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Implications of Early Vendor Down-Select in Defense Acquisition Programs

June 2024

MAJ Timothy M. Malloy, USA
CPT Jonathan R. Young, USA

Thesis Advisors: Dr. Robert F. Mortlock, Professor
Keith A. Hirschman, Professor

Department of Defense Management

Naval Postgraduate School

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

ACQUISITION RESEARCH PROGRAM
DEPARTMENT OF DEFENSE MANAGEMENT
NAVAL POSTGRADUATE SCHOOL

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ABSTRACT

This study examines the impact of early vendor down-selection on the competition within defense acquisition programs, with a specific focus on its effects on cost, schedule, and performance outcomes. By conducting a comparative case study analysis of programs that employed early down-selection versus those that maintained multiple vendors, the research highlights how reduced competition correlates with increased risks and negative outcomes, including cost overruns and project delays. The findings advocate for maintaining competitive dynamics throughout the acquisition process as a strategy to improve overall program success and efficiency. This study contributes to the ongoing discourse on optimal acquisition strategies in the defense sector, suggesting a reevaluation of current practices to enhance competitive forces within the acquisition framework.

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LIST OF ACRONYMS AND ABBREVIATIONS

AAF	Adaptive Acquisition Framework
ACAT	Acquisition Category
AoA	Analysis of Alternatives
ASA(ALT)	Assistant Secretary of the Army for Acquisition, Logistics, and Technology
ASD(IBP)	Assistant Secretary of Defense (Industrial Base Policy)
BES	Budget Estimate Submission
CAPE	Cost Assessment and Program Evaluation
CBA	Capabilities-Based Assessment
CBO	Congressional Budget Office
CDD	Capability Development Document
CICA	Competition in Contracting Act
CJCS	Chairman of the Joint Chiefs of Staff
COTS	Commercial-Off-the-Shelf
CRS	Congressional Research Service
DAS	Defense Acquisition System
DAU	Defense Acquisition University
DAVE	Defense Acquisition Visibility Environment
DCR	DOTmLPF-P Change Recommendation
DFARS	Defense Federal Acquisition Regulation Supplement
DPG	Defense Planning Guidance
DOD	Department of Defense
DODD	Department of Defense Directive
DODI	Department of Defense Instruction
DOTmLPF-P	Doctrine, Organization, Training, materiel, Leadership, People, Facilities, Policy
EMD	Engineering and Manufacturing Development

FAR	Federal Acquisition Regulation
FARA	Future Attack Reconnaissance Aircraft
FCS	Future Combat Systems
FM&C	Financial Management and Comptroller
FYDP	Future Years Defense Program
GCV	Ground Combat Vehicle
GMV	Ground Mobility Vehicle
HMMWV	High Mobility Multi Wheeled Vehicle
ICD	Initial Capabilities Document
IFB	Invitation for Bid
IP	Intellectual Property
J&A	Justification and Approval
JCIDS	Joint Capabilities Integration and Development System
JCB	Joint Capability Board
JCS	Joint Chiefs of Staff
JEON	Joint Emergent Operational Need
JLENS	Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System
JROC	Joint Requirements Oversight Council
JSD	Joint Staff Designator
JSF	Joint Strike Fighter
JTRS	Joint Tactical Radio System
JUON	Joint Urgent Operational Need
KO	Contracting Officer
KPP	Key Performance Parameters
KSA	Key System Attributes
LCC	Life-Cycle-Cost
LRIP	Low Rate Initial Production
FRP	Full Rate Production

MCA	Major Capability Acquisition
MDA	Milestone Decision Authority
MHS	Modular Handgun System
MILCON	Military Construction
MILPERS	Military Personnel
MOSA	Modular Open System Architecture
MSA	Material Solution Analysis
MTA	Middle Tier of Acquisition
NDS	National Defense Strategy
NDIA	National Defense Industrial Association
NDIS	National Defense Industrial Strategy
NMS	National Military Strategy
NSC	National Security Council
NSS	National Security Strategy
OASD(IBP)	Office of the Assistant Secretary of Defense for Industrial Base Policy
O&M	Operations and Maintenance
O&S	Operations and Support
OMB	Office of Management and Budget
OMFV	Optionally Manned Fighting Vehicle
OSD	Office of the Secretary of Defense
OT	Other Transaction
OTA	Other Transaction Agreement
OUSD(A&S)	Office of the Under Secretary of Defense for Acquisition and Sustainment
OUS(C)	Office of the Under Secretary of Defense (Comptroller)
OUSD(R&E)	Office of the Under Secretary of Defense for Research and Engineering
P&D	Production and Deployment
PM	Program Manager

PMO	Program Management Office
POM	Program Objective Memorandum
PPBE	Planning, Programming, Budgeting, and Execution
PPB(E)E	Planning, Programming, Budgeting, Enactment, and Execution
PSS	Product Support Strategy
RDT&E	Research, Development, Test, and Evaluation
RFP	Request for Proposal
RMD	Resource Management Decision
SAR	Selected Acquisition Report
SECDEF	Secretary of Defense
TCAPS	Tactical Communication and Protective System
TD	Technical Demonstrator
TMRR	Technology Maturation and Risk Reduction
TRL	Technology Readiness Level
USD	Under Secretary of Defense
VCJCS	Vice Chairman of the Joint Chiefs of Staff

EXECUTIVE SUMMARY

This study provides a thorough analysis of the effects of early vendor down-selection in U.S. Department of Defense (DOD) acquisition programs. The study is organized around detailed case studies and utilizes extensive historical data to compare programs that underwent early vendor down-selection with those that maintained broader competitive environments during their procurement processes, across different levels of spending and procurement.

The U.S. military has consistently maintained its position as the most powerful globally, primarily due to its advanced technological capabilities and efficient procurement strategies that guarantee optimal value in defense acquisitions. This study seeks to examine the frequently discussed approach of early vendor down-selection, which involves selecting a single supplier at the beginning of the acquisition process, and its impact on the success of the program. This practice is closely examined, especially for its purported negative impacts on cost effectiveness, adherence to schedules, and performance results.

The primary objective of the research is to determine the impact of early down-selection on the three key success indicators of defense acquisition programs: cost, time, and performance. The analysis is based on a thorough examination of case studies within the Department of Defense (DOD), focusing on programs that were either advantaged or disadvantaged by decreased competition.

The research findings indicate that when vendors are selected early, it weakens the competitive dynamics that are essential for achieving the best program results. Programs that imposed restrictions on competition in their early stages exhibited a higher likelihood of surpassing budget limits, experiencing delays in schedules, and encountering compromised system performance, as opposed to programs that maintained competition for a longer duration. The study examines multiple case studies in which early down-selection resulted in Nunn-McCurdy breaches, which are substantial cost overruns that require formal reporting to Congress.

The findings have important implications for the procurement policies of the Department of Defense (DOD). The study proposes that ensuring a competitive atmosphere during the acquisition process will not only lead to improved pricing and innovation, but also to enhanced overall effectiveness and efficiency of defense programs. The research strongly supports the need for policy changes that would promote competitive dynamics, allowing programs to take advantage of market forces in order to achieve optimal outcomes in defense acquisitions.

The study presents a thorough analysis and suggests a series of interconnected recommendations to improve defense procurement strategies. First, it proposes a reassessment of existing methods for obtaining goods or services in order to expand competitive practices throughout the entire process of obtaining goods or services, guaranteeing that competitive forces are sustained to reduce expenses and stimulate innovation. Furthermore, it is advisable to implement strategic sourcing policies in order to promote ongoing competition throughout the later stages of the acquisition process. This approach would aid in reducing the risks linked to early vendor lock-in and fostering improved overall program outcomes. The study recommends implementing regulatory changes that discourage early down-selection, unless it can be clearly demonstrated that doing so would be advantageous for specific program characteristics. This would ensure that decisions regarding down-selection are made based on strategic benefits rather than simply following routine procedure. Finally, it is important to conduct additional empirical research in order to continuously improve and update acquisition policies to align with the changing technological and market trends. This will help ensure that the acquisition framework remains adaptable and efficient in addressing contemporary defense challenges.

I. INTRODUCTION

The U.S. military, since its inception on June 14, 1775, has continued to grow, improve, and evolve into the world's most powerful military (Kersley & O'Sullivan, 2015, p. 41; U.S. Army Center of Military History, n.d.). The United States was able to achieve and maintain this status by consistently investing large sums of money into the defense sector (Peter G. Peterson Foundation, 2023). As President Dwight D. Eisenhower noted in his 1961 farewell speech, "we have been compelled to create a permanent armaments industry of vast proportions" (National Archives, 2023, para. 3). In 2016, the United States spent more on defense than the next seven nations combined did (Candreva, 2017, p. 77). This large financial investment enables the U.S. military to purchase and operate a host of technologically advanced weapons systems (Douglas, 2021).

The Defense Acquisition System (DAS) is the process that converts taxpayers' money into military capability through the development and management of more lethal, innovative, and technologically advanced weapons systems (Office of the Under Secretary of Defense for Acquisition and Sustainment [OUSD(A&S)], 2022b). For every increase in the efficiency of the DAS, the U.S. government saves money and produces more capability, and does so faster. A critical component of an efficient acquisition is the appropriate use of competition and competitive forces in a capitalistic economy.

A. PURPOSE OF RESEARCH

The purpose of this research is to analyze the impacts of early-stage vendor down-select, and the subsequent loss of competitive forces, in Department of Defense (DOD) acquisition programs. Program Management Offices (PMOs) face pressure to limit their choices, or down-select, to a single vendor in the initial stages of the acquisition process. However, this early down-selection eliminates competitive dynamics crucial for the DOD to secure the best-performing product within a reasonable time frame and budget. Although the immediate reductions in cost by not involving multiple vendors might be palpable, the potential unforeseen expenses arising from the absence of competition could outweigh these savings in the long run. This concern pertains not only to programs within the major

capabilities acquisition pathway but also extends to those in the middle tier of the acquisition process.

B. PROBLEM STATEMENT

The DAS's early-stage decision to down-select to a single vendor diminishes the competitive landscape and may limit the potential for achieving the best product. This study aims to comprehensively evaluate the repercussions of this early vendor down-selection strategy on the success metrics (cost, time, and performance) of DOD acquisition programs. Through an in-depth case study analysis, this research assesses the effects of reduced competition on program cost, schedule, and performance, comparing outcomes in these three areas with programs that maintained multiple vendors throughout much of the acquisition process. By examining these scenarios, the study intends to provide valuable insights into the consequences of not carrying competition into prototyping within the Defense Acquisition System, thereby informing future acquisition strategies and decision-making processes within the DOD, provided funds are available to support such a strategy.

C. RESEARCH QUESTIONS

This study aims to comprehensively evaluate the repercussions of early vendor down-selection strategies on the success metrics (cost, time, and performance) of DOD acquisition programs. This analysis raises several aspects that must be considered, all of which can provide program managers with valuable insights into how and when competition will be useful in creating the best product for the warfighter. First, how do competition levels during the Technology Maturation & Risk Reduction (TMRR) and Engineering & Manufacturing Development (EMD) phases affect program success rates at different acquisition category (ACAT) levels? Second, is there a relationship between the intensity of competition at various stages and subsequent program outcomes, specifically whether increased competition correlates with higher success rates? Third, what is the impact of Nunn-McCurdy violations based on levels of competition and program outcomes across ACAT I, II, and III programs? Fourth, is there a relationship between the type of acquisition pathway, the level of competition, market maturity, and program effectiveness?

D. METHODOLOGY

We use a case study methodology to compare programs of record from within the DOD. This approach allows for real-world data to be collected and assessed. The research provides a thorough and methodical analysis to evaluate the cost savings of an early vendor down-select compared to the long-term program impacts of reduced competition over the life of the program. This study aims to assess the expenditures associated with early vendor down-select in comparison with the costs accrued by retaining multiple vendors until Milestone C. The primary objective of this analysis is to explore the intricate balance between costs incurred and the corresponding value obtained from multiple vendors competing to create the best value for the government. By looking more closely at this balance, the research strives to offer valuable insights for decision-makers involved in similar project scenarios. Through this examination, the study aims to contribute substantial understanding of and practical implications for strategic decision-making in vendor selection processes. Additionally, the study provides a qualitative assessment of the effects of the competition within the case studies acquisition processes examined.

E. SCOPE AND LIMITATION

The study employs historical data derived from reports to perform a case study, aiming to evaluate and compare the consequences associated with different levels of competition within the DAS. By scrutinizing individual programs, the research enhances its credibility and underscores the tangible effects of decisions made by program managers (PMs) in the real world. However, a few limitations need acknowledgment. These include constrained access to primary program data, dependence on secondary program data, utilization of qualitative measures of effectiveness, a restricted statistical confidence stemming from a narrow selection of programs, and an inherent inability to validate conclusions due to the absence of baseline programs. It is crucial to note that these limitations preclude the formulation of statistical inferences, underscoring the reliance on case studies in this research.

Subsequent chapters delve into specific case studies within the DOD, analyzing the effects of early vendor down-select on program outcomes. Through detailed cost-

effectiveness analysis of these case studies, we compare the expenses associated with early vendor down-select to those of retaining multiple vendors. Additionally, qualitative assessments are conducted to understand the effects of competition within the acquisition processes and the management of these programs. These chapters aim to provide practical insights to inform strategic decision-making within the DOD's acquisition programs and contribute to enhancing efficiency and effectiveness in defense procurement by identifying the pros and cons of maintaining competition for various programs.

II. BACKGROUND

This chapter introduces the concepts of how the DOD develops and acquires weapons systems and the role of competition and competitive forces throughout the process. The DAS, or the "Big A" of acquisition, as it is referred to by some acquisition professionals, is the overarching systems and processes used to acquire weapon systems. The DAS is a system of systems that generates the weapon systems requirements, forecasts, allocates funding, and oversees the actual development process of the weapon system. The development of the system is routed through one of six pathways in the Adaptive Acquisition Framework (AAF), referred to as the "Little A" of acquisition (Kadish et al., 2006, p. 4). Competition within these pathways carries with it potential benefits, but at a cost to the acquisition program.

A. THE DEFENSE ACQUISITION SYSTEM

The defense acquisition process is the overarching system of systems that enables the DOD to develop and procure weapon systems. The primary high-level policies, written and updated between 2019 and 2022, are contained in the 5000 series of DOD directives and instructions. According to DOD Directive 5000.01,

> The objective of the Defense Acquisition System (DAS) is to support the National Defense Strategy, through the development of a more lethal force based on U.S. technological innovation and a culture of performance that yields a decisive and sustained U.S. military advantage. The acquisition system will be designed to acquire products and services that satisfy user needs with measurable and timely improvements to mission capability, material readiness, and operational support, at a fair and reasonable price. (OUSD[A&S], 2022b, p. 4)

The defense acquisition process is broken down into three major decision support systems: the requirements process, or Joint Capabilities Integration and Development System (JCIDS); the financial aspect, or the Planning, Programming, Budgeting, and Execution (PPBE) process; and the Defense Acquisition System. Simply put, JCIDS pertains to the performance of the system, PPBE pertains to the cost, and the acquisition process pertains to the schedule. If performance is lacking, the schedule and cost have to

increase to compensate (Federal Acquisition Institute, 2022). Together, these three decision support systems shape the military's acquisition structure in accordance with the strategic guidance outlined in the 5000-series guidance (Army Force Management School, 2021, p. 196). The defense acquisition process is visually depicted in Figure 1 as three separate entities with varying priorities and purposes but with overlap and interdependencies. The role of these three systems is defined in a 2022 report to Congress:

> Joint Capabilities Integration and Development System (JCIDS). The process by which DOD identifies capabilities, or items, required by the military to fulfill its missions, resulting in programmatic requirements;
>
> Planning, Programming, Budgeting, and Execution (PPBE) System. The process by which DOD translates strategic guidance into resource allocation decisions, resulting in funding;
>
> Defense Acquisition System (DAS). The process by which DOD manages the development and purchase of products and services, resulting in acquisition (sometimes referred to as "Little A" acquisition). (McGarry, 2022, p. 5)

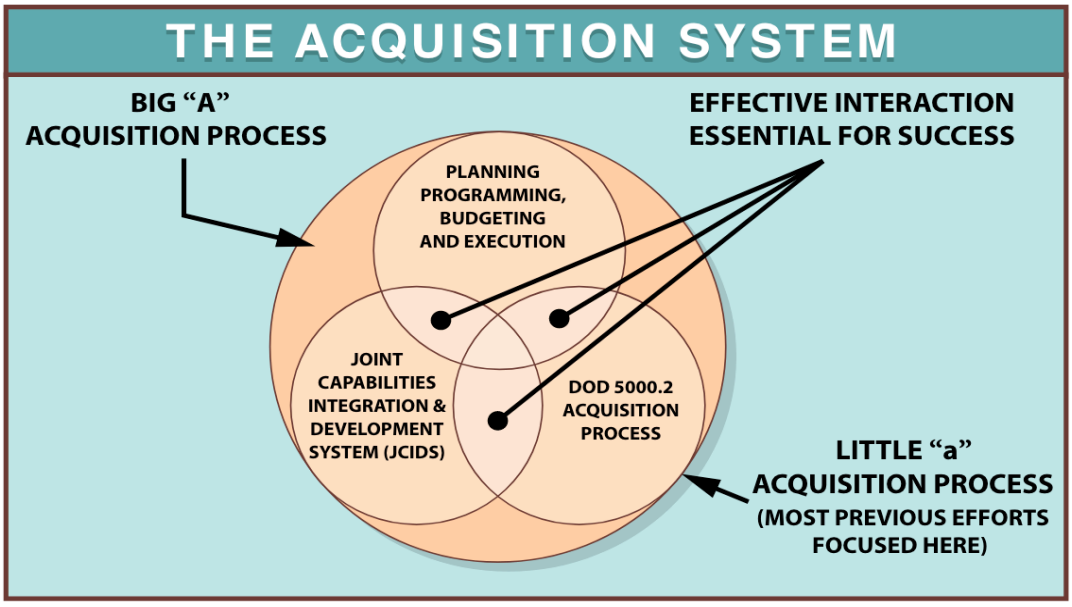

Figure 1. The Defense Acquisition System. Source: Kadish et al. (2006).

The defense acquisition process also is referred to as a three-legged stool; if one of the legs is missing, the stool cannot support anything. The process is also sometimes

referred to as the triple constraint (Mortlock, 2016). These three systems are always in contention with one another, and if one is out of sync with the others, the entire process falls into disarray. As depicted in Figure 2, the three decision support systems, DAS, PPBE, and JCIDS, are interconnected components of defense planning and execution. They are influenced by strategic guidance, current threats, missions, force readiness, and DOTmLPF-P considerations. DOTmLPF-P stands for doctrine, organization, training, materiel, leadership, personnel, facilities, and policy. These factors create a dynamic interplay between the DAS, PPBE, JCIDS, and other defense processes, ensuring adaptability to evolving strategic, operational, and resource requirements.

