance

	State	Location	Country
Principal Place Of Performance Code:	MI		USA
Principal Place Of Performance County Name:	OAKLAND		
Principal Place Of Performance City Name:	TROY		
Congressional District Place Of Performance:	11		
Place Of Performance Zip Code(+4):	48083	- 2778	

Product Or Service Information

Product/Service Code:	2355	Description:	COMBAT, ASSAULT, AND TACTICAL VEHICLES, WHEELEC
Principal NAICS Code:	336992	Description:	MILITARY ARMORED VEHICLE, TANK, AND TANK COMPO
Bundled Contract:	Not a bundled requirement		
DOD Acquisition Program:	279		
Country of Product or Service Origin:	USA	UNITED STATES	
Place of Manufacture:	Mfg in U.S.		
Domestic or Foreign Entity:	U.S. Owned Business		
Recovered Materials/Sustainability:	No Clauses Included and No Sustainability Included		OMB Policy on Sustainable Acquisition
InfoTech Commercial Item Category:	Not IT Products or Services		
Claimant Program Code:	A4A	Description:	COMBAT VEHICLES
Sea Transportation:	No		
GFP Provided Under This Action:	Transaction does not use GFP		
Use Of EPA Designated Products:	Justification - Price		
Description Of Requirement: *(4000 characters)*	The contract includes Firm Fixed Price (FFP) Contact Line Item Numbers (CLIN) for vehicles, trailers, kits (packaged and installed), Test hardware and support, Vehicle Refurbishment,		

Competition Information

Extent Competed For Referenced IDV:	
Extent Competed:	Full and Open Competition after exclusion of sources
Solicitation Procedures:	Negotiated Proposal/Quote
Type Of Set Aside:	No set aside used.
Evaluated Preference:	No Preference used
SBIR/STTR:	Select One
Fair Opportunity/Limited Sources:	Select One
Other Than Full And Open Competition:	Only One Source-Other (FAR 6.302-1 other)
Local Area Set Aside:	No
FedBizOpps:	Yes
A76 Action:	No
Commercial Item Acquisition Procedures:	Commercial Item Procedures not used
Number Of Offers Received:	3
Small Business Competitiveness Demonstration Program:	
Commercial Item Test Program:	No

Preference Programs / Other Data

Contracting Officer's Business Size Selection:	Other than Small Business
Subcontract Plan:	Individual Subcontract Plan
Price Evaluation Percent Difference:	0 %

APPENDIX B: FINANCIAL RATIOS AND METRICS

Metric	Measure / Definition / Rationale	Ratio	Source
Profitability & Performance			
Sales Growth or Decline	Measures a firm's growth / decline by comparing annual net sales.	Current Annual Sales (Income Statement) / Previous Year's Annual Sales (Income Statement) = Growth / Decline	(Easton et al. 2018)
Net Profit Margin Ratio	Measures a firm's profit margin, operating expense margin, and net non-operating expenses. How well does a firm turn $1 of sale into profit?	Net Income (Income Statement) / Sales (Income Statement) = Profit Efficiency	(Easton et al. 2018)
ROE: Return on Equity	Measures management's effectiveness of using shareholder's capital to create profit	Net Income (Income Statement) / Shareholder's Equity (Balance Sheet) = Shareholder Profitability	(Easton et al. 2018)
Opeating Cash Flow Ratio	Measures a firm's potential ability to seek value-added opportunities as well as cover short-term liabilites	Operating Cash Flow (Balance Sheet) / Sales (Income Statement) = Debt Coverage & Opportunity	(Zeller & Stanko, 1994)
Operational Efficiency			
ROA: Return on Assets	Measures how well a firm utilizes its assets to create profit.	Net Income (Income Statement) / Total Assets (Balance Sheet) = Asset Efficienty	(Easton et al. 2018)
Gross Profit Margin Ratio	Measures the difference between selling price and the cost to make or buy the products sold for the year.	Gross Profit (Income Statement) / Sales (Income Statement) = Efficiency Quotient	(Easton et al. 2018)
Sales Backlog	Measures a firm's performance capacity	Average Net Sales (Income Statement) / Backlog (Form 10-K) = Unfullfilled Sales Orders	(Easton et al. 2018)
Solvency & Stability			
Debt-to-Equity Ratio	Measures the proportion of how much a firm's stockholders are financing its operations.	Total Liabilities (Balance Sheet) / Total Equity (Balance Sheet) = Measure financial leverage	(Easton et al. 2018)
Interest Coverage (Expense) Ratio	Measures a firm's ability to cover the cost of its interest payments.	Interest Expense (Income Statement) / Operating Income (Income Statement) = Debt Coverage Efficiency	(Easton et al. 2018)
DSO: Days Sales Outstanding	Measures how quickly a firm receives payment for goods and/or services rendered.	365 x (Accounts Receivable (Balance Sheet) / Sales (Income Statement)) = Payment Efficiency	(Easton et al. 2018)
Altman's Z-Score	Measures the financial distress of a firm.	Z-Score = ([Working Capital / Total Assets] x 1.2) + ([Retained Earnings / Total Assets] x 1.4) + ([Operating Earnings / Total Assets] x 3.3) + ([Market Capitalization / Total Liabilities] x 0.6) + ([Sales / Total Assets] x 1.0)	(Altman, 1983)
Market Competitiveness			
Herfindahl-Hirschman Index (HHI)	Measures the market concentration and competitiveness of an industry. Metric used by the DOJ to determine whether a firm can proceed with a merger and/or acquisition in order to maintain anti-monopolistic environment.	Identify # of firms within a given industry. Determine each firm's market share (e.g. total sales). Square each of the firm's market share. Sum those calculations. 1,500 < X < 2,500. Market is either Low, Medium, or High depending on the sum.	(Ordover & Willig, 1983)

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Acquisition Research Program
Graduate School of Defense Management
Naval Postgraduate School
555 Dyer Road, Ingersoll Hall
Monterey, CA 93943

www.acquisitionresearch.net