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An Economic Analysis on Risk Sharing, Incentivization, and Defense Procurement Contract Design in the Maor Defense Acquisition Program Setting

December 2025

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ABSTRACT

The purpose of this study is to develop a theory-based framework linking program risk, contractor behavior, and contract type selection to combat information asymmetry that contributes to cost overruns, slipping timelines, and underperformance relative to initial expectations in Major Defense Acquisition Programs (MDAPs). This thesis aims to answer: What is the optimal contract structure for achieving effective risk-sharing and incentivizing performance in MDAPs? Theoretical modeling and mathematical simulation are used to analyze and solve these issues and provide acquisition professionals with a practical tool to combat information asymmetry when contracting for developmental efforts of MDAPs. The research concludes that a dynamic, risk-adaptive incentive model that evolves with program maturity is most effective in combating asymmetric information. Specifically, modifying the standard cost-plus-incentive-fee (CPIF) structure where target profit and share-ratio are variables of target cost was found to be most effective when technical risk and uncertainty are high. This study recommends integrating mechanism-based analysis into defense contracting to enhance MDAP acquisition strategies. This thesis recommends implementing the Budget Based Cost-Plus Incentive Scheme (BBCPS) incentive mechanism for developmental efforts of MDAPs. The BBCPS modifies the standard CPIF incentive in a smart way to align the objectives of offerors and contractors with the government.

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DISCLOSURES

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LIST OF ACRONYMS AND ABBREVIATIONS

CAS	Cost Accounting Standards
CLIN	Contract Line Item Numbers
COR	Contracting Officer's Representative
CPFF	Cost-Plus-Fixed-Fee
CPIF	Cost-Plus-Incentive-Fee
CRS	Congressional Research Service
DAU	Defense Acquisition University
DCAA	Defense Contract Audit Agency
DCMA	Defense Contract Management Agency
DFARS	Defense Federal Acquisition Regulation Supplement
DoD	Department of Defense
DoDIG	Department of Defense Inspector General
EMD	Engineering and Manufacturing Development
EVMS	Earned Value Management System
FAR	Federal Acquisition Regulation
FFP	Firm-Fixed-Price
GAO	Government Accountability Office
IPT	Integrated Product Team
JCIDS	Joint Capabilities Integration and Development System
MDAP	Major Defense Acquisition Program
MSA	Materiel Solution Analysis
NCMA	National Contract Management Association
O&S	Operations and Support
PPBE	Planning, Programming, Budgeting, and Execution
QASP	Quality Assurance Surveillance Plan
TINA	Truth in Negotiations Act
TMRR	Technology Maturation and Risk Reduction
TRIM	Truth Revealing Incentive Mechanism

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I. INTRODUCTION

The Department of Defense (DoD) manages some of the most complex and costly procurement efforts in the world. These are known as Major Defense Acquisition Programs (MDAPs), and they typically involve the research, development, testing, production, and deployment of advanced weapons systems, platforms, or integrated capabilities. Examples include next generation fighter aircraft, strategic missile systems, and amphibious warfare platforms. According to Title 10, U.S. Code § 4201, MDAPs are defined as follows:

> a DoD acquisition program that is not a highly sensitive classified program (as determined by the Secretary of Defense) and – (1) that is designated by the Secretary of Defense as a MDAP; or (2) in the case of a program that is not a program for the acquisition of an automated information system, that is estimated by the Secretary of Defense to require – (A) an eventual total expenditure for research, development, test, and evaluation of more than $300,000,000 (based on fiscal year 1990 constant dollars); or (B) an eventual total expenditure for procurement, including all planned increments or spirals, of more than $1,800,000,000 (based on fiscal year 1990 constant dollars). (Major Defense Acquisition Programs [MDAP]: definition; exceptions, 2025)