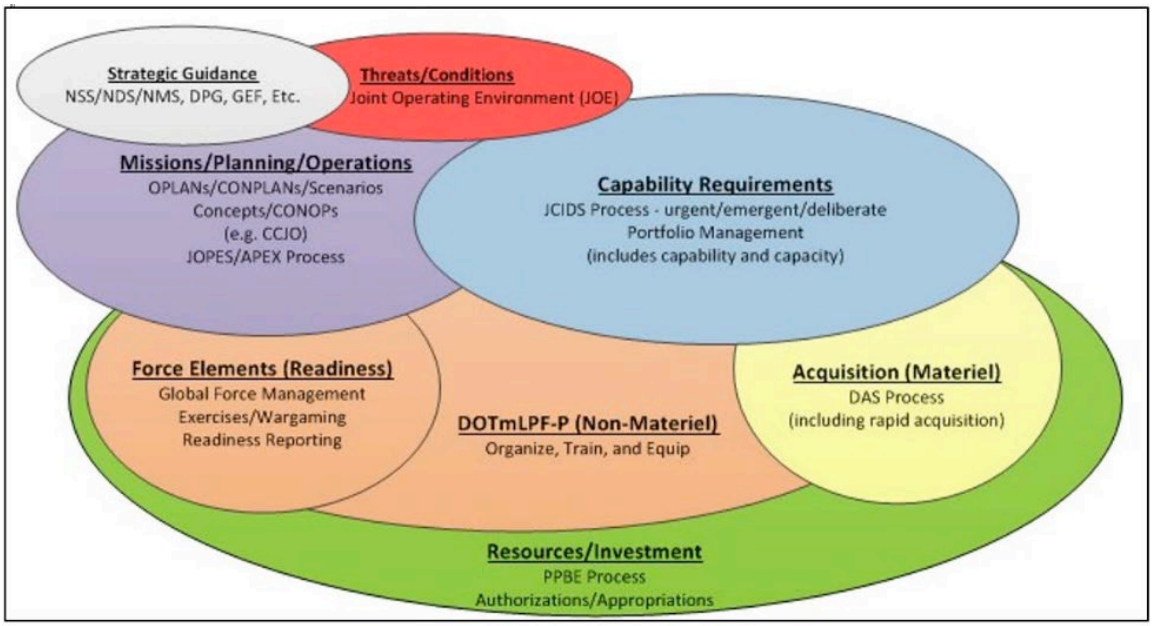

Figure 2. JCIDS Interaction with the PPBE Process and the DAS. Source: Chairman of the Joint Chiefs of Staff (CJCS; 2018).

B. JOINT CAPABILITIES INTEGRATION AND DEVELOPMENT SYSTEM

The JCIDS is one of the decision support systems that comprise the Big A of the acquisition process. Its purpose is "to identify current and future capability gaps in the joint forces' ability to conduct its core missions" (Army Force Management School, 2021, p. 196). The JCIDS process is often referred to as the requirements generation process

because it identifies, assesses, and prioritizes the capabilities needed to fill those gaps (Schwartz, 2013, p. 3). The need can be bottom-up–driven by the end users, top-down by senior leaders, or a combination of both. The requirements, being a jumping-off point for many acquisition programs, must be well-defined and developed to prevent cost, schedule, and performance issues later on (Federal Acquisition Institute, 2022). The purpose of the JCIDS is further defined in CJCS Instruction 5123.01H: "it provides the baseline for documentation, review, and validation of capability requirements across the Department. Validated capability requirements documents facilitate DOTmLPF-P changes, guide the DAS, and inform PPBE processes" (CJCS, 2018, p. 67).

The DOTmLPF-P paradigm comprises categories or areas that can be adjusted to fill a capability gap. DOTmLPF-P analysis is also routinely used throughout the acquisition process to assess the second- and third-order effects across the enterprise of a potential change. Figure 3 defines each facet of DOTmLPF-P, saving the "m" for last, which indicates that a materiel solution is usually the last resort (Joint Chiefs of Staff [JCS], 2018).

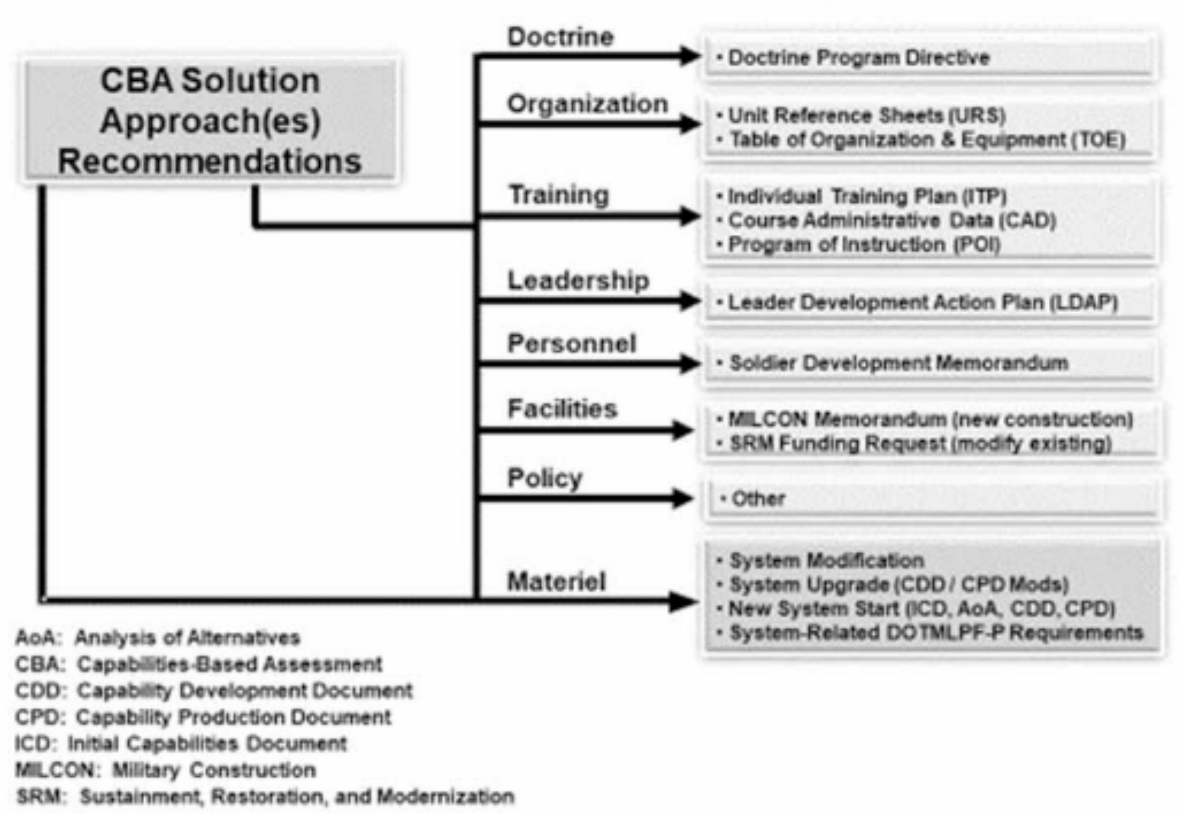

Figure 3. Solutions Documents. Source: Army Force Management School (2021, p. 65).

The JCIDS process takes a capabilities-based, threat-informed approach to identifying warfighter needs. The capabilities-based assessment (CBA) fosters a more collaborative mentality across the services, and it better unifies the services' efforts. The governing strategic documents that focus military priorities are the National Security Strategy (NSS), the National Defense Strategy (NDS), and the National Military Strategy (NMS; Schwartz, 2013, pp. 3–4). Figure 4 depicts the NMS planning process from the perspective of the joint service. Planning is an iterative process that generally starts with high-level strategic documentation such as the NSS, NDS, and NMS. This guidance is then disseminated to the services and combatant commands and analyzed through the lenses of contingency planning, capability development, and force development to identify capability gaps against the tiered strategic documentation. While these are three separate focus areas, they are inherently interconnected.

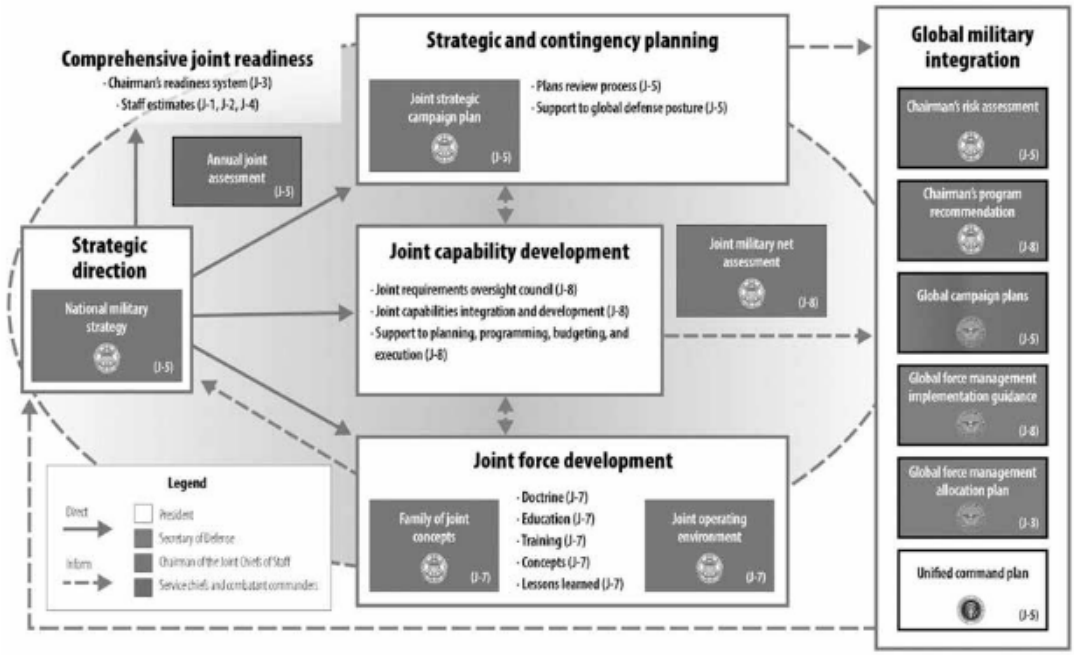

Figure 4. Joint Strategic Planning System. Source: Army Force Management School (2021, p. 30).

The JCIDS process is "the primary means for the Joint Requirements Oversight Council (JROC) to fulfill its responsibilities to the Chairman of the Joint Chiefs of Staff (CJCS)" (CJCS, 2018, p. 1). The *Manual for the Operation of the Joint Capabilities Integration and Development System* explains that the JROC's "responsibilities include assessing joint military capabilities, and identifying, approving, and prioritizing gaps in these capabilities, to meet applicable requirements in the National Defense Strategy (NDS)" (JCS, 2018, p. 1). The JROC is led by the vice chairman of the Joint Chiefs of Staff (VCJCS) and is comprised of a flag officer from every service, typically the vice chief of each service. The JROC receives input from various under secretaries of defense (USDs), the combatant commanders (CCMDs), and the service chiefs (CJCS, 2018, pp. 15–20).

The Joint Staff Gatekeeper designates programs based on their potential cost, acquisition category (ACAT) level, and level of joint interest. The Joint Staff Designation (JSD) determines the staffing pathway and timeline for the program. Programs can be determined to have JROC interest, Joint Capability Board (JCB) interest, or joint

information interest. The JSD also accounts for the criticality of the joint interest and interoperability of the program. Not every acquisition program has joint interests. As such, each service has its own requirements process (Defense Acquisition University [DAU], n.d.-c).

The CBA, which assesses the capability gap, will result in a determination for either a materiel solution or a non-materiel solution. Non-materiel solutions result in a DOTmLPF-P Change Recommendation (DCR) in an effort to fill the gap without acquiring a system. A materiel solution will use the results from the CBA as the basis for the requirements documents that start the development process. The three types of requirements documents are the Joint Urgent Operational Needs (JUON) statement, the Joint Emergent Operational Needs (JEON) statement, the Initial Capabilities Document (ICD), and the Capabilities Development Document (CDD). The requirement document used is determined by the operational urgency of the capability gap (DAU, n.d.-b). The type of document used determines which development pathway is used in the DAS. Figure 5 depicts the various JCIDS documents in relation to the operational urgency of the capability gap, the anticipated timeline for development, and the JCIDS staffing timeline. It is important to note that not all capability gaps are assessed through the JCIDS process. If there are no joint equities, there is no need for JCIDS involvement. In those cases, the services rely on their own requirements processes.

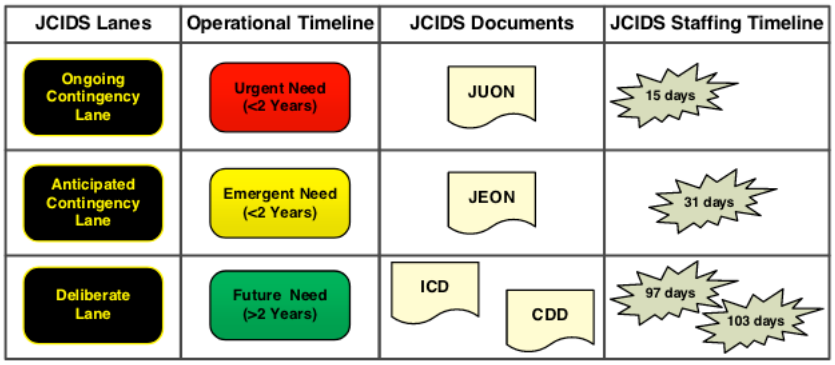

Figure 5. The JCIDS Process for Various Acquisition Pathways. Source: JCS (2018).

C. PLANNING, PROGRAMMING, BUDGETING, AND EXECUTION

The U.S. defense budget for Fiscal Year 2023 was $891 billion, which was one of the highest defense budgets ever, surpassed only by those during World War II and at the height of the Global War on Terror (Congressional Budget Office [CBO], 2023, p. 16). The DOD has the largest line item in the discretionary budget with nearly three million employees, making it the largest U.S. federal agency (McGarry, 2022, p. 1). Although other factors influence the size of the U.S. defense budget, the largest contributor is the DOD Defense budget request and its detailed funding requirements. The PPBE system is the process used by the DOD to craft and justify its budget proposal (Candreva, 2017, p. 195). McGarry (2022) defines the PPBE system as a "strategic planning process for allocating resources among the military departments, defense agencies, and other components" (p. 2). In DOD Directive 7045.14, the Office of the Under Secretary of Defense (Comptroller) (OSD[C]; 2019) explains the purpose of PPBE:

> The PPBE shall serve as the annual resource allocation process for DOD within a quadrennial planning cycle. The Quadrennial Defense Review (QDR) [now referred to as the NDS], force development guidance, program guidance, and budget guidance are the principal guides used in this process. Programs and budgets shall be formulated annually. The budget shall cover 1 year, and the program shall encompass an additional 4 years. (p. 1)

The PPBE system should be thought of as a system of systems, with each category having its own systems and processes to achieve its aims. The PPBE system runs parallel to and "is embedded among strategic and operational planning processes of the military" (Candreva, 2017, p. 65). Candreva (2017) noted that PPBE "is dedicated to the task of determining budgetary allocations for the manning, training and equipping of the military and the operation and support of defense systems that support national security objectives" (p. 195).

The PPBE system comprises four sequential phases and related subphases, as depicted in Figure 6. Sometimes the system is considered to have five phases, PPB(E)E, with the additional "e" on PPBE being the enactment phase. While technically part of the budgeting phase, enactment, the process of Congress authorizing and appropriating the requested funds, is its own complex and dynamic process that can cause friction. The

phases are inherently linked and flow into one another, but there are also interdependencies and timeline complexities that lead to the start of one phase well before the end of the previous phase (Candreva, 2017, p. 207).

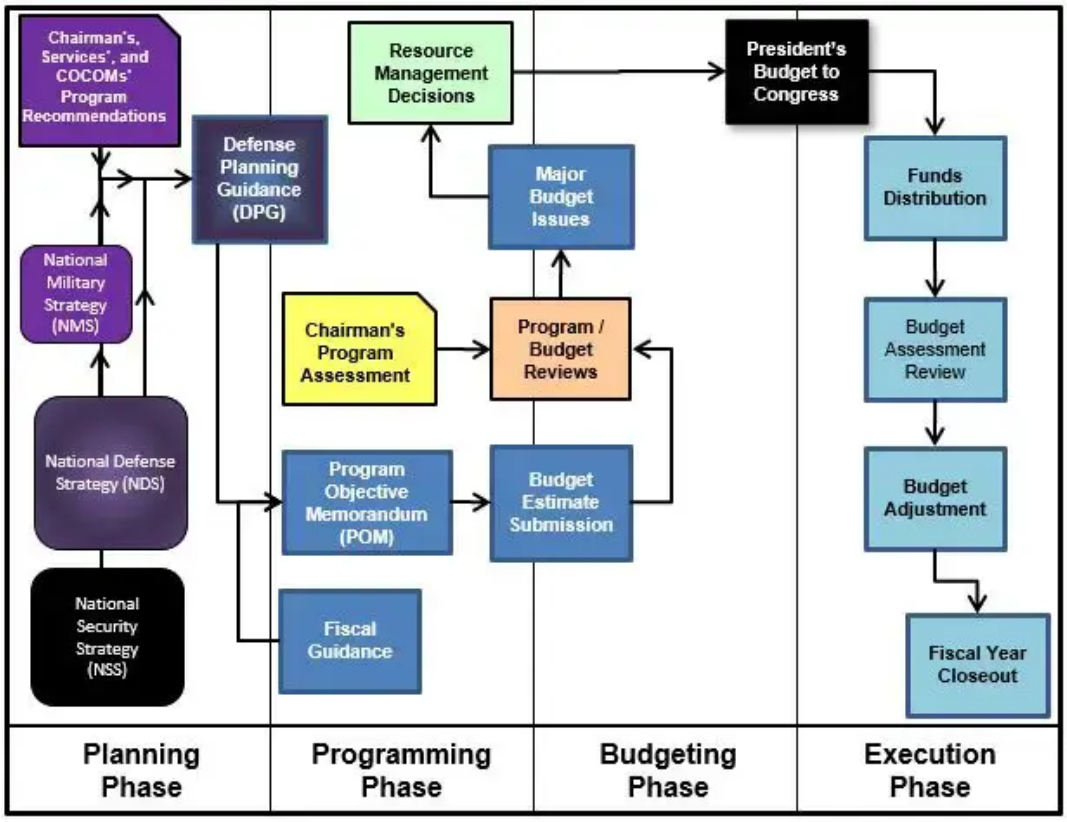

Figure 6. The PPBE Process. Source: AcqNotes (2024).

a. Planning Phase

The planning phase aims to identify military capability gaps where strategy surpasses current capabilities and to prioritize remedies for these differences that can be addressed in follow-on phases. In effect, the planning phase informs decision-makers, who are responsible for resource allocations, gaps, and the prioritization of efforts to fill those gaps. According to McGarry (2022), the USD for policy in the planning phase "assesses strategic guidance (e.g., the President's National Security Strategy; the Secretary of Defense's National Defense Strategy; and the CJCS's National Military Strategy) and

coordinates the DPG detailing force development priorities that inform the programming phase" (p. 6). The overarching goals, missions, and strategies that provide guidance to the DOD and drive the planning process come from the highest echelons of the U.S. government. Every 4 years, the president, advised by the National Security Council (NSC), publishes the NSS, which guides not just the DOD but many other agencies. Based on the guidance within the NSS, the secretary of defense (SECDEF) publishes the military's objectives in the NDS. The CJCS, based on the prior guidance, publishes the NMS, a document focused specifically on military operations and capabilities (Candreva, 2017, pp. 209–211).

The comprehensive joint assessment produces the family of joint operating concepts that describes the medium- to long-term (8–20 years) future operating framework of the military. This framework is inherently linked to the JCIDS process and shapes future developments. This assessment is foundational in the Chairman's Program Recommendation, a prioritization of acquisition programs, and the Chairman's Program Assessment, which examines how well the services' planned funding of programs supports the combatant commanders. These assessments culminate in the Defense Programming Guidance (DPG), which outlines the SECDEF's priorities for the services. Accompanying the DPG is the Fiscal Guidance (FG), which gives planners a rough idea of the upcoming budget and its policies (Candreva, 2017, pp. 212–214). Table 1 summarizes the planning phase's activities, key stakeholders, and outputs.

Table 1. The Planning Phase. Source: McGarry (2022, p. 7).

Phase	Description	Lead Actor	Output(s)
Planning	Review strategic guidance Assess threats Evaluate takeaways from war games Identify capability gaps and risks	Under Secretary of Defense for Policy	Chairman's Program Recommendations (CPR) Defense Planning Guidance (DPG) Fiscal Guidance (FG)

b. Programming Phase

The goal of the programming phase, as Candreva (2017) explains, "is to allocate resources among programs across a midrange time horizon [3–7 years] that best achieves the planning objectives" (p. 209). In essence, decision-makers analyze the anticipated effects of forecasted resource allocation and their impacts on the future force (McGarry, 2022, p. 9). During this phase, the abundance of resource allocation decisions that will determine the livelihood of many acquisition programs are made. Candreva (2017) states, "The programming phase allocates resources across a set of programs that are believed to best achieve those goals and objectives" (p. 214).

The mid-range time frame is defined in the Future Years Defense Program (FYDP) as the budget year plus 4 additional years. The planned allocation of resources against the FYDP generates the Program Objective Memorandum (POM), which is a key input in the next phase. According to McGarry (2022),

> A POM describes proposed resource requirements (forces, personnel, and funding) for programs over five years. Each POM prioritizes and adjusts programs in the FYDP and describes risks associated with unfunded, underfunded, or overfunded programs. After each component submits a POM, the CJCS submits to the Secretary of Defense a chairman's program assessment, an independent assessment intended to inform program reviews. The CJCS typically reviews the extent to which the military departments satisfied combatant command requirements. The Director of CAPE leads program reviews, forecasts resource requirements for the next five years, and updates the FYDP. (p. 9)

The FYDP is a classified database containing a 5-year projection of DOD activities that is updated every year during the programming and budgeting phases. The FYDP is a means of linking internal DOD programs and objectives to the appropriations process that is mandated by Congress. Figure 7 depicts the FYDP structure as a cube with the three axes being the major stakeholders that must be aligned for the desired outcome to be achieved in the following phases (McGarry, 2022, pp. 6–9). This alignment can be complex due to the various types of appropriations and the amount of time in which each one is allotted to be spent, which must also fall under a service's budget line against a specific program. There are five types of DOD appropriations: Research, Development, Test, and Evaluation

(RDT&E) appropriations that are expendable for 2 years; Procurement or investment appropriations that are expendable for 3 years; Military Construction (MILCON) appropriations that are expendable for 5 years; Military Personnel (MILPERS) appropriations that are expendable for 1 year; and Operations and Maintenance (O&M) appropriations that are expendable for 1 year. These appropriations are planned out years in advance on developmental programs whose performance and spending plans are still variable (DAU, 2022, p. 2).

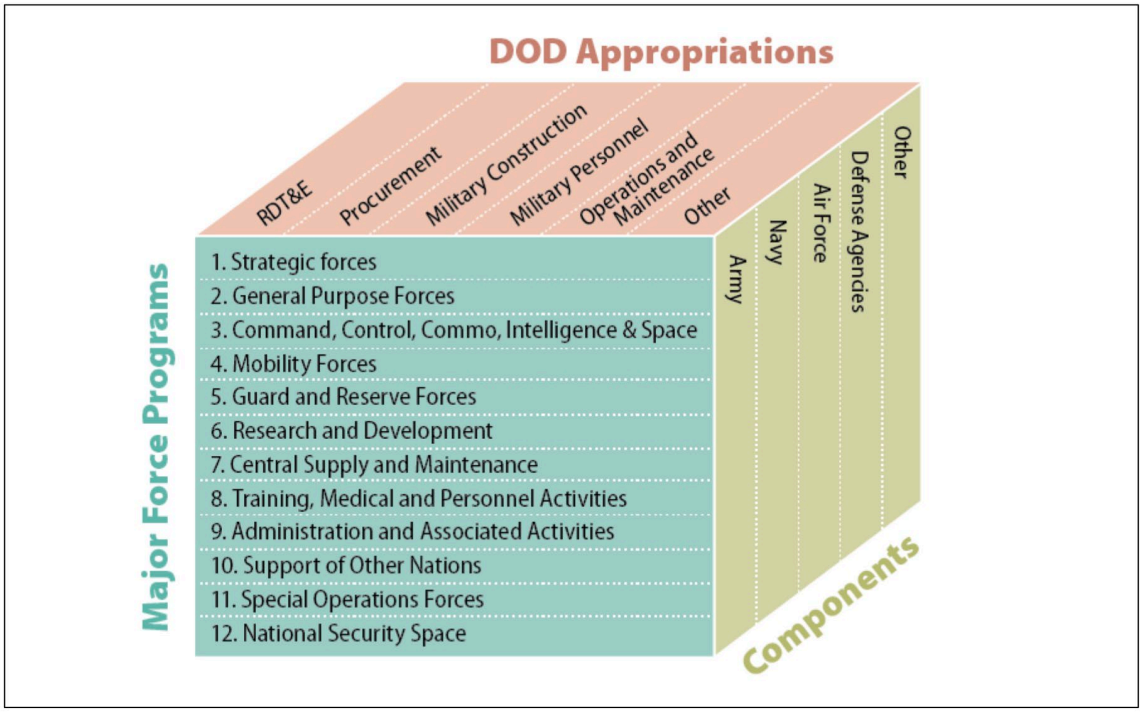

Figure 7. FYDP Structure. Source: McGarry (2022, p. 13).

The FYDP and the POM are intrinsically linked. As one is updated, so is the other. Each service compiles a POM and submits it to the OSD, where all of the POMs are consolidated. When there are issues or gaps in funding, the SECDEF may direct the services to conduct a Resource Management Decision (RMD). An RMD is a decision document that is drafted after a review that usually finds a resource gap or a misalignment of resources (McGarry, 2022, pp. 6–9, 40). Table 2 summarizes the programming phase's activities, key stakeholders, and outputs.

Table 2. The Programming Phase. Source: McGarry (2022, p. 7).

Phase	Description	Lead Actor	Output(s)
Programming	Translate planning decisions into program and resource requirements Consider program alternatives Develop five-year projections for forces, personnel, funding	Director, Cost Assessment and Program Evaluation (CAPE)	Program Objective Memorandum (POM) Resource Management Decisions (RMDs; programmatic)[a] Future Years Defense Program (FYDP) updates

c. Budgeting Phase

The goal of the budgeting phase is to craft and receive approval of an actionable budget that serves to justify funding decisions to Congress, which is the approval or enacting authority (Candreva, 2017, p. 209). Candreva (2017) explained, "The budget is written to describe and justify the mix of programs suggested by the services in their POM, and programs in the POM must be funded" (p. 224). McGarry (2022) described the process:

> During the budgeting phase, the DOD Comptroller reviews the Budget Estimate Submission (BES) developed by each DOD component. The BES covers the first year of the POM and adjusts amounts in the FYDP. The output is the DOD portion of the President's budget request to Congress. At certain points throughout the year, particularly in the fall, OSD works with the White House Office of Management and Budget (OMB) to make changes to budgets through RMDs. (p. 7)

While the POM covers large defense programs, assuming unlimited funding, the budget is an all-encompassing document that is constrained. The budget composition starts with the OMB publishing guidance for budget composition in Circular A-11. This guidance trickles down to the lower echelons where the detailed budget estimates are made. These individual commands' budget estimate submissions are consolidated by each service's assistant secretary for financial management and comptroller (FM&C) and then sent to the Office of the Under Secretary of Defense (Comptroller; OUSD[C]). Budget reviews occur at various echelons throughout this process, culminating with reviews by the OSD and the president's OMB. The consolidation of budgets and the review process will inevitably produce some conflicts that will be adjudicated through RMDs before the president's budget is submitted to Congress on the first Monday of February (Candreva, 2017, pp.

224–230). Figure 8 depicts the PPBE cycle in a given calendar year. It is important to note that multiple budgets are being worked on; this figure depicts when routine events occur.

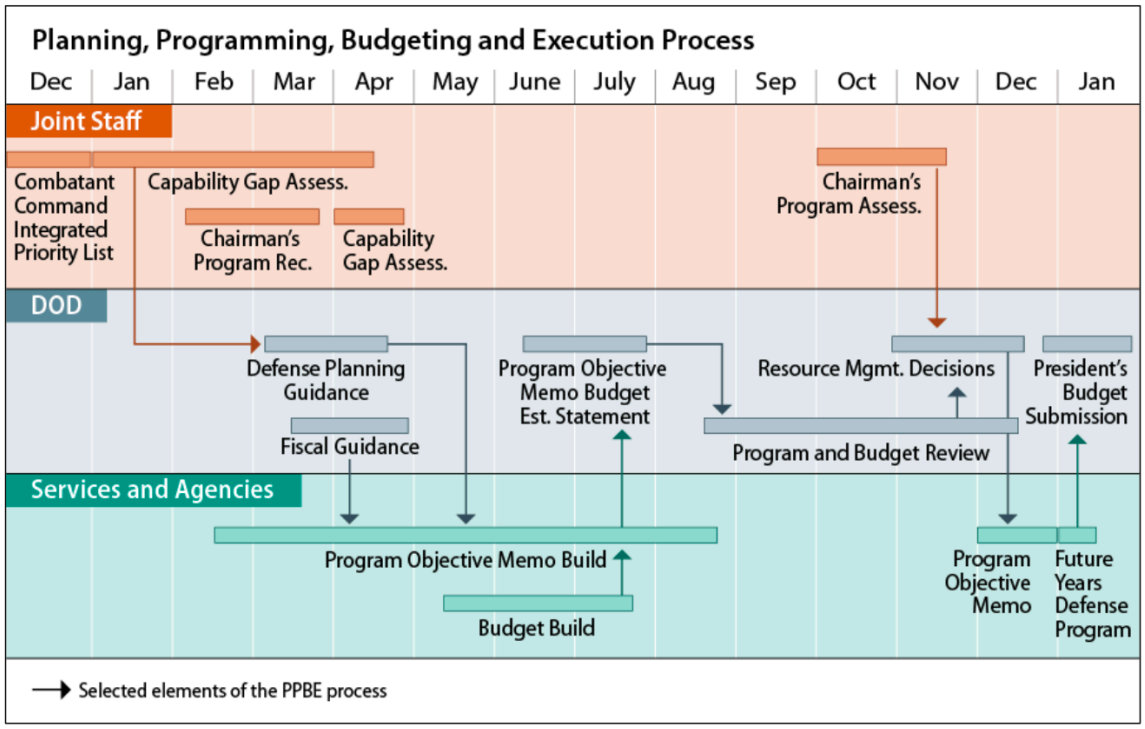

Figure 8. Calendar-Driven Events in the PPBE Process. Source: McGarry (2022, p. 11).

The budgeting process is not over once the OSD and the OMB agree; the budget still needs to be approved. While this may seem a trivial distinction, it takes an act of Congress to authorize and appropriate funds. Budget enactment is a lengthy process involving multiple House and Senate committees and their associated hearings, markups, debates, amendments, and votes that ultimately should produce an approved National Defense Authorization Act (NDAA) and appropriations, as seen in Figure 9. It is this budget, not the budget the OSD created, that the DOD will use (Candreva, 2017, pp. 92–100, 230–240). Table 3 summarizes the programming phase's activities, key stakeholders, and outputs.

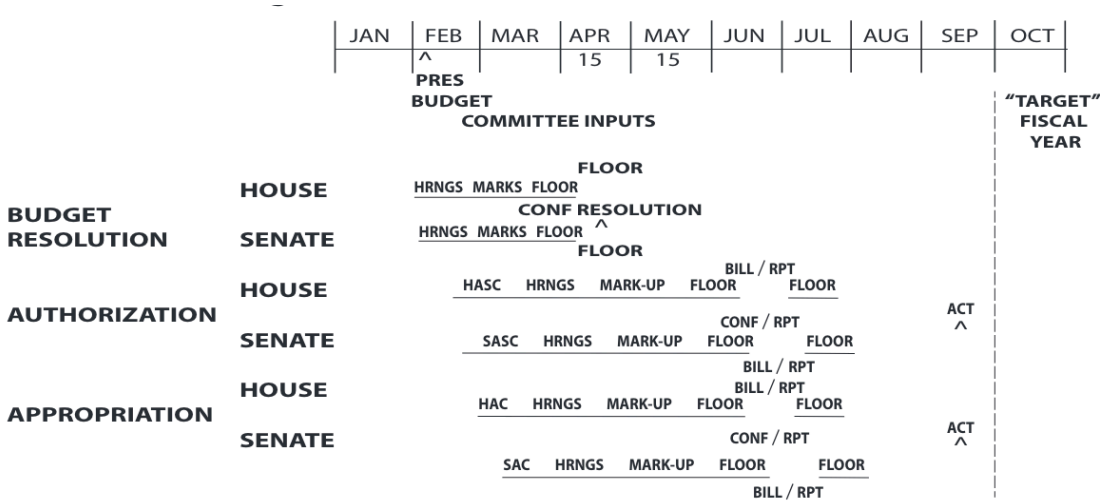

Figure 9. Congressional Enactment Timeline. Source: DAU (2022).

Table 3. The Budgeting Phase. Source: McGarry (2022, p. 8).

Phase	Description	Lead Actor	Output(s)
Budgeting	Review budget justifications Consider funding alternatives Prepare budget submission	Under Secretary of Defense (Comptroller)	Budget Estimate Submission (BES) RMDs (programmatic)[a] FYDP updates (incorporating RMDs) DOD portion of President's budget request

d. Execution Phase

The goal of the execution phase is to implement the products of the first three stages to produce the desired capability (Candreva, 2017, p. 209). McGarry (2022) described the process as follows:

> OSD and the DOD components evaluate the obligation and expenditure of funds, as well as program results. The purpose of execution review is to assess program objectives against outcomes. The components assess compliance with priorities and guidance of the Secretary of Defense, performance metrics, and program results. OSD staff review the assessments and recommend changes, in coordination with the CJCS and the Joint Staff. (p. 10)

While the majority of the PPBE process is forward-looking, the execution phase is where the rubber meets the road; that is, it is where resources are turned into capabilities.

During this phase, reviews are conducted through two different lenses: financial and programmatic. The financial reviews focus on the fiduciary responsibility of being stewards of taxpayers' dollars. The programmatic reviews focus on evaluating programs for their execution of approved strategies (Candreva, 2017, pp. 231–232). Table 4 summarizes the programming phase's activities, key stakeholders, and outputs.

Table 4. The Execution Phase. Source: McGarry (2022, p. 8).

Phase	Description	Lead Actor	Output(s)
Execution	Assess output to planned performance Adjust resources, as necessary	Multiple: Under Secretary of Defense (Comptroller) and DOD component financial managers	Assessments (internal reviews by OSD and DOD components) Reprogramming actions and transfers (including external interactions with Congress)

D. THE ACQUISITION PROCESS

The third pillar of the DAS serves as a vital component that executes the actions within the acquisition procedure. This system encompasses various processes, which directly complement the JCIDS (requirements) and PPBE (funding) that bridge the gap between need identification and the allocation of resources to fill the need. The acquisition life cycle of military systems and related items procured from contractors is guided by DOD Instruction 5000.02 (OUSD[A&S], 2022c), titled *Operation of the Adaptive Acquisition Framework*, and the DOD Instruction 5000 series for additional pathways. These instructions play a crucial role in governing this process.

The acquisition process is a comprehensive endeavor that encompasses various stages, starting from the initial design and engineering to construction, testing, deployment, sustainment, and, ultimately, the disposal of the acquired systems. The approach employed is event-driven, wherein programs advance through a sequence of processes, milestones, and reviews (Neenan, 2024). Each milestone signifies the completion of a particular phase and determines the program's progression to the subsequent stage.

Milestones hold significant importance within the DAS, as they serve as pivotal checkpoints for the oversight and management of acquisition programs. To advance to the

next phase of the acquisition process, it is essential for the program to meet legal and regulatory requirements at every milestone. The three primary milestones encompassing the progression of a project for the major capability acquisition pathway are denoted as Milestone A, which serves as the commencement of technology maturation and risk mitigation; Milestone B, with a primary emphasis on attaining full-rate production; and Milestone C, signifying the critical determination to proceed with production and deployment.

Additionally, the DAS uses a structured classification system to govern the supervision and administration of acquisition programs. The DAS employs three primary ACATs to manage programs: ACAT I, ACAT II, and ACAT III. These categories serve to define the extent of examination and supervision that each program undergoes given their level of costs and/or interest, with ACAT I programs occupying the highest position, followed by ACAT II and ACAT III programs, each being subject to progressively reduced levels of oversight.

ACAT I programs represent the highest tier of acquisition within the acquisition hierarchy, with the exception of classified programs of a highly sensitive nature. The classification of these entities is based on their projected expenditure amounts, which are expected to cost more than $525 million for research, development, test, and evaluation (RDT&E) or $3.065 billion in procurement costs (OUSD[A&S], 2021, p. 19). ACAT I is subdivided into three distinct sub-categories: ACAT ID, ACAT IB, and ACAT IC. These sub-categories introduce additional levels of detail and complexity by considering factors such as the program's position in the acquisition process, funding allocations, total procurement costs, special interests of the Milestone Decision Authority (MDA), and decision authority. This method ensures that a thorough analysis is tailored to the distinct features and complexities of each program.

ACAT II programs, which rank lower than ACAT I programs, are those that do not initially meet the criteria of for ACAT I classification but still maintain a floor expenditure. They require a total expenditure for RDT&E exceeding $200 million or a procurement expenditure exceeding $920 million in constant fiscal year dollars. The Milestone Decision Authority for ACAT II programs is typically held by the Component Acquisition Executive

or their designee, indicating moderate oversight without imposing comprehensive scrutiny (OUSD[A&S], 2021).

ACAT III programs represent the foundational tier within the acquisition hierarchy, falling below the financial thresholds required for an ACAT II classification and are consequently not designated as "major systems". The DOD sets the threshold for ACAT III, ensuring programs not meeting financial criteria for ACAT II or above are appropriately categorized. The Milestone Decision Authority for ACAT III programs is designated by the Component Acquisition Executive, reflecting a decentralized decision-making process (OUSD[A&S], 2021). This tier offers the least level of oversight, recognizing the lower financial commitment and complexity associated with ACAT III programs. The hierarchical framework ensures judicious allocation of resources while accommodating the diverse landscape of defense acquisition initiatives.

Before any program begins, it must have an approved acquisition program baseline (APB). The acquisition program baseline "describes the program goals through a list of objectives and thresholds for the cost, schedule and technical performance parameters" (Suarez, 2006, p. iv). The APB serves as a theoretical roadmap that the PM can follow and use to evaluate their program. This roadmap provides the PM and leadership with a clear measuring stick to monitor the program's cost, schedule, and performance, ensuring there are no anticipated deficiencies in these categories. If a deficiency occurs in one or more categories, the program will be reviewed and reevaluated to be "re-baselined," adjusting the original baseline reasonably to allow the program to continue within the framework of the original APB (Drezner & Krop, 1997). Historically, there have been many instances where large programs undergo rebaselining; however, this can create delays and require concessions in other parts of the program to be resolved. In the worst-case scenarios, the inability to operate within the limits of the APB will result in the cancellation of the program, leaving the warfighter without their desired product.

Table 5, published in 2021 by the OUSD(A&S), summarizes in detail the ACAT levels, minimum thresholds for each level, and the governmental officials responsible for overseeing the program.

Table 5. Description and Decision Authority for ACAT I–III Programs. Source: OUSD(A&S), (2021).

ACAT	Reason for ACAT Designation	Decision Authority

ACAT I	• MDAP[1] (Section 2430 of Title 10, U.S.C.)
	  ○ Dollar value for all increments of the program: estimated by the DAE to require an eventual total expenditure for research, development, and test and evaluation of more than $525 million in Fiscal Year (FY) 2020 constant dollars or, for procurement, of more than $3.065 billion in FY 2020 constant dollars
	  ○ MDA designation
	• MDA designation as special interest[3]
		ACAT ID: DAE
		ACAT IB: SAE[2]
		ACAT IC: Head of the DoD Component or, if delegated, the CAE

ACAT II	• Does not meet criteria for ACAT I
	• Major system (Section 2302d of Title 10, U.S.C.)
	  ○ Dollar value: estimated by the DoD Component head to require an eventual total expenditure for research, development, and test and evaluation of more than $200 million in FY 2020 constant dollars, or for procurement of more than $920 million in FY 2020 constant dollars
	  ○ MDA designation (Section 2302 of Title 10, U.S.C.)
		CAE or the individual designated by the CAE[4]

ACAT III	• Does not meet dollar value thresholds for ACAT II or above • Is not designated a "major system" by the MDA	Designated by the CAE[4]
Footnotes		
1. Unless designated an MDAP by the Secretary of Defense (SecDef), AIS programs[5], Defense Business System programs, and programs or projects carried out using rapid prototyping or fielding procedures pursuant to Section 804 of Public Law (PL) 114-92, do not meet the definition of an MDAP. 2. ACAT IB decision authority is assigned pursuant to Section 2430 of Title 10, U.S.C. Paragraph 3A.2.b. provides DoD implementation details. 3. The Special Interest designation is typically based on one or more of the following factors: technological complexity; congressional interest; a large commitment of resources; or the program is critical to the achievement of a capability or set of capabilities, part of a system of systems, or a joint program. Programs that already meet the MDAP thresholds cannot be designated as Special Interest. 4. As delegated by the SecDef or Secretary of the Military Department.		

E. THE ADAPTIVE ACQUISITION FRAMEWORK

The AAF pathway is a dynamic and flexible approach to acquisition that enables the DOD's acquisition personnel latitude to develop strategies for delivering effective solutions. It addresses the evolving nature of technology, markets, and mission requirements, acknowledging that a uniform approach may not be appropriate in all acquisition cases (OUSD[A&S], 2022c). The AAF pathways offer a variety of acquisition processes designed to address specific aspects and challenges, allowing acquisition professionals to select and tailor the most suitable pathway based on their program's unique characteristics. The framework assists in facilitating seamless transitions between different pathways, ensuring programs remain aligned with the organization's dynamic needs (OUSD[A&S], 2022c). The AAF pathways emphasize tailoring, recognizing that no two programs are identical and that a customized approach is essential for success. Figure 10 delineates the various acquisition approaches that offer PMs to leverage commercial

innovation in their approach to delivering systems to the warfighter, from rapid prototyping to more traditional approaches, making the pathways applicable across various acquisition scenarios (OUSD[A&S], 2022c).

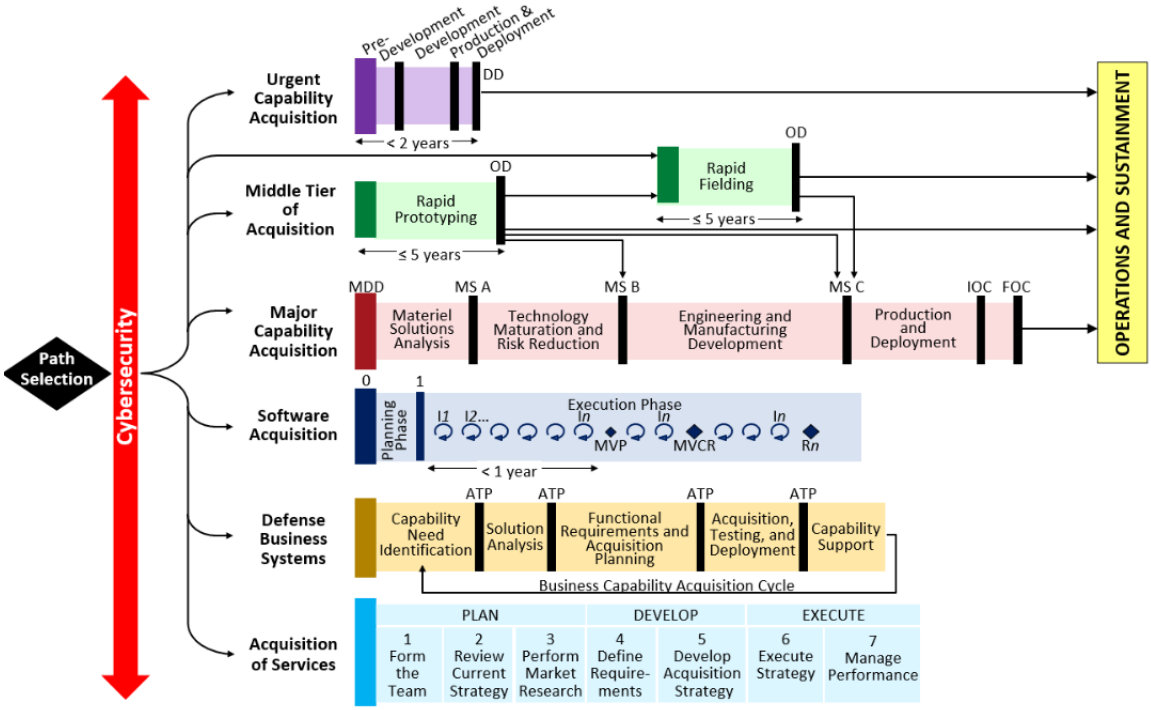

Figure 10. The Adaptive Acquisition Framework. Source: OUSD(A&S), (2021).

1. Major Capability Acquisition Pathway

The Major Capability Acquisition (MCA) pathway is used to "acquire and modernize military unique programs that provide enduring capability" (OUSD[A&S], 2022b, p. 13). The pathway's process adheres to a well-structured framework, guiding the progression from initial analysis through the ongoing support of acquired assets. The phased approach, encompassing key stages such as design, development, integration, testing, evaluation, production, and support, ensures a comprehensive and systematic handling of Major Defense Acquisition Programs (MDAPs), major systems, and other intricate acquisitions (OUSD[A&S], 2022c). This methodology is essential for managing the complexity and scale of these programs.

The Materiel Development Decision (MDD) plays a pivotal role within the MCA pathway, serving as an essential checkpoint in order for the acquisition to enter into the MCA (OUSD[A&S], 2021). This decision, informed by a validated requirements document, is where the MDA determines the entry phase of the acquisition into the MCA and at which milestone the initial review will be conducted. At this critical juncture, the MDA considers several key factors to make informed decisions, such as the urgency of the need, technology readiness level, manufacturing readiness level, and resource availability (Mortlock, n.d.). Crucially, this method includes adaptability, as the procurement and maintenance procedures are customized to the distinct attributes of each project, such as its scale, intricacy, hazards, urgency, and other pertinent factors. This adaptable approach acknowledges that in the field of defense acquisitions, a uniform solution is not suitable for all situations, enabling the optimization of processes according to the distinctive attributes of each project. By emphasizing the importance of the MDD, the MCA pathway can more effectively conform to overarching policies, such as "deliver performance at the speed of relevance" and "be responsive" (Mortlock, n.d.). This underscores the value of adaptability, responsiveness, and customized acquisition strategies in defense acquisitions (Mortlock, n.d.). Figure 11 depicts all phases of the MCA in sequential order.

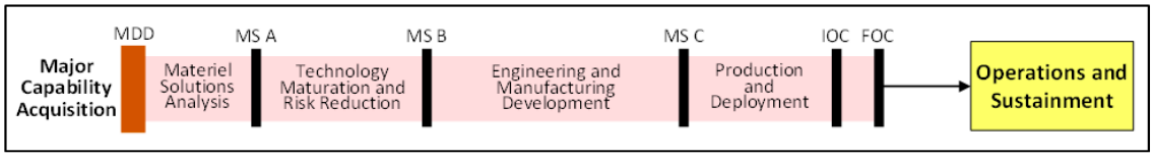

Figure 11. Major Capability Acquisition Pathway. Source: OUSD(A&S), (2022a).

The first phase of the MCA, the Materiel Solution Analysis (MSA) phase, evaluates potential materiel solutions to address the capability gaps identified in the Initial Capabilities Document (ICD). This phase includes conducting the Analysis of Alternatives (AoA) study plan, selecting the product concept, transforming identified capability gaps into practical and achievable requirements, and formulating the acquisition strategy to ensure those gaps are filled in the operational force. The AoA proves highly beneficial in

delivering an "analytical comparison of the operational effectiveness, suitability, and life cycle cost of alternatives that satisfy validated/established capability needs. It is a step in the acquisition process to identify and assess potential solutions to a gap, or anticipated gap, in mission need" (National Nuclear Security Administration, 2021, p. 3). During the MSA phase, there is also the task of crafting a preliminary Capability Development Document (CDD) and an initial acquisition strategy, converting capability gaps into actionable system-specific performance requirements and characteristics. At Milestone A, the decision authority makes the final determination regarding the commencement of a new acquisition program and grants approval for entry into the Technology Maturation and Risk Reduction (TMRR) phase (Office of the Under Secretary of Defense for Research and Engineering [OUSD(R&E)], 2021, p. 2-1).

The TMRR phase is the second phase of the MCA process and is meant "to reduce technology, engineering, integration, and life cycle cost risk to the point that a decision to contract for EMD can be made with confidence in successful program execution for development, production, and sustainment" (OUSD[R&E], 2021, p. 3-1). TMRR encompasses a range of activities focused on reducing the risks associated with future product development. However, its effectiveness relies heavily on close collaboration between the program lead and the future end user to ensure the development of the product will meet its intended use. These tasks involve assessing and modifying designs and requirements, improving and confirming capability specifications, and setting final cost limits. Usually, this stage includes various suppliers participating in activities to advance technology and reduce the overall risks of the subcomponents and the final component (OUSD[R&E], 2021, p. 3-1).

The third phase is known as the Engineering and Manufacturing Development (EMD) phase. Its objective is "to develop, build, and test a product to verify that all operational and derived requirements have been met, and to support production or deployment decisions" (OUSD[R&E], 2021, p. 4-1). Central to this phase is the smooth integration of diverse system architectures with other subsystems to ensure coherent communication across the entire system, aligning system elements with the technological choices made during the MSA and TMRR phases. This phase ends

> when the design is stable, the system meets validated capability requirements demonstrated by developmental and initial operational testing as required in the TEMP [Test and Evaluation Master Plan], manufacturing processes have been effectively demonstrated and are under control, software sustainment processes are in place and functioning, industrial production capabilities are reasonably available, and the system has met or exceeds all directed EMD phase exit criteria and Milestone C entrance criteria. (OUSD[R&E], 2021, p. 4-10)

The fourth phase is the Production and Deployment (P&D) phase. Its purpose is "to produce items for the warfighter that will achieve operational capability and satisfy mission needs" (OUSD[R&E], 2021, p. 5-1). Key events include "LRIP [low rate initial production], personnel training, completion of T&E intended to meet developmental assessment objectives, IOT&E, and the full-rate production (FRP) or full-deployment (FD) decision" (OUSD[R&E], & Director, Operational Test and Evaluation, 2022, p. 4-4). The crucial aspect of this phase involves applying the knowledge gained during LRIP and transitioning to a consistent process for full production. It is essential to implement quality assurance measures to meet all necessary specifications. Furthermore, a gradual approach to production and deployment must be considered to ensure effective fielding by the program office. This includes proper management of life-cycle sustainment and training efforts, which sets the stage for the final phase that is primarily focused on long-term sustainability (OUSD[R&E], 2021, pp. 5-4–5-9). The phase prioritizes production but experiences a gradual shift from sustainment plan execution to oversight. The PM and the Product Support Integrated Product Team are charged with implementing the planned process of delivering, verifying, and deploying the product support package to support the follow-on Operations and Support (O&S) phase.

Finally, the last phase is the O&S phase, which involves two main aspects: ongoing operational support of the product and its eventual disposal (OUSD[R&E], 2021, p. 6-1). The operational support phase is a crucial and an extensive process that requires careful planning to guarantee the long-term viability of the product. This involves ensuring that there is suitable infrastructure in place to support ongoing operations and maintenance activities, a consideration that should be considered right from the beginning of the program. It also includes consistently monitoring the product after it has been deployed to

identify any maintenance or repair needs, establishing proactive maintenance protocols, providing continuous support to end users, and making necessary improvements based on feedback from users. These aspects, along with others identified in documents such as the Life Cycle Sustainment Plan, contribute to the effective management of the operational support phase. Once the system has served its purpose or is due for replacement by a newer version, it is disposed of in compliance with regulations and policies. This guarantees that the system is handled and disposed of in a way that complies with environmental and legal standards (OUSD[R&E], 2021, p. 6-2).

A unique law that is applicable only to MDAP programs is the Nunn-McCurdy Act (Peters & O'Connor, 2016). The Nunn-McCurdy Act is primarily a means of notifying Congress when MDAP programs have exceeded certain cost thresholds compared to the program baselines. There are two classifications of breaches or violations: critical and significant. The report to Congress by Peters and O'Connor (2016) defines that a

> significant breach is when the Program Acquisition Unit Cost (the total cost of development, procurement, and construction divided by the number of units procured) or the Average Procurement Unit Cost (the total procurement cost divided by the number of units to be procured) increases 15% or more over the current baseline estimate or 30% or more over the original baseline estimate. (p. 2)

Their report continues by explaining that "a critical breach occurs when the cost increases 25% or more over the current baseline estimate or 50% or more over the original baseline estimate" (p. 2). Over the years, this act has adopted a facet of program management that assumes programs experiencing critical breaches as being terminated unless the DOD can articulate the necessity of that program and a path forward that mitigates the causes of the cost overruns.

2. Middle Tier of Acquisition Pathway

The Middle Tier of Acquisition (MTA) pathway is designed to facilitate rapid prototyping and fielding of new capabilities, ensuring swift adaptation to emerging threats. It promotes streamlined processes, reducing bureaucratic hurdles and enabling faster decision-making by tailoring reviews, assessments, and documentation to each program's

unique characteristics and risks (OUSD[A&S], 2019b). The MTA pathway operates within the broader context of the AAF and leverages principles from the framework, such as "empowering PMs, simplifying acquisition policy, employing tailored acquisition approaches, conducting data-driven analysis, actively managing risk, and emphasizing sustainment" (OUSD[A&S], 2022b, p. 4). Additionally, the MTA pathway is notable for its ability to adapt and enhance other acquisition pathways in the AAF. This flexibility acknowledges that not all programs possess equal levels of maturity in different areas, and certain approaches may be more appropriate for stages of a program's growth. Figure 12 illustrates the versatile nature of distinct domains, providing project managers with the flexibility to initiate the MTA pathway and seamlessly transition to alternative acquisition pathways.

The MTA pathway consists of two components: rapid prototyping and rapid fielding, as depicted in Figure 12. Rapid prototyping involves several key procedures that are necessary for effective implementation:

> identify merit based operational needs communicated by Joint Chiefs of Staff and Combatant Commanders, demonstrating and evaluating performance, transitioning successful prototypes to new or existing acquisition programs, considering life cycle costs, logistics support, and interoperability, reducing total ownership cost, and transitioning successful programs to operations and sustainment. (OUSD[A&S], 2019b, pp. 8–9)

Rapid fielding is similar to rapid prototyping and provides similar benefits to the user that rapid prototyping does. Rapid fielding employs established technologies that necessitate minimal development to equip units ready for deployment (OUSD[A&S], 2019b).

The key aspects of this pathway are time and initial product maturity. To fulfill the goals of rapid prototyping in this pathway, the PM must be capable of producing a prototype that meets all the necessary criteria in a functional environment within a 5-year time frame from the start of the MTA program. Furthermore, to achieve the goal of rapid fielding, the PM must initiate production within 6 months of the program start date and finish production within 5 years (OUSD[A&S], 2019b).

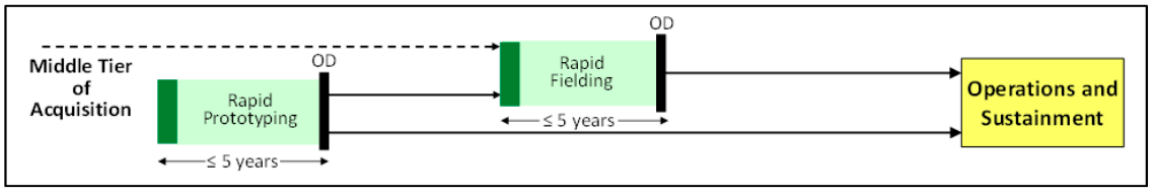

Figure 12. Middle Tier of Acquisition Pathway. Source: OUSD(A&S), (2021b).

3. Urgent Capability Acquisition Pathway

The Urgent Capability Acquisition pathway is designed to address emergent capability needs in less than 2 years (OUSD[A&S], 2019c). The pathway consists of four stages: Pre-Development, Development, Production and Deployment, and Operations and Sustainment in a truncated fashion, as seen in Figure 13 (OUSD[A&S], 2019c). The pre-development stage lays the groundwork for the rapid development and deployment of quick-reaction capabilities (OUSD[A&S], 2019c). The development stage identifies any shortfalls in "performance, safety, suitability, survivability, supportability, including software, and lethality" (OUSD[A&S], 2019c, p. 15). Stakeholder involvement is crucial in determining necessary corrections and acceptable risks. The Production & Deployment stage focuses on mass production and deployment of the capability, training, reserve equipment, and logistical support required for operational use. The Operations and Sustainment phase ensures the capability's effectiveness throughout its life cycle (OUSD[A&S], 2019c). It involves the management team overseeing maintenance, logistics, and updates to meet evolving operational requirements, contributing to its operational readiness and longevity.

The Urgent Capability Acquisition pathway emphasizes speed and efficiency in addressing critical and time-sensitive operational requirements (OUSD[A&S], 2019c). By streamlining the acquisition process into these four stages, the DOD aims to quickly identify, develop, and deploy capabilities to meet urgent needs while ensuring ongoing support and sustainment. This approach allows the military to adapt quickly to emerging threats and changing operational environments. Figure 13 illustrates a simplified flow of phases in a concise manner, closely resembling that of the MCA.

Figure 13. Urgent Capability Acquisition Pathway. Source: OUSD(A&S), (2021b).

F. THE BENEFITS OF COMPETITION

America's economic success is often attributed to its capitalist economy that leverages the private sector's desire for profit with competition to drive the economy (Stucke, 2013, p. 162). A competitive market, as defined by Mankiw (2012), is "a market in which there are many buyers and many sellers so that each has a negligible impact on the market price" (p. 66). Competitive markets are often referred to as perfect competition because no one buyer or seller can influence the price of a good or service. A monopoly, on the other hand, exists when there is a single supplier of a good or service to the entire economy and that supplier has a significant ability to alter the price of a good or service by adjusting the supply to the market (Mankiw, 2012, pp. 299–324). While perfectly competitive and monopolistic markets are the most recognized market structures, in reality, markets consist of varying degrees of each. Table 6 depicts the various market structures in which buyers and sellers operate and the implications those markets have for the prices of goods or services provided. Ultimately, it is the market conditions, not the supplier's cost, that should determine price.

Table 6. Market Structures. Source: Public Contracting Institute (2012, p. 13).

Level	Buyers	Sellers	Market Entry/Exit	Relative Pricing Power
Perfect Competition	Many independent	Many independent	Relatively easy	Pricing balance between buyers and sellers
Effective Competition	Limited independent	Limited independent	Relatively easy	Relative pricing balance between buyers and sellers
Oligopoly	Many independent	Few independent	Restrictions	Relatively greater pricing advantage to sellers
Oligopsony	Few independent	Many independent	Relatively easy	Relatively greater pricing power to buyers
Monopoly	Many independent	One	Restrictions	Considerable pricing power to sellers
Monopsony	One	Many independent	Relatively easy	Considerable pricing power to buyers
Bilateral Monopoly	One	One	Restrictions	Pricing power established by negotiation (as in sole source Government negotiation)

Monopolistic market structures have several drawbacks from a societal and public policy perspective. The most obvious is an increase in the price charged to consumers. Companies within the American economy are driven primarily by profit. When a single supplier of goods or services has the power to manipulate prices, it is only natural for them to charge more so the seller will realize a larger profit. While this is beneficial for the owner or manufacturer of these goods and services, it is not for the rest of society. Monopolies produce a less than socially optimal quantity of goods or services. This is a result of monopolies limiting quantities sold to increase their selling price. This increased cost results in a loss of potential customers who would have otherwise made the purchase. While the seller may not care because they are maximizing profit, it is the inefficient allocation of resources that causes concern to the government (Mankiw, 2012, pp. 310–313).

The U.S. government has implemented several laws to increase competition and prevent monopolies from forming because of the negative impacts of monopolistic markets. Dating back a century, the Sherman Antitrust Act and the Clayton Antitrust Act aimed to limit the power one company has on the market (Mankiw, 2012, pp. 319–323). Regarding the Sherman Antitrust Act, the U.S. Supreme Court opined,

> The Sherman Act was designed to be a comprehensive charter of economic liberty aimed at preserving free and unfettered competition as the rule of trade. It rests on the premise that the unrestrained interaction of competitive forces will yield the best allocation of our economic resources, the lowest prices, the highest quality and the greatest material progress. (Department of Justice, n.d., para. 13)

The government has taken this stance against monopolies because of the benefits a healthy competitive environment has for society. The DOD seeks the economic benefits of a competitive environment by promoting cost-effectiveness, timely delivery of products, and enhanced performance of products and services to support the National Defense Strategy (NDS) and ancillary documents in an efficient and effective marketplace. An effective and efficient marketplace encourages innovation throughout all phases of the DAS, ensuring that all industry participants offer their most technically acceptable products at the most competitive costs. This is facilitated by awarding contracts to companies that act as a forcing function to accomplish this goal. Competition also increases the industrial base capability and capacity. Insufficient competition can result in elevated expenses, diminished innovation, and potential hazards to the national security. Given the consolidation occurring in the defense sector, it becomes increasingly crucial to foster competition. The DOD needs to confront obstacles that prevent new participants from entering the market, aid small enterprises, and guarantee a just and transparent competitive atmosphere by implementing strategies such as supervising mergers, managing intellectual property (IP), and establishing plans to enhance the resilience of sector-specific supply chains (OUSD[A&S], 2022d). Ultimately, promoting competition within the DAS is crucial for enhancing efficiency, fostering innovation, and ensuring resilience in addressing national security requirements. On the other hand, monopolies incentivize the opposite: reduced quantity, higher costs, lower performance, and less innovation (Boushey & Knudsen, 2021; Department of Justice, n.d.). Without the pressure of competition, monopolistic entities have the ability to prioritize profit maximization over efficiency and meeting requirements, resulting in an overall decline in the market's ability to behave efficiently in favor of the government.

Another market condition that is common among defense acquisitions is the monopsony, where the DOD is the single buyer with many sellers (Sankar et al., 2023).

While this is not true for every market, there are several where this is the case. These markets typically are characterized as large, complex systems that are on the leading edge of technology (Orkand Corporation, 1973). These programs often have a long development phase and are purchased in small lot sizes at a high per-unit cost. These markets often correlated to systems that have no civilian application or whose sales are restricted from civilians or other militaries (Day, 2012). Examples of equipment that is restricted to only the U.S. military include many of the DOD's space, nuclear, intelligence, cyber, and survivability systems that even the closest allies cannot purchase. A substantial portion of the DOD's portfolio is restricted from civilian purchase. Systems such as automatic weapons, aircraft, armored vehicles, and ships have no civilian application, and their sale is restricted from civilians.

In a theoretical monopsony market, the buyer retains leverage over setting the price of goods (Public Contracting Institute, 2012). Sellers compete for the lowest price to be able to make the sale to the only buyer. This is the opposite of a monopoly, but unlike monopolies that have laws preventing their abuse, monopsony has no such limitations. While this appears to be an advantage to the government, it does not hold significant power over price determination (Day, 2012). In the short run, the DOD could force prices down to the point the seller does not make a profit. Businesses can bear losses for a time if the potential for future profit exists. In the long run, operating a loss will not last because the company will exit the market either through bankruptcy, shifting resources to a different market, or being absorbed by other more profitable businesses (Orkand Corporation, 1973). Either of these long-term effects are unhealthy to the Defense Industrial Base (DIB) and the effects of a shrinking DIB are discussed later in this chapter. Because of the possibility of driving sellers out of business and thus not acquiring the needed goods, the DOD generally does not force excessively low prices (Day, 2012).

G. COMPETITION WITHIN THE DAS

Having assessed how competition and the lack of competition impact the American economy as a whole, it is imperative to understand what policies and regulations govern competition within the DAS. There are three realms in which competition is discussed

within the DAS. The first is the acquisition process, which takes a management perspective of maintaining competition throughout the process to attain a desired end state. The second is the Federal Acquisition Regulation (FAR) as it pertains to the Competition in Contracting Act (CICA), the execution of contracts, and the use of non-FAR-based contracts. The third is the strategic policy aimed at maintaining a healthy DIB that retains the necessary capability and capacity to fulfill the operational needs of the services.

1. A Programmatic Perspective

Competition in the acquisition process is outlined in each program's acquisition strategy, which details the purpose for and desired result of maintaining competition throughout the various steps of the process. The impacts can almost always be traced back to cost, schedule, or performance implications. DOD Directive 5000.01, the overarching defense acquisition policy, emphasizes the importance of competition by stating,

> The DOD Components will acquire systems, subsystems, equipment, supplies, product support, sustainment, and services in accordance with the statutory requirements for competition.
>
> (1) Acquisition managers will take all necessary actions to promote a competitive environment, including consideration of alternative systems, data rights, and modular design to meet current and future mission needs.
>
> (2) Planning and contracting for appropriate amounts of data rights, and incorporating a modular and open design to enable upgrades, technology refreshes, and future re-competes may enhance competition throughout the life cycle. (OUSD[A&S], 2022b, p. 5)

The acquisition strategy is a comprehensive plan that each acquisition program maintains that details the acquisition approach and the execution plan throughout the life cycle of the program. The strategy should evolve to reflect desired program goals, objectives, and risks. DOD Instruction 5000.85 charges PMs to include a plethora of concerns, including competition, in their acquisition strategy (OUSD[A&S], 2021). The instruction states,

> The acquisition strategy will address how program management will create and sustain a competitive environment, from program inception through sustainment. Program management should use competition at various levels to create competitive environments that encourage improved performance

> and cost control. Decisions made in the early phases of the acquisition process can either improve or reduce program management's ability to maintain a competitive environment throughout the program life cycle.
>
> Strategies to be considered include: competitive prototyping, dual sourcing, and a modular open systems approach that enables competition for upgrades, acquisition of complete technical data packages, and competition at the subsystem level. This also includes providing opportunities for small business and organizations employing those with disabilities. (OUSD[A&S], 2021, pp. 26–27)

While PMs are charged to pay special attention to competition throughout the life cycle of a product, there are two phases during which competition is emphasized in the DOD Instruction 5000 series documents: the development of the technology and the O&S phase (OUSD[A&S], 2021, p. 14). During development, the use of technical demonstrators (TDs) not only demonstrates the feasibility of technology but also encourages technical competition, and it is normal to include multiple vendors throughout the TMRR phase (Army Force Management School, 2021, p. 217). Critical to enhancing competition, innovation, and interoperability, MDAPs will utilize the modular open systems approach (MOSA) to the maximum extent practicable (OUSD[A&S], 2021, p. 26). With over half of total life-cycle costs resulting from the O&S phase, continued competition of sustainment activities is imperative to attain the best product for the lowest price (DAU, n.d.-d; OUSD[A&S], 2021, p. 18). DOD Instruction 5000.02 (OUSD[A&S], 2022c) charges PMs to "consider the procurement of data deliverables and associated license rights needed to support competitive acquisition and life-cycle sustainment strategies" (p. 11). DOD Instruction 5010.44 (OUSD[A&S], 2019a) focuses on considering the best value over the life cycle of a program. Owning the IP rights fosters a competitive environment where the DOD reaps the cost savings from future upgrades. Additionally, IP rights open opportunities for small businesses and disadvantaged businesses to participate in major programs (OUSD[A&S], 2019a). The instruction goes even further by highlighting the importance of securing IP rights early in the life cycle, while competition still exists, to ensure the DOD acquires these rights for the best rate. As a program continues through the life cycle, it becomes substantially more difficult to implement impactful change to the program; as such, the decision that is made early in the process is critical.

2. A Contracting Perspective

Contracts are the primary means through which the PM achieves their desired outcomes. It is only the contracting officer (KO), not the PM, who has the legal authority to enter the government into legally binding contracts. The FAR and the Defense Federal Acquisition Regulation Supplement (DFARS) are the primary regulations that govern the KO's activities as they relate to acquiring materiel and services with appropriated funds. FAR Part 6 (2023) is the section of this regulation that details competition requirements. FAR Part 6 embodies the Competition in Contracting Act (CICA) of 1984 by categorizing the three markets in which the DOD operates: full and open competition, full and open competition after exclusion of sources, and other than full and open competition. CICA applies to all procurement contracts, for both goods and services, unless specifically exempt by statute. The purpose of CICA is to ensure adequate levels of competition exist in the DOD acquisition process to increase savings through lower, more competitive pricing; acquire higher quality goods and services; curb fraud; and promote accountability (Manuel, 2011, pp. 1–5).

FAR 6.101 charges KOs to "provide for full and open competition through the use of the competitive procedure(s) contained in this subpart that is best suited to the circumstances of the contract action and consistent with the need to fulfill the Government's requirements efficiently." Full and open competition is considered to have been achieved when "all responsible sources are permitted to submit sealed bids or competitive proposals" (Manuel, 2011, p. 10). A responsible source is defined in FAR 9.104-1 (2024) as an entity that meets the following requirements:

1. Have adequate financial resources to perform the contract, or the ability to obtain them.
2. Be able to comply with the required or proposed delivery or performance schedule, taking into consideration all existing commercial and governmental business commitments.
3. Have a satisfactory performance record. A prospective contractor shall not be determined responsible or nonresponsible solely on the basis of a lack of relevant performance history.
4. Have a satisfactory record of integrity and business ethics.
5. Have the necessary organization, experience, accounting and operational controls, and technical skills, or the ability to obtain them.

6. Have the necessary production, construction, and technical equipment and facilities, or the ability to obtain them.
7. Be otherwise qualified and eligible to receive an award under applicable laws and regulations. (FAR 9.104-1, 2024)

Full and open competition is the desired state, but the regulation affords KOs flexibility based on circumstances. When the requirements for full and open competition are not met, the acquisition is considered to be noncompetitive but potentially may still be in accordance with CICA requirements (FAR 6, 2023; Manuel, 2011, p. 10). To guide the government through this process, KOs employ a test for adequate price competition, comprising five conditions that must be met. KOs must ensure that the solicitation garners at least two offerors, the offers must satisfy the government requirements, offerors must independently contend for the award, the ultimate selection must be the lowest evaluated price given the absence of trade-offs, and the offers must be responsive to the solicitation (Yoder, 2024).

Full and open competition after the exclusion of sources is a market only some contractors can compete in and meet CICA requirements. Contracting activities may exclude procurement sources for the purposes of dual sourcing or small business set-asides. Dual sourcing refers to the practice of "excluding a particular source in order to establish or maintain an alternative source" (Manuel, 2011, p. 9). The DOD has an interest in fostering a healthy DIB that has multiple vendors so it is not at the whim of a single provider (Manuel, 2011, pp. 11–13). Another method of ensuring competition is through small business set-asides, which are procurements that are specifically reserved for small businesses or small businesses owned by disadvantaged individuals (FAR 6, 2023).

Similarly, other than full and open competition is considered non-competitive but may be in accordance with CICA requirements if it meets one of the seven exceptions to full and open competition. This market condition is referred to by some acquisition professionals as sole source acquisition because only one source is authorized. The exceptions are situations where competition is not possible or it is more beneficial to the government to operate in a non-competitive environment. These circumstances that permit other than full and open competition are listed in FAR 6.302 (2024):

1. Only one responsible source and no other supplies or services will satisfy agency requirements.

2. Unusual and compelling urgency.
3. Industrial mobilization; engineering, developmental, or research capability; or expert service.
4. International agreement.
5. Authorized or required by statute.
6. National security.
7. Public interest.

CICA requires KOs who intend to pursue non-competitive procurements to document, provide justification, and seek approval before contract award unless there are unusual and compelling circumstances. This justification must be done in writing and certify the accuracy and completeness of the KOs' claim. This document is referred to as a justification and approval (J&A; FAR 6, 2023; Manuel, 2011, pp. 15–17).

CICA fosters competition through the planning and solicitation of contracts to maximize the number of vendors who receive and can accomplish the desired acquisition. Solicitations for contracts are mandated to be written in a manner that allows full and open competition. This manifests itself in the contract specifications. They should be specific enough to satisfy the needs of the customer but not so specific that they preclude particular vendors. A procurement notice is required to be published no less than 15 days prior to the release of the official solicitation to ensure the maximum number of entities are aware of the upcoming Request for Proposal (RFP) or Invitation for Bid (IFB; Manuel, 2011, pp. 21–23).

3. Non–FAR-Based Contracting Policy

Since its authorized use in the late 1980s, non–FAR-based contracts have become more prevalent in defense acquisitions (Mak, 2022, pp. 4–5). Non–FAR-based contracts are categorized into three types: other transactions (OT), procurements for experiments, and R&D agreements (DAU, n.d.-a). Other transactions, often referred to as Other Transaction Agreements (OTAs), are by far the most used non–FAR-based contract, with over $24 billion being obligated from Fiscal Year 2019 to Fiscal Year 2021 as reported in a Government Accountability Office (GAO) report (Mak, 2022). The GAO report found that of the three types of OTAs—prototype, research, and production—prototype OTAs accounted for 99% of OTAs.

OTAs, being non-FAR-based contracts, do not have to abide by the FAR, which provides increased flexibility to the government. This means that CICA does not apply to OTAs (OUSD[A&S], 2023, p. 19). However, practitioners and PMs are urged to consider price reasonableness, IP rights, and physical property rights when using OTAs. The government team is responsible for documenting that the price is fair and reasonable and there is evidence of competition (OUSD[A&S], 2023, p. 24). According to the OT guide published by the OUSD(A&S) in 2023,

> Both OT statutory authorities require the use of competitive practices to the maximum extent practicable. Agencies are not required to complete the formal competition structure laid out in CICA (i.e., three tiers of competition: full and open, limited, and sole source with justification and approval), nor follow the competition rules in the FAR. The OT statutes and guidance allow the agency to determine what the competition will look like and how it will be structured. Competition is a good thing. It helps keep prices low and quality high, and it gives the Government leverage in negotiations. If an agency wishes to award a follow-on from a Prototype OT into either a Production OT or a procurement contract without further competition, the solicitation documents and the original OT award must have been competitive. (p. 43)

This DOD policy and U.S. code require competition to be used to the maximum extent possible for prototyping efforts; if those efforts lead to follow-on production agreements, additional competition is not mandated so long as the applicable statutory and policy requirements were met during the prototyping effort (OUSD[A&S], 2023, p. 16). This allows for an expedited transition, for which OTAs are known and used. The DOD OT guide further elaborates:

> The exercise of the authority to award a prototype OT pursuant to 10 U.S.C. § 4022 (b)(2) requires that "to the maximum extent practicable, competitive procedures shall be used." Further, for a successful prototype to be eligible for a follow-on production contract or transaction, pursuant to 10 U.S.C. § 4022(f), competitive procedures must have been used for the selection of the parties for participation in the prototype transaction. While the Competition in Contracting Act is not applicable, agreements officers should include a document trail as to when and how the statutory competition requirement was met. Depending on the surrounding circumstances, competition may have been satisfied with the award to the consortium. Alternatively, an agreements officer could reasonably document satisfying the competition requirement among consortium

> participants for an individual prototype project or prototype subproject. (OUSD[A&S], 2023, p. 49)

OTAs are known to reduce schedule burdens and increase the speed of the acquisition process because they are not constrained or obligated by the FAR. This provides PMs flexibility when it comes to prototyping, R&D, and follow-on production. While these agreements are not bound by the FAR or CICA, they are still required to maintain competition to the maximum extent possible to maximize performance and cost savings. There is potential for the benefits of competition to atrophy as an agreement can transition from prototyping to follow-on production without any additional competition.

4. Defense Industrial Base Policy

The OSD has taken a significant interest in the health of the DIB to ensure it has the necessary capability and capacity to provide goods and services so that the DOD can accomplish its missions. The first ever *National Defense Industrial Strategy* (NDIS), published in 2023 by the Office of the Assistant Secretary of Defense for Industrial Base Policy (OASD[IBP]) (2023), lays out "a strategy for a more robust, resilient, and dynamic defense industrial ecosystem" (OASD[IBP], 2023, p. i). A leading challenge policy-makers face is the non-competitive and unfair practices that have evolved over the last 3 decades (DOD, 2023, p. 11). The NDIS highlights three risk areas that are directly impacted by a lack of competition: increased costs and reduced defense budget, a weakened industrial ecosystem, and degraded technology with a lack of innovation (OASD[IBP], 2023, pp. 49–50).

The first and most apparent concern of lack of competition is increased costs to the DOD. The assistant secretary of defense for Industrial Base Policy describes the cost impacts caused by a lack of competition:

> Lack of competition can lead to fewer incentives and less pressure for defense contractors to offer fair pricing and to control costs and gain efficiencies. These anti-competitive practices increase the potential for unchecked costs and harm sub-tier suppliers due to market consolidation. They could discourage new entrants into the defense industry and reduce the diversity of talent and expertise available to the DOD. Furthermore, failure to strengthen trade and technology-sharing agreements with allies and partners forces the United States to bear a greater proportion of the research and development costs of cutting-edge defense-related goods.

> Finally, anti-competitive behavior and market consolidation driven in large part by integration challenges and adversarial actions may weaken the U.S. economy, leading to potential budget constraints for defense spending. This could limit the DOD's ability to invest in modernization, research, and development while also reducing ally and partner capability. (OASD[IBP], 2023, p. 49)

The second concern resulting from a lack of competition is a weakened industrial ecosystem. Foundational to the health of the DIB is fostering competition. The NDIS states, "The overall health and viability of the defense industrial ecosystem could be affected by anti-competitive behavior, market consolidation, and adversarial trading practices. A less diverse and competitive DIB could limit options for the DOD" (OASD[IBP], 2023, p. 49).

The third concern relating to a lack of competition and unfair market conditions is a reduction in innovation and quality. This concern is twofold: (a) theft of IP, from adversaries, negatively impacts U.S. economic growth by driving away responsible vendors, and (b) a lack of competition stagnates the potential technological gains and innovations of U.S. industry. The theft and proliferation of American IP by the country's adversaries harms U.S. industry. It disincentivizes the historic industrial innovation and efforts that result from U.S. efforts to retain a technological edge. This malfeasance makes it difficult and potentially undesirable for American or partnered industries to join the defense market. A lack of participants in the defense industry leads to a lack of competition. The NDIS states, "Failure to promote competition, especially at home, could also lead to slower technological advancements, quality issues, and even the loss of our technological edge in key areas" (OASD[IBP], 2023, p. 49).

The NDIS suggests several corrective actions that can be implemented to facilitate economic deterrence, a policy that promotes a fair and effective market that supports a healthy DIB ecosystem, which in turn promotes economic security, an integral part of integrated deterrence (OASD[IBP], 2023). The two methods most relevant to PMs and acquisition practitioners are increasing the use of commercial-off-the-shelf (COTS) products and ensuring the use of the modular open systems approach (MOSA) during materiel development.

A leading concern for the ASD(IBP) is supply chain resilience. The NDIS highlights an effort to diversify DOD suppliers by working with nontraditional suppliers, both domestic and international, to both broaden the DIB and facilitate competition within defense contractors (OASD[IBP], 2023, pp. 20–21). COTS purchases are an encouraged form of nontraditional procurement that, if used where applicable, can increase competition and subsequently reduce costs and improve delivery time. Expanding the defense supplier base fosters competition and reduces the risk of relying on the dwindling number of traditional defense contractors (DOD, 2023, p. 31).

To avoid vendor lock and reduce life-cycle costs, the NDIS calls for an increase in competition to ensure that adequate IP and data rights are secured (OASD[IBP], 2023). The NDIS further urges PMs to use MOSA to avoid IP restrictions and thus foster competition throughout the procurement of a system (OASD[IBP], 2023, pp. 37–38). MOSA is a design approach that mitigates the restrictions of using proprietary components. According to the NDIS, "MOSA combines system engineering open architecture techniques with open licensing and related legal and business considerations to isolate proprietary technology and prevent overleveraging of limited private investments from undermining return on government investment" (OASD[IBP], 2023, p. 38).

The DIB policy office's guidance highlights the concerns of the DIB's capability and capacity to support the DOD in a conflict and the nation's efforts to deter foreign aggressors. A lack of competition causes concerns about increased costs, a weakened defense industrial ecosystem, and a reduction of innovation. In response, the NDIS charges acquisition professionals to leverage COTS procurements to increase defense contractors, use MOSA to ensure the maximum number of competitors are able to participate, and ensure the appropriate acquisition of IP rights by the DOD (OASD[IBP], 2023). This policy is in line with the president's national policy on fostering competition throughout the American economy, the NSS, and the NDS.

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III. LITERATURE REVIEW

This chapter aims to review previous work containing an analysis of DOD acquisition programs and their use of competition. There are four general topics of literature as they pertain to competition within the DAS. The first is the health of the DIB and the massive consolidation of defense firms. The second category highlights the benefits of competition and calls for its use in the DAS. The third category highlights the disadvantages of competition within the DAS. The final category calls for the strategic use of competition that is tailored to specific acquisitions and circumstances. The *2018 National Defense Authorization Act* (NDAA) initiated a comprehensive military modernization effort to ensure the U.S. military is capable of meeting current and future threats (McCain & Reed, 2017, pp. 1–4). To match this mandate, the defense budget has consistently increased to facilitate the development and procurement of modernized equipment. With this increase in investment and effort, leaders must be responsible and efficient with taxpayer's dollars. To ensure this, reviews and analyses are necessary to understand whether programs are operating in accordance with policy and if that policy is having the desired effect (CBO, 2023).

A. U.S. DEFENSE INDUSTRIAL BASE

The DOD report on the *State of Competition within the Defense Industrial Base* (OUSD[A&S], 2022d), the Congressional Research Service report on *The U.S. Defense Industrial Base: Background and Issues for Congress* (Nicastro, 2023), and the National Defense Industrial Association (NDIA; 2023) report entitled *Vital Signs 2023: Posturing the U.S. Defense Industrial Base for Great Power Competition* focus on the broader DIB and the limited number of competitive defense firms. These reports are a part of President Biden's larger initiative to promote competition in the American economy. Over the last 3 decades, there has been substantial consolidation within the defense sector, leading to fewer but larger defense contractors. This forces the DOD to rely on fewer contractors to accomplish its mission. This consolidation and subsequent lack of competition raises concerns regarding the capability and capacity of the DIB, which impacts national security.

However, this is not a new trend. A DAU research paper published in 2012 attributes this decline to the end of the Cold War and the subsequent reduced defense budget that facilitated the merging of many defense contractors (Wydler et al., 2012, p. 5). In response to these trends, the ASD(IBP) office was created to strengthen the United States' DIB. While this issue is mostly above the PM's influence, it is certainly impactful to a program office's operations (Daly & Schuttinga, 1982; Nicastro, 2023; Nicastro & Peters, 2023).

B. THE IMPORTANCE OF COMPETITION IN DEFENSE ACQUISITIONS

The majority of the literature focuses on the benefits of competition for the acquisition of goods or services for the DOD. For example, the University of Maryland's Center for Public Policy (Gansler et al., 2009) published a comprehensive assessment of competition in defense acquisitions that analyzes the benefits of competition. Similarly, a 2009 RAND report by Arena and Birkler highlights the benefits of competition within the DAS, including reduced costs, increased surge capability, increased quality and performance, increased innovation, and a more equitable distribution of contracts awarded. A Center for Strategic and International Studies study by Berteau et al. (2010) finds that cost overruns are substantially more common in acquisitions where there is no competition when compared to programs with either full or partial competition, which might suggest that competition in defense acquisition is a tremendous benefit. A study published in *Defense AT&L* magazine focuses on the barriers to continuous life-cycle competition, reaffirming that the inherent benefits of competition should be reaped not just during the development and production of a product, but throughout its entire life (Janiga et al., 2013). A report presented at the 2012 DAU Research Symposium expounds upon the consequences of vendor lock that results from failing to continually apply competitive pressure throughout the life cycle of a product (Wydler et al., 2012).

C. RECONSIDERING COMPETITION IN DEFENSE ACQUISITIONS

While most studies focus on the benefits of competition, there are a few studies that highlight the downsides of competition. For example, Gearey (1992) argues that the DOD has become too focused on facilitating competition and that the benefits of competition are often negated or are inapplicable to defense procurements. Levenson (2014) uses a

statistical approach to counter the idea that simply injecting competition in DOD acquisitions will save the government money, referring to the DOD mandating competition as "the placebo effect of competition" (p. 416). The basis of his argument is the difference in commercial markets compared to the defense market (Levenson, 2014). In their RAND report, Arena and Birkler (2009) note that competition has substantial front-end cost and schedule impacts to programs, with the benefits potentially never being realized. In addition to the added direct costs of competition, they note the increased indirect costs and complications of the added workload to the Program Management Office to administrate additional contracts (Arena & Birkler, 2009, pp. 6–11). Harrison (2012) draws similar conclusions to Levenson (2014) and Arena and Birkler (2009) that the defense market is not a free market and a substantial increase in development costs results from competition. Additionally, Harrison (2012) notes that dual sourcing limits the benefits of the learning curve.

D. ASSESSING THE IMPACTS OF EARLY VENDOR DOWN-SELECT

While some researchers are completely against competition in defense acquisition, others support the strategic use of competition throughout the acquisition process for certain programs to maximize the benefits of competition while mitigating its negative side effects. Daly and Schuttinga (1982) assessed that stimulating competition in the acquisition process is expensive up front and the cost savings may not be realized for some years, so under appropriate circumstances, competition should be used to attain desirable results. Harrison (2012) affirms Daly and Schuttinga's (1982) assessment, finding that calculated competitive pressure in the acquisition process is beneficial to the government. Levenson (2014) expounds upon Harrison's (2012) work by focusing on the complexities that competition creates for companies during technology development by comparing commercial markets to the defense market. Finally, Arena and Birkler's 2009 RAND report explores the impacts of stimulating competition through dual sourcing, weighing the pros and cons and urging managers to estimate the break-even point of when competition is beneficial for specific programs, as no two acquisitions are the same.

Thomas Marion's 1995 master's thesis most closely resembles the aim of this research but focuses on the reasons for early vendor down-select. However, Marion fails to understand or articulate the cost, schedule, and performance impacts on programs because of an early vendor down-select. Additionally, this study was completed almost 3 decades ago. Since then, there have been significant changes to the DIB, the DAS, federal regulations, and federal policy. A recent assessment of early vendor down-select impacts on defense acquisitions does not exist. As such, a case study of relevant defense acquisitions should be conducted to assess the impacts of competition.

E. CONCLUSION

This chapter presents a thorough examination of the literature on competition within the DAS. The literature is classified into four primary subjects: the condition of the DIB, the advantages of competition in defense acquisitions, the drawbacks of competition, and tactics for strategically employing competition in customized acquisitions. The discussion emphasizes apprehensions regarding the consolidation of companies in the DIB and its repercussions on national security. Furthermore, it analyzes the vast body of literature that supports the advantages of competition, such as cost reduction, enhanced quality, and innovation. Conversely, it also recognizes literature that highlights the drawbacks of competition, such as escalated initial expenses and schedule disruptions. Additionally, it underscores that over the past 3 decades, substantial transformations have taken place in the DIB, the DAS, federal regulations, and federal policy. Hence, it is crucial to reevaluate the benefits and drawbacks of competition within the DAS, the extent to which such competition is implemented, and for how long it is carried across different programs. Finally, the chapter emphasizes the significance of conducting a recent evaluation of the effects of early vendor down-select on defense acquisitions. It highlights deficiencies in the current research and the necessity for additional investigation to guide future policy and practice in defense acquisitions.

IV. THE CASE STUDY

The foundation of this case study involves analyzing and comprehending the competitive dynamics with the DAS, particularly in terms of success criteria for different programs at various levels. This case study focuses on how the competitive process used during the acquisition cycle affects the effectiveness and results of the defense programs. This analysis is designed to evaluate defense acquisition programs of record from different ACAT levels to examine the specific impacts of competition at different stages of the acquisition process. The methodology used to select programs was based on the diversity of ACAT levels, with the goal of providing a comprehensive understanding of the implications of competition across the entire spectrum. This undertaking is backed by a comprehensive compilation of data, mainly obtained from reputable and diverse repositories such as the Executive Services Directorate Selected Acquisition Report (SAR), Defense Acquisition Visibility Environment, Congressional Research Service reports, RAND Corporation reports, GAO reports, DOD Office of the Inspector General reports, the U.S. Department of Defense Contract Notification website, and a carefully chosen assortment of news articles. The study's analytical framework aims to analyze competition before and after the Milestone B decision, specifically examining the competitive environment during the TMRR and EMD phases. The selection criteria used were based on ACAT level, competition levels, program success rates, and adherence to the Nunn–McCurdy thresholds. The objective of the analysis is to discover the relationship between competitive processes and the tangible benefits they create for the end product available to the warfighter. This preliminary investigation establishes the context for a thorough examination, with the goal of determining practical observations regarding the specific locations and times when competition produces the most notable benefits.

A. ANALYSIS

Through research, 27 defense acquisition programs were identified as having adequately available information to be included in this study. Pertinent information includes the number of vendors carried through the TMRR and EMD phases, the results of

the MS B decision, the results of the MS C decision, ACAT level, and if there were any Nunn–McCurdy breaches. These 27 programs are developmental in nature coming from the U.S. Army, Navy, and Air Force across multiple PEOs. Of these 27 programs, five programs did not have successful MS C decisions, three programs experienced Nunn–McCurdy violations, 19 were ACAT I, four were ACAT II, and four were ACAT III. Table 7 lists the programs that were selected for this study.

Throughout our research, ACAT I programs proved to have the most reliable data available; as such, ACAT I programs comprise the majority of our data points. The ACAT II and ACAT III programs that had available reliable data are from a diverse selection from across the services' portfolios. Of these 27 programs, the majority were routed through the MCA pathway. A handful started in the MTA pathway and then transitioned to an MCA. There were a few programs in which the AAF pathway was unclear, such as the B-21 and the Modular Handgun System (MHS). The GAO report for the B-21 is unclear whether the program has taken the MCA or MTA pathway (Gertler, 2019). There are attributes in both programs that fall into both pathways. The MHS is interesting, because it began development before the MTA pathway even existed, but exhibits characteristics similar to that of an MTA. For the intent and purpose of this study, the MHS is categorized as having progressed through the MCA pathway. All the programs that were routed through the MTA pathway started with a high level of competition that was stepped down to a lesser level to conduct Production Verification Testing (PVT), before selecting a final vendor. This stair-stepping of competition in MTA programs allowed them to be effectively compared against their MCA counterparts. As such, MTA programs' levels of competition were included alongside the TMRR and EMD comparisons, with the difference being that these phases do not exist in the MTA pathway, the timeline is shorter, and step-down gates are not as formal or rigid.

Table 7. Selected Defense Acquisition Programs

Program	ACAT	Service Lead	AAF Pathway	Contract type for development or Rapid Prototyping	Number of Competitors in TMRR	Authorized entry into EMD (MS B)	Number of Competitors in EMD or PVT	Authorized Entry to P&D (MS C)	Nunn-McCurdy violation?	Source
Amphibious Combat Vehicle (ACV 1.1)	ACAT I	Marine Corps	MCA	Fixed Price Incentive	3	Authorized	2	Authorized		(Mak, 2016) (OSD, 2018a)
Armored Multi-Purpose Vehicle (AMPV)	ACAT I	Army	MCA	Cost Plus Incentive Fee	2	Authorized	1	Authorized		(Army Technology, 2024) (Freedberg, 2014) (Mak, 2015) (OASA[ATL], 2018) (OASA[ATL], 2021) (OSD, 2022a)
B-21 Raider	ACAT I	Air Force	UNK	Cost Plus Incentive fee	3	Authorized	1	Authorized		(Gertler, 2019) (Gertler, 2021)
Future Attack Reconnaissance Aircraft (FARA)	ACAT I	Army	MCA	OTA	5	Cancelled	0	N/A		(Ludwigson, 2023b) (Oakley, 2022) (Oakley, 2023) (OASA[ATL], 2023)
Future Combat Systems (FCS)	ACAT I	Army	MCA	OTA	4	Authorized	1	Cancelled		(Pernin et al., 2012)
Gerald R. Ford-class Aircraft Carrier	ACAT I	Navy	MCA	Fixed Price Incentive	1	Authorized	1	Authorized		(O'Rourke, 2024) (OSD, 2022b)
GPS III Satellite Program	ACAT I	Air Force	MCA	CPIF/CPAF	2	Authorized	1	Authorized		(OSD, 2010) (OSD, 2018b) (Space News, 2008)
Ground Based Strategic Deterrent	ACAT I	Air Force	MCA	Cost Plus Incentive fee	2	Authorized	1	Authorized		(Erwin, 2020) (USAF, 2021)
Ground Combat Vehicle (GCV)	ACAT I	Army	MCA	Cost Plus Fixed Fee then revised to Fixed Price Incentive Fee	2	Cancelled	0	N/A		(Feickert, 2014)
Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS)	ACAT I	Army	MCA	Cost Plus Incentive Fee	1	Authorized	1	Cancelled	Critical and Significant Breach	(OSD, 2014a) (Peters & O'Connor, 2016) (Sullivan, 2010) (Sullivan, 2012)
Joint Light Tactical Vehicle (JLTV)	ACAT I	Army	MCA	Cost Reimbursable - TD Firm Fixed Price - EMD	3	Authorized	3	Authorized		(Behler, 2018) (OSD, 2019b)
Joint Strike Fighter F-35 Lightening II	ACAT I	Joint PEO	MCA	Multiple	2	Authorized	1	Authorized	Critical Breach	(Bolkom, 2009) (Behler, 2018) (Hoehn, 2022) (Ludwigson, 2023 a) (Peters & O'Connor, 2016)
Joint Tactical Radio System (JTRS) Program	ACAT I	Joint PEO	MCA	Cost Plus Award Fee	6	Cancelled	0	N/A	Significant Breach	(Defense Industry Daily, 2020) (Gallagher, 2012) (Oppenheim, 2006) (OSD, 2015) (OSD, 2014b) (Peters & O'Connor, 2016) (Ward, 2020)
KC-46 Pegasus	ACAT I	Air Force	MCA	Fixed Price Incentive	2	Authorized	2	Authorized		(Hoehn, 2020)
Next Generation Jammer (NGJ)	ACAT I	Navy	MCA	Cost Plus Incentive fee	2	Authorized	1	Authorized		(DoN, 2021) (Next Generation Jammer (NGJ) Increment 1, 2016) (Perez, 2021)
Ohio Replacement Program	ACAT I	Navy	MCA	Cost Plus Incentive Fee	2	Authorized	1	Authorized		(O'Rourke, 2023)
P-8 Poseidon	ACAT I	Navy	MCA	Cost Plus Fixed Fee	2	Authorized	1	Authorized		(OSD, 2019c)
Small Diameter Bomb II (SDB II)	ACAT I	Navy & Air Force	MCA	Fixed Price Incentive Firm	2	Authorized	1	Authorized		(Behler, 2018) (O'Toole, 2024) (USAF, 2019) (Weisgerber, 2009)
T-7A Red Hawk	ACAT I	Air Force	MCA	Fixed Price Incentive	3	Authorized	1	Authorized		(Kass, 2024) (O'Toole, 2024) (OSD, 2022c)
Family of Medium Tactical Vehicles (FMTV)	ACAT II	Army	MCA	Firm Fixed Price	3	Authorized	3	Authorized		(Reed et al., 1996)
Joint Direct Attack Munition (JDAM)	ACAT II	Air Force	MCA	UNK	2	Authorized	1	Authorized		(Lorell & Graser, 2001) (OSD, 2019a)
MQ-9 Reaper	ACAT II	Air Force	MCA	Cost Plus Incentive Fee	1	Authorized	1	Authorized		(OSD, 2016) (OSD, 2019d)
Next Generation Squad Weapon (NGSW)	ACAT II	Army	MTA**	Firm Fixed Price	3	Authorized	1	Authorized		(O'Toole, 2024) (U.S. Army Public Affairs, 2022)
Distributed Common Ground System - AF (DCGS-AF)	ACAT III	Air Force	UNK	Firm Fixed Price	4	Authorized	1	Authorized		(DoD, 2016) (USAF, 2016)
Distributed Common Ground System - Army (DCGS-A)	ACAT III	Army	UNK	Firm Fixed Price	8	Authorized	2	Authorized		(*DoD*, 2018) (O'Toole, 2024)
Ground Mobility Vehicle (GMV 1.1)	ACAT III	SOCOM / Army	MTA -> MCA	Firm Fixed Price	6	Authorized	6	Authorized		(DOT&E, 2019) (Janes, n.d.) (Parson, 2014)
Modular Handgun System (MHS)	ACAT III	Army	MCA*	Firm Fixed Price	5	Authorized	3	Authorized		(Behler, 2018) (Nathaniel F., 2016) (OASA[ATL], 2016) (Peters & Purdy, 2018) (Poling, 2017)

Detailed analysis of these programs yielded several observations:

1. Maintaining a greater number of competitors is easier for programs with a lower ACAT level. Conversely, programs that are more expensive tend to have less competition.
2. Fewer ACAT II and ACAT III programs fail compared to ACAT I programs.
3. Programs that fail often down-select to a single vendor at the beginning of the EMD phase and are more susceptible to Nunn–McCurdy breaches.
4. Nunn–McCurdy breaches tend to result in program cancellation unless there is an urgent capability gap that must be filled. However, levels of competition appear to be below average in programs that experienced breaches.

1. Levels of Competition per ACAT Level

A clear trend identified in this study is the significant increase in the level of competition among ACAT III programs compared to those classified as ACAT II and ACAT I. Additionally, a nuanced difference emerges between ACAT I and ACAT II levels in terms of competition as those programs advance into the EMD phase. Figure 14 presents the average number of vendors for each phase across the different ACAT levels, based on an analysis of the selected 27 programs.

ACAT III programs exhibit more than double the amount of competition compared to their larger ACAT counterparts at the initial phase. Specifically, the average for ACAT III programs starting the TMRR phase is 5.75 vendors, in contrast to 2.6 and 2.3 vendors for ACAT I and ACAT II, respectively. This gap widens further during the EMD phase, where ACAT III programs maintain an average of three vendors, versus a mere 1.1 for ACAT I programs, illustrating nearly threefold the level of competition in ACAT III programs relative to those in ACAT I.

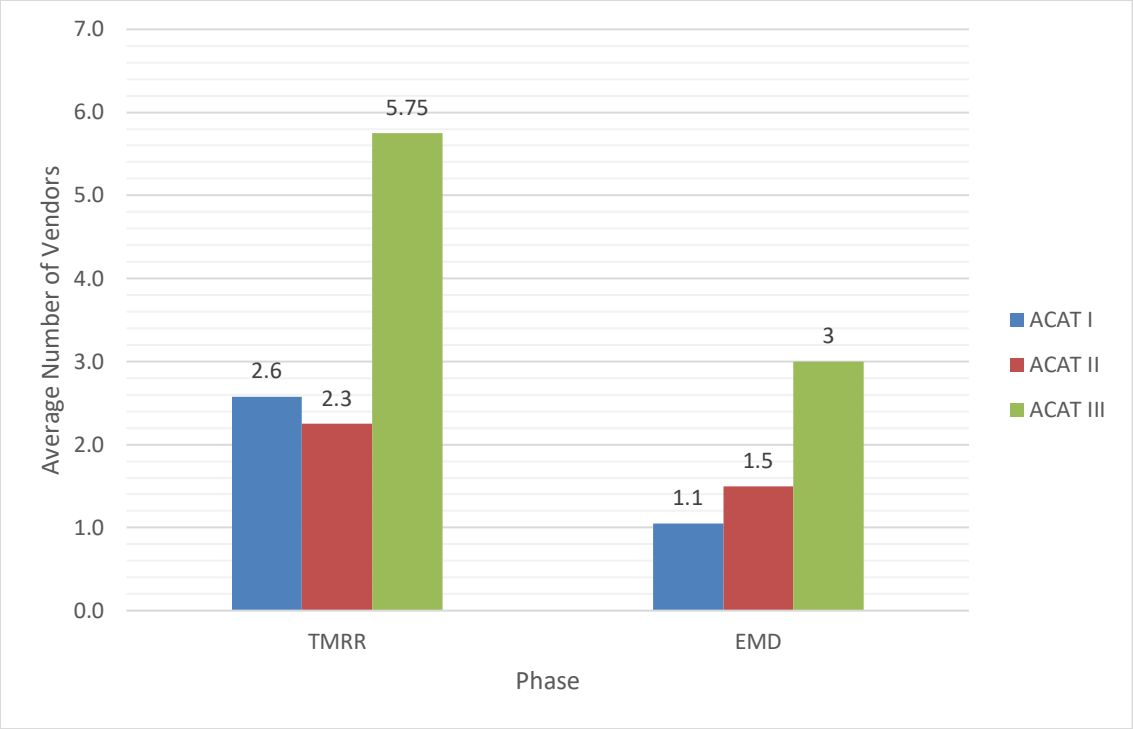

Figure 14. Average Level of Competition per Phase per ACAT Level

Narrowing the scope to look at only programs that were approved past the MS C decision, which for the purposes of this research is considered successful, yields similar results. Figure 15 shows the average level of competition for the 22 programs that were approved to enter production. The trends are the same as seen in Figure 14 with a slight increase in competition in the EMD phase. On the contrary, the opposite trend is identified in the TMRR phase for ACAT I programs, with a reduction in competition for successful programs. While we do not believe a decrease in competition in the TMRR phase correlates to an increase in program success, this phenomenon is further explained in the discussion section of this chapter.

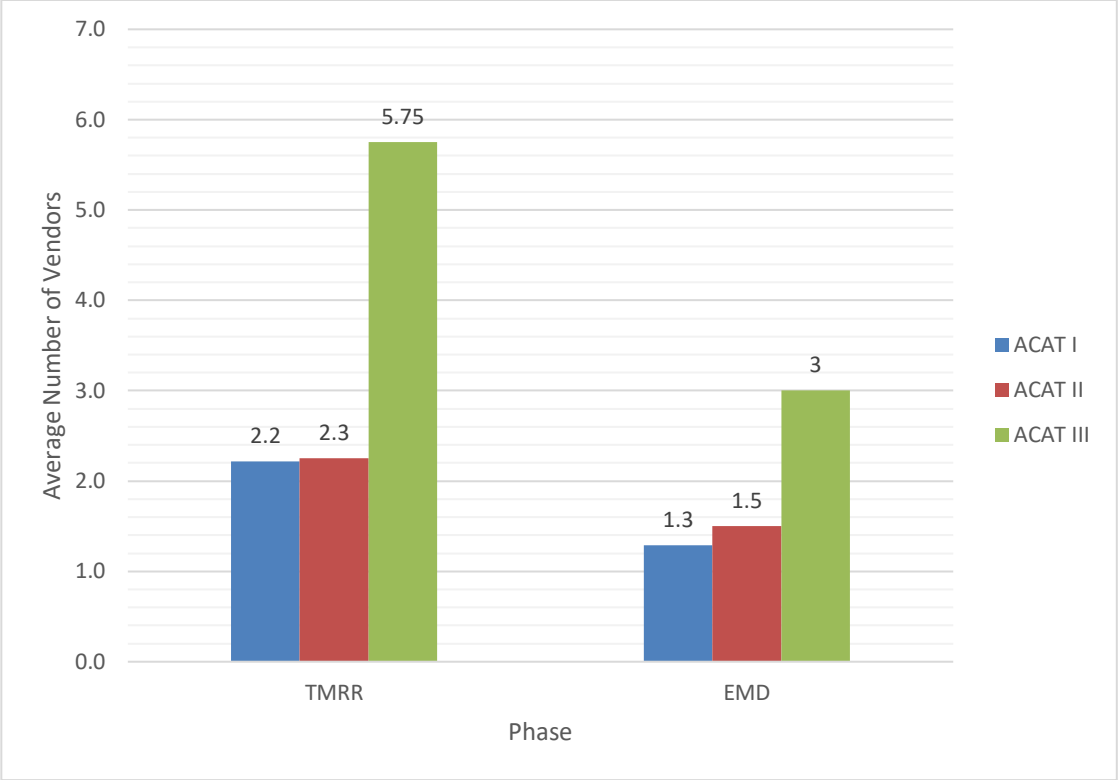

Figure 15. Average Level of Competition per Phase for Successful Programs

2. Canceled Programs Down-Selected to a Single Vendor Prior to the EMD Phase

Among the selected defense acquisition programs, five were not approved for production. However, a distinct pattern emerges among these programs, as highlighted in Figure 16. The assessment reveals that every program that was ultimately canceled had narrowed down to a single vendor before entering the EMD phase. In contrast, these same programs began the TMRR phase with higher-than-average competition, compared to the overall findings and the successful programs detailed in Figures 14 and 15, respectively. This trend of starting with above-average competition in the TMRR phase, only to dwindle to below-average competition by the EMD phase, is further explored later in this chapter. An additional insight from Figure 16 indicates that ACAT II and ACAT III programs have a higher success rate in receiving production approval. While over half of the 27 programs evaluated were ACAT I, none of the 11 programs classified as either ACAT II or ACAT III failed to advance to production.

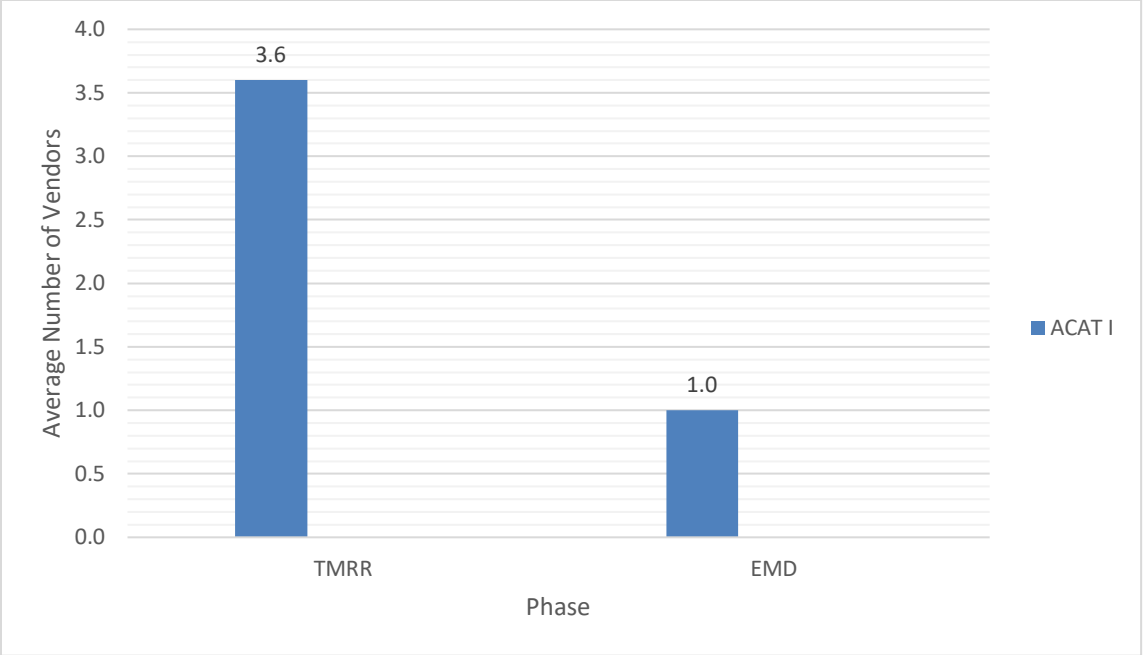

Figure 16. Average Level of Competition per Phase for Canceled Programs

3. Critical Nunn-McCurdy Breaches

Nunn-McCurdy violations or breaches are mechanism to notify Congress of cost overruns but have morphed into a form of control by now requiring programs with critical breaches to be terminated unless certified by the SECDEF (Peters & O'Connor, 2016, pp. 1–3). The nature of Nunn–McCurdy breaches means that programs that experience a breach are likely to be canceled unless there is a compelling capability gap that is deemed necessary to fill. Therefore, the two programs that were selected that experienced a breach are not assessed on whether they went into production or not, but whether the level of competition or lack of competition played a role in the program's cost overruns. The data for the two selected programs experiencing a Nunn–McCurdy breach as seen in Figure 17, proved inconclusive in terms of whether a lack of competition played a role in the cost overruns. However, no program having three or more vendors in the TMRR phase and two or more vendors in the EMD phase experienced either a significant or critical breach.

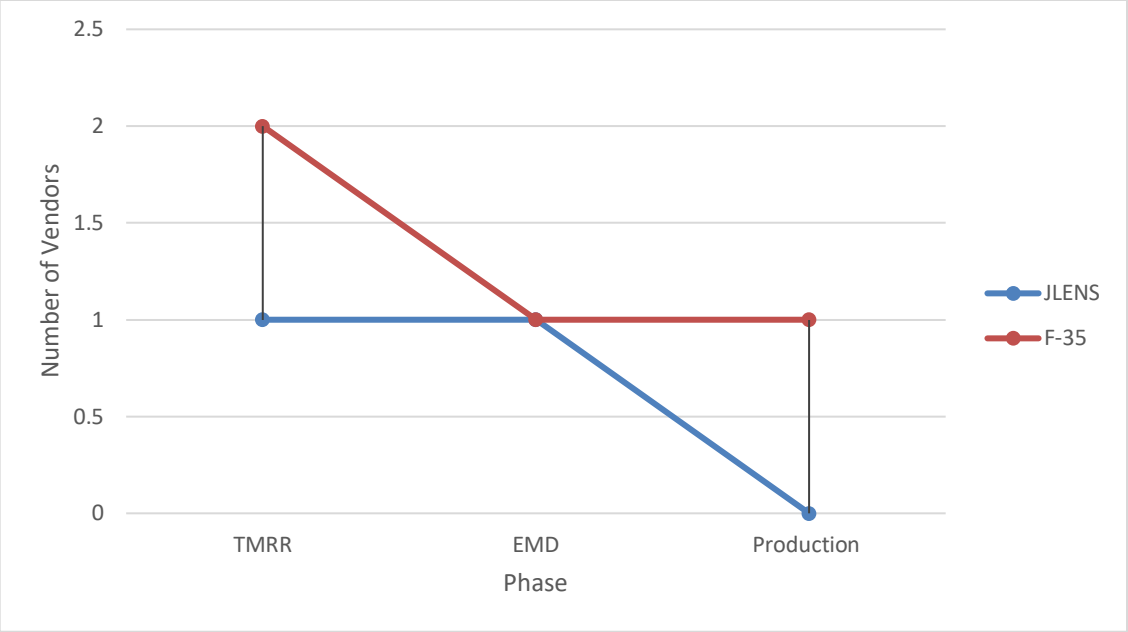

Figure 17. State of Competition for Programs with a Critical Nunn-McCurdy Breach

B. DISCUSSION

Due to the complexities and dynamics of defense acquisition programs and the various internal and external factors that impact them, it is nearly impossible to definitively determine the impacts that early vendor down-select has on the success of a program. As such, this section presents a discussion of possible reasons for the trends identified earlier in this chapter and logical conclusions. Through our analysis and understanding of the specific programs that are included in this study, we have found that

1. It is difficult for ACAT I and ACAT II programs to maintain more than three vendors in the TMRR phase and more than one vendor in the EMD phase.
2. It is easier and more advantageous to maintain higher volumes of competition throughout the life cycle of ACAT III programs, because it is cheaper and the benefits are more readily apparent.
3. Risky programs with potentially unattainable or opposing requirements tend to have above-average levels of competition.

4. Programs that have experienced critical Nunn-McCurdy violations have below-average levels of competition.

1. Challenges and Dynamics of Competition in ACAT I Programs

As previously discussed, ACAT I programs are at the top of the acquisition hierarchy. These programs are categorized as ACAT I based on their projected expenses: exceeding $525 million for RDT&E or surpassing $3.065 billion for procurement, as defined by the Office of the Under Secretary of Defense for Acquisition and Sustainment (OUSD[A&S]) in 2021. ACAT I programs face significant challenges in both establishing and maintaining these programs, especially in creating a competitive environment. The high cost associated with these programs makes sustaining competition an unrealistic expectation. The hope is that competition will enhance the product's quality and reduce costs, but if it fails to do so, the funds allocated for competition could be deemed a loss—resources that could have been more effectively allocated elsewhere within the program. The commitment to maintaining competition introduces a substantial risk to programs that are already scrutinized for their performance and are expected to adhere to the acquisition program baseline (APB) of cost, schedule, and performance requirements.

As a program progresses through its life cycle, the cost of maintaining competition escalates significantly. Initially, in the beginning phases of MCA, the amount of money that is dedicated to the program is relatively small in comparison to the overall budget. Nevertheless, "when the program moves to the production phase, the magnitude of the funding required for a second, competitive source becomes large relative to program costs and in absolute terms, reaching tens or hundreds of millions of dollars" (Arena & Birkler, 2009, p. 9). To secure such funding, PMs and PEOs must convincingly demonstrate that competition will add tangible value to the program. This involves persuading top DOD officials, the military services in joint programs, and various congressional committees of the advantages of competition and its potential to yield beneficial outcomes. Therefore, incorporating competition into ACAT I programs serves as a significant challenge for PMs.

Through this analysis, it is observed that programs can still incorporate competition for ACAT I programs in various innovative ways, largely influenced by the industry's

maturity and the availability of the products offered in the industry. For instance, when selecting a prototype for the F-35, the DOD initiated a concept demonstration competition within a mature market. The competition involved testing the Boeing X-32 and the Lockheed Martin X-35 through multiple evaluations to determine which advanced technology would proceed to the MCA for developing the final F-35 product (U.S. Department of Defense, n.d.). Although the F-35 serves as a unique case, it highlights the substantial cost of competition in these programs, with a unit price reaching $16.5 billion, as reported by the GAO (Ludwigson, 2023a). Extending the competition beyond the initial prototype demonstration phase would have incurred exorbitant expenses, significantly expanding the program's budget beyond the substantial funds already allocated. This decision stresses the balance between pursuing a reasonably priced innovation and adhering to the financial constraints imposed by the program's budget.

Additionally, the analysis suggests that the level of competition in ACAT I programs is determined by an external complex mix of factors, including market maturity, contractor availability, and the DIB capability. Specifically, in the Navy Shipbuilding sector, the number of companies that can meet the government's specific needs, as outlined in FAR Part 15, is limited. This scarcity means companies like Huntington Ingalls Industries often stand as the primary, if not sole, providers for certain requirements, effectively reducing the pool of potential competitors (Ross, 2022). Such a constrained competitive landscape not only limits the options within the DIB but also risks creating a dependency on specific vendors for the DOD, raising concerns about costs and schedule overruns, lack of innovation, and troublesome production efficiency.

Additionally, several other factors must be considered by PMs when incorporating competition into their program plans. In the larger ACAT I programs, introducing competition to the later stages of the MCA increases the workload of the program's office significantly. In carrying this competition into the EMD and production phases, the program office will experience "additional planning, extra work to qualify the second producer, and difficulties in configuration" (Arena & Birkler, 2009, p. 11). Studies also reveal that each additional proposal, resulting from these efforts, leads to increased administrative costs. These encompass the time and resources required for their careful and

thorough evaluation (Kang & Miller, 2022, p. 9). Finally, related to the administrative costs, allowing more competition throughout the MCA process potentially opens the programs likelihood of receiving more protests, which could potentially lead to a delay in the program as it moves closer to production or fielding (Kang & Miller, 2022, p. 9).

While competition can potentially drive greater innovation, a 2012 study by Todd Harrison of the Center for Strategic and Budgetary Assessments suggests that this competition may result in significantly higher costs than those incurred through a sole-source selection or by avoiding competition in the iterative rounds of the MCA (Levenson, 2014, p. 419). Harrison's study contends that extending competition throughout the MCA is likely to increase overall expenses for the government. However, it also identifies this approach as the first and most straightforward method to reduce costs as the government monitors rising DOD expenditures closely (Levenson, 2014, p. 438). In cases like the F-35, there is no room to extend competition further, considering the Biden administration's request for the DOD to find creative cost-cutting measures as it moves into fielding and sustaining the program. This is crucial to ensuring affordability over the F-35's 66-year lifespan (Maurer, 2021). Harrison's thoughts, when applied to ACAT I programs, indicate that a deliberate decision is necessary to circumvent a competition placebo effect before integrating competition into the program's strategy. These factors encompass the extent of the competition, the award fee for each round, learning curve rates, production costs in Low Rate Initial Production and for Test Article 1, as well as the total number of products each competitor will produce (Harrison, 2012, p. 18). It is clear that competition does not offer a universal solution.

2. Competitive Edge in ACAT III

The data collected in Figure 14 shows there is clearly something easier or more beneficial for maintaining higher levels of competition in ACAT III programs than their larger and more expensive ACAT I programs. While there is some differentiation between ACAT II and ACAT I programs regarding the level of competition they are able to maintain, the largest difference is between ACAT III programs and both ACAT I and II programs. ACAT III programs on average had twice as much competition in the TMRR

phase and almost three times as much in the EMD phase. There are several possible facilitating factors to this trend: competition is less of a financial burden in ACAT III programs, the DIB has more responsible vendors for less complex programs, competition has a more direct impact to ACAT III life-cycle costs, and ACAT III programs typically deal with more mature technology that requires less integration.

As previously discussed, ACAT III programs are at the bottom of the acquisition hierarchy. These programs are categorized as ACAT III based on not meeting the ACAT II dollar threshold or being designated a "major system" by the MDA. ACAT III programs are programs costing less than $200 million for RDT&E or surpassing $920 million for procurement, as defined by the Office of the Under Secretary of Defense for Acquisition and Sustainment (OUSD[A&S]) in 2021. When compared to the costs of ACAT I programs ACAT III programs are an order of magnitude cheaper. This allows PMs to be able to afford more competition for a longer duration than their more expensive counterparts. Additionally, when there are cost overruns or adjacent programs require funding and leaders consider reducing competition, it is less impactful when the plan is for more than two vendors. This creates a win-win situation. The PM that has to reduce competition is still able to retain an adequately competitive environment while generating additional funds.

The pool of responsible vendors is often significantly larger for ACAT III programs because generally, the barrier to entry is reduced in comparison to ACAT I programs. Because ACAT III programs are not MDAPs, they are often less complex and require less integration than their more complex and expensive counterpart ACAT I programs. Three of the four ACAT III programs included in this study were very high Technology Readiness Level (TRL). These programs are Tactical Communication and Protective System (TCAPS), Family of Tactical Headsets, and Ground Mobility Vehicle (GMV 1.1). The more mature technology that these programs are starting with correlates to program success. It also correlates to more responsible vendors existing in the economy, not just the DIB. For example, the GMV, a light utility vehicle aimed to replace the High Mobility Multi Wheeled Vehicle (HMMWV) for certain specialized units, has many traditional defense contractors that are responsible but also many non-traditional vendors. Continuing

the GMV example, during the TMRR phase, the program contracted with Northrop Grumman, AM General, HDT Global, Oshkosh, Navistar, and General Dynamics. While most of these are traditional defense contractors, some are not (Janes, n.d.).

The more responsible vendors available are a benefit to PMs and their programs. The benefits include effective price competition, leverage to acquire IP rights, more innovation, and more redundancy. The Army's MHS is an excellent example of a program that leveraged competition to achieve all these aims. With five vendors submitting a total of nine systems, the Army was able to, as determined by the Congressional Research Service (CRS), procure the weapon system at a competitive price (Nathaniel F., 2016; Peters & Purdy, 2018; Poling, 2017). It is difficult to compare the price the Army is paying for the XM17 to those of the commercially available Sig Sauer P320, but the CRS report indicates the combined cost of over a half million pistols, half a billion rounds of ammunition, holsters, intellectual property, and training is less than it would cost a citizen to purchase the hardware from Cabela's. A key factor that makes this price impressive is that it includes the IP rights. These rights allow "the services to maintain, modify, potentially upgrade, and extend the service life of the weapons and ammunition" (Peters & Purdy, 2018, p. 2). While most ACAT I programs in this study down-select to sole source prior to the EMD phase, securing the IP rights to the MHS enables the Army to effectively leverage competition throughout the entire life cycle of the product, not just during development. O&S costs typically comprise between 42% to 68% of the life-cycle costs (OSD[CAPE], 2020, p. 5). In a way, this level of competition acts as a mechanism to increase the level of responsible competitors in the DIB post-award, yielding tangible benefits to the services. In the event of large-scale conflict that requires substantial industrial and manufacturing mobilization, there are ample responsible vendors that retain viable designs or that could be retooled to manufacture the MHS.

3. Competition Versus Requirements

The phenomenon detailed in Figure 16 of higher-than-average competition in the TMRR phase resulting in sole source selection before the EMD phase may be attributed to either unspecific requirements, unattainable requirements, or a robust DIB with a plethora

of responsible vendors. Figure 16 is comprised of five programs that were not approved into the production phase: Future Attack Reconnaissance Aircraft (FARA), Ground Combat Vehicle (GCV), Future Combat Systems (FCS), Joint Tactical Radio System (JTRS), and Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS). Notably FARA, FCS, and JTRS had above-average (2.6 vendors) competition in the TMRR phase for ACAT I programs of five, four, and six vendors respectively (Defense Industry Daily, 2020; Oakley, 2023; OASA[ATL], 2021; Pernin et al., 2012).

The FARA and FCS programs are similar in the fact that they have been plagued with unattainable requirements and less than ideal circumstances. There have been multiple programs that have attempted to replace the aging reconnaissance helicopter and armored fighting vehicle. The U.S. Army has attempted to replace its aging fleet of Vietnam-era armed reconnaissance helicopters with the RAH-66 Comanche canceled in 2004, the ARH-70 Arapaho canceled in 2008, and the OH-58 modernization program cancellation, before ultimately retiring the OH-58 in 2017 with no replacement, and the most recent cancellation of FARA in 2024 (Roblin, 2024). Similarly, the U.S. Army's attempts to replace the M2 Bradley Fighting Vehicle have been fraught with attempts starting with the cancellation of the Armored Systems Modernization program in 1992, then FCS in 2009, then the Ground Combat Vehicle (GCV) in 2014, and the current attempt with Optionally Manned Fighting Vehicle (OMFV; Jennings, 2015). Both FCS and GCV suffered from excessive requirements that afforded no room for trade-offs that created diametrically opposed requirements (Mortlock, 2022). The desire for a vehicle equipped and ready for anything the battlefield might bear caused it to be too big and too heavy. Similarly, FARA struggled with incompatible requirements to the point Col Greg Fortier, the FARA project manager stated: "There's no version of the world that exists in physics, [except] maybe on a different planet, where the speed at range, endurance at range and payload all exist in a 14,000-lb. helicopter—not at what we're asking [for]" (Trimble, 2021). While additional circumstances impacted the decisions to cancel both programs, the unattainable requirements that these programs were founded on shaped their acquisition strategies to leverage a disproportionate amount of competition in the hope one vendor would produce a capability that would satisfy the warfighter. While Chapters II and III of this thesis discuss

the benefits of competition and DOD policy regarding competition, at no point does any of the literature reviewed allude to competition being able to achieve the impossible, but this did not stop FCS and FARA from trying.

The JTRS program, which is captured in Figure 16, is another canceled ACAT I program that had above-average competition in the TMRR phase (Ward, 2020). The program experienced an extraordinarily long development phase because of relatively immature technology, increasing requirements, increasing scope, increasing interest across the DOD, and a dynamic political environment that resulted in multiple program restructurings (Gallagher, 2012; Oppenheim, 2006). These restructurings gave way to an acquisition strategy that tried to leverage six vendors in the TMRR phase. Sean Gallagher opined that, similar to FARA and FCS, "building a radio that worked with all the different waveforms envisioned by the project required bending some fundamental rules of physics." While JTRS was not successful for a multitude of reasons, the expeditious use of competition is likely not one of them.

While a cursory assessment of Figure 16 would lead readers to think that excessive competition in the TMRR phase of ACAT I programs is not healthy, we believe that this is an anomaly. It is our belief that, of the data collected, the failed ACAT I programs contain three outliers: FARA, FCS, and JITRS. We assess that those programs are unique in the fact that they retained such high volumes of competition to somehow counteract the unattainable or unrealistic requirements they were obligated to. Until further research is conducted to fully flush out this idea, it would be inappropriate to correlate program failure to an increased level of competition.

4. Linking Competition to Nunn-McCurdy Breaches

As previously noted, the success of a program that experiences a Nunn–McCurdy violation is dependent upon the urgency or the size of the capability gap that the program is supposed to fill. Another way of viewing this is there is a certain threshold of risk to the warfighter that Congress and decision-makers are not willing to assume and as such are willing to expend more time and resources to close the gap and reduce the risk. When assessing Nunn–McCurdy breaches through the lens of competition and how competition

may have impacted the program, the volume of competition cannot be correlated to a production decision, instead the level of competition may be a factor in the breach itself. The data in this case study for Nunn–McCurdy breaches is quite limited with only two of our selected programs experiencing violations, the Joint Strike Fighter (JSF) and the JLENS program.

While it is difficult to draw conclusions from only two data points, both critical Nunn-McCurdy breaches included in this study as depicted in Figure 17, had either average or below-average levels of competition for ACAT I programs in the TMRR phase before down selecting to sole-source in the EMD phase. While there is not a substantial difference in Tables 8 and 9, there appears to be slightly more competition in the EMD phase for successful programs than the average or failed programs in Figure 16. All failed programs had one thing in common: they down-selected to sole source leading into the EMD phase. While the average competition for successful ACAT I programs in the EMD phase is only 1.4, it leads one to believe that carrying at least two vendors through EMD is beneficial to program success. This trend could lend to an argument that a lack of competition in both the TMRR and EMD phases, among many other factors, led to program cost overruns triggering the critical Nunn-McCurdy breach.

V. CONCLUSION

This research aimed to explore the implications of early vendor down-selection in defense acquisition programs. The objective was to analyze these implications in terms of the triple constraints: cost, schedule, and performance. Employing a case study methodology, we examined multiple recent defense acquisition programs that had reached a Milestone C decision or had progressed to production. While quantifying the impacts on cost and schedule proved challenging, we were able to identify some general correlations and trends between the level of competition, ACAT, and programs that successfully entered production. Tying our research back to the original research questions, the questions and answers are summarized:

1. Do the competition levels during the TMRR and EMD phases affect program success rates at different ACAT levels? Yes, all programs tend to be more successful when they carry at least two vendors through the EMD phase.

2. Is there a relationship between the intensity of competition at various stages and subsequent program outcomes, specifically whether increased competition correlates with higher success rates? It appears that competition above two vendors per phase does not increase the likelihood of program success, but it may have other benefits.

3. What is the impact of Nunn–McCurdy violations based on levels of competition and program outcomes across ACAT I, II, and III programs? All programs experiencing a critical Nunn-McCurdy violation had down-selected to sole source prior to the EMD phase.

4. Is there a relationship between the type of acquisition pathway, the level of competition, market maturity, and program effectiveness? It does not appear so. The MTA and Urgent Capability Acquisition pathways are relatively new, and as such substantial data is not available.

A. FINDINGS

The findings of this study reveal significant variations in competition levels and their implications on program outcomes, particularly across different ACAT levels. The first and most evident correlation found in this study was the significantly lower levels of competition in ACAT I and II programs when compared to the less expensive ACAT III programs. On average, ACAT I and II programs had between 30–50% less competition during the TMRR and EMD phases compared to ACAT III programs. Inversely, ACAT III programs, on average, had between 2 and 2.8 times as much competition as their more expensive counterparts. A multitude of reasons contribute to this trend. Through qualitative analysis, we determined that the cost of maintaining competition, the limited DIB for large, complex programs, and external factors result in less competition for ACAT I and II programs. Conversely, ACAT III programs are able to sustain more competition because it is less costly, there are more vendors available, including more nonstandard vendors, and the benefits of competition are more readily realized.

The second finding highlights a less direct correlation between competition intensity and program success; while fewer ACAT II and III programs fail, this appears more linked to the maturity of the technology rather than competition levels. The correlation identified is that fewer ACAT II and III programs fail. This research examined 19 ACAT I programs and eight ACAT II and III programs. Of these, five ACAT I programs failed, while none of the ACAT II or III programs did. This trend appears to have less correlation with levels of competition and more with the maturity of the technology.

The third finding observed is that all the programs in this study that failed to go into production were ACAT I programs that had down-selected to a single vendor prior to or at the beginning of the EMD phase. While the average level of competition in the EMD phase for successful ACAT I programs is only 1.3 vendors, no program that retained two or more vendors through the EMD phase failed to make it into production. Thus, we concluded that down-selecting to a sole source early in the acquisition process increases the chances of a program not making it to production. Conversely, retaining two or more vendors through the EMD phase significantly enhances a program's chances of success. However, we were unable to establish a specific correlation between the type of acquisition pathway and the

success of the program. Given that the MTA is a relatively new pathway, there was not enough data to provide valuable insights in this study.

Finally, the occurrence of Nunn–McCurdy breaches predominantly in programs that down-selected early highlights a nuanced impact of competition levels on program outcomes, particularly concerning cost deviations. The trend identified is that Nunn–McCurdy breaches tend to occur more frequently in programs that down-select early in the acquisition process. The two programs studied that experienced critical Nunn–McCurdy breaches had down-selected to a single vendor in the EMD phase. Although the success of programs experiencing a breach is not correlated with competition levels, the occurrence of the breach itself seems to be somewhat correlated. Similar to the third trend, down-selecting to a sole source before or at the very beginning of the EMD phase increases the program's likelihood of cost deviations.

B. IMPLICATION AND RECOMMENDATION

The results from this research indicate that maintaining certain levels of competition can benefit program success. However, the study also brought to light several practices that could be adopted and may prove beneficial. Additionally, it highlighted the need for more studies and an improved knowledge management system. Below is a list of recommendations derived from this study:

1. ACAT I defense acquisition programs should retain two or more contractors through the EMD phase. Maintaining this level of competition increases the likelihood of the program advancing to the production phase. Additionally, this increase in competition reduces the likelihood of critical Nunn–McCurdy breaches, which result from cost deviations from the baseline.

2. While it can be challenging for ACAT I programs to maintain competition due to the high cost of the programs, it is worth exploring the use of competition at the subcontractor level to harvest some of the benefits of competition at a more manageable scale. The use of a MOSA strategy to

limit the size and scope of various components of a program will allow a greater pool of responsible competitors.

3. Conduct further studies, specifically analyzing competition in ACAT levels against each other, and consider factors beyond competition and cost as to why programs are failing or succeeding. The following section details the areas that merit further research.

4. Competition is beneficial where it makes sense, but it does not always make sense. Continue to empower PMs, as required by DoDI 5000, to tailor their approaches to their specific acquisitions. No two acquisitions are the same; the circumstances and conditions will vary. As such, there is no one-size-fits-all approach to the use of competition in defense acquisitions.

5. Modify and improve the various repositories of information. The acquisition community lacks a comprehensive database for knowledge management, lessons learned, or simply documenting programs. Over the course of this study, it was found that SAR varied significantly, there is no "one-stop shop" for information, and DAVE has significant potential but is currently lacking in the availability and uniformity of information provided by government programs. A unified and comprehensive knowledge management system could enhance understanding of lessons learned and increase awareness of both successful and unsuccessful approaches. It could provide a more transparent understanding of what has been tried, what didn't work, and who holds the intellectual property. A unified repository would enable the various analyses that could be used to provide decision-makers with the most up-to-date trends, allowing them to make informed decisions.

C. FUTURE RESEARCH

The research conducted in this study was limited by factors such as time, scale, scope, level of detail, and the access to and availability of acquisition program

documentation and information. These limitations resulted in our research being more qualitative in nature, highlighting trends that led to less definitive conclusions. Future research that incorporates a more quantitative approach may yield more substantiated conclusions and a deeper understanding of the impacts of competition on acquisition programs. Potential future studies could include:

1. A cost-benefit analysis of specific programs would be beneficial to better understand the financial implications over the life cycle of a program and to gauge competition from a cost perspective. For instance, in the case of the MHS, without a cost-benefit analysis, definitive conclusions cannot be drawn as to whether the cost of carrying multiple vendors was worthwhile. Conversely, understanding the costs incurred throughout the life cycle of programs that down-selected early could provide decision-makers with valuable data when considering the benefits of competition.

2. A detailed and comprehensive analysis of external factors that cause programs to stumble could yield insight for practitioners and senior leaders. Factors such as politics, continuing resolutions, leader turnover, and policy changes impact defense acquisition programs to varying degrees. Understanding how these factors affect programs would allow practitioners to better plan for and adjust their strategies accordingly.

3. Including the APBs in a similar study could reveal correlations. Analyzing programs with an approved APB against those without one and observing how their performance varies could be enlightening. Additionally, assessing how well programs adhered to their baseline and whether there was a correlation to program success could provide beneficial insights.

4. Conduct a cost-benefit analysis of implementing a MOSA strategy to leverage competition in ACAT I programs throughout the life cycle of the program.

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Acquisition Research Program
Naval Postgraduate School
555 Dyer Road, Ingersoll Hall
Monterey, CA 93943

www.acquisitionresearch.net