In a notable shift reported by Insinna (2025) within the defense acquisition sector, Boeing has declared it will no longer bid on fixed-price development contracts, citing unsustainable financial risk. Boeing executives have publicly cited billions in losses on programs such as the KC-46 and T-7A as evidence that the fixed-price structure fails when applied to high-uncertainty development (Insinna, 2025). Other contractors are following suit. L3Harris CEO Chris Kubasik stated the company would refuse to bid fixed-price on development work where specifications are not settled (Marrow, 2023). Inside Defense reports that L3Harris has already passed on multiple fixed-price development solicitations, attributing losses in later phases as a motivating factor (Mesch, 2023). Industry analysts also note Boeing's punitive losses—such as absorbing $7 billion on KC-46 alone—are fueling broader reluctance across major contractors to assume development risk under fixed-price terms (Losey, 2024). Northrop Grumman has declined to bid on certain programs when design maturity did not justify the risk, RTX has vowed to be more selective and disciplined after absorbing cover overruns on FFP programs, and Lockheed Martin has cautioned it will walk away from solicitations that push excessive developmental risk onto industry (Losey & Robertson, 2024). Collectively, these positions signal a growing industry-wide resistance to FFP developmental contracting, underscoring a widening gap between current government contracting strategies and the realities of defense innovation.

According to multiple Government Accountability Office (GAO) (2024; 2025a; 2025b) and DoD Inspector General (DoDIG) (2021; 2022) reports, recurring issues include poor cost estimation, shifting requirements, insufficient oversight, and weak contract management. These reports show despite decades of acquisition reform, MDAPs are consistently criticized for exceeding budget estimates, slipping timelines, and underperforming relative to initial expectations. These reports suggest that underlying many of these issues is a fundamental misalignment between contract structure and the nature of the program being executed, where contract structure is the internal organization of the contract including clauses and incentive mechanism design (Oakley, 2024; Oakley, 2025a; Oakley, 2025b; DoDIG 2021; DoDIG 2022).

While the DoD employs a robust set of frameworks—such as the Federal Acquisition Regulation (FAR), Cost Accounting Standards (CAS), Defense Acquisition University (DAU) training, and Integrated Product Teams (IPTs)—to inform contract type selection, these mechanisms are primarily procedural and compliance-based (National Contract Management Association [NCMA], 2023). Wang & San Miguel (2013) identified the DoD's current framework provide essential structure for acquisition decision-making but do not incorporate a formal economic framework that quantitatively links program-specific risk, contractor incentives, and contract structure. This capstone introduces a formal economic decision framework based on principal–agent theory and mechanism-design concepts to complement existing policy tools and strengthen the analytical basis for contract selection in high-risk acquisition environments (Wang & San Miguel, 2013). This leads to situations where FFP contracts are used inappropriately in high-risk environments, increasing the likelihood of cost overrun, degraded performance, or failure to deliver (Russell, 2021). Conversely, cost reimbursement contracts are sometimes used without strong incentive mechanisms, leading to unchecked spending and moral hazard (DoDIG, 2022). Contract types should, in theory, adapt across phases, from technology maturation to full rate production (Office of the Under Secretary of Defense for Acquisition and Sustainment [OUSD(A&S)], 2021). Contracting officials are ultimately responsible for contract type determinations, but in practice often default to familiar approaches relying on IPT's of the program office with representatives from the functional areas involved (FAR 1.6, 2025).

This capstone is motivated by a persistent question: Why do MDAPs so often fall short of cost, schedule, or performance expectations despite available regulatory tools? This research contends that the absence of a coherent, theory-based framework linking program risk, contractor behavior, and contract type selection is a key contributor. By applying economic models and analyzing historic patterns, this study aims to equip acquisition professionals with practical recommendations for improved contract structure and risk allocation. A central aim of incentive-compatible contract design is to promote truth telling, where contractors disclose accurate cost and technical information rather than concealing or distorting it. In the context of this research, contract design is the combination of contract type and contract structure to successfully accomplish procurement objectives.

The primary research question guiding this capstone is:

1. What is the optimal contract structure for achieving effective risk-sharing and incentivizing performance in MDAPs?

Supporting this inquiry are additional secondary research questions:

2. How does contract type affect contractor behavior in terms of cost control, schedule adherence, and technical performance?
3. How does asymmetric information between government and contractors affect contract outcomes, and what mechanisms can help mitigate cost growth, schedule overruns, and insufficient performance?

The primary purpose of this capstone is to examine how defense procurement contract types, and contract structure specifically fixed price, cost-reimbursement affect risk allocation, contractor behavior, and program outcomes in MDAPs. This research builds on economic theories to help the government select and design contracts that better align incentives and share risks appropriately across the life cycle of an acquisition program.

This study also seeks to analyze the performance of design mechanisms in a realistic MDAP setting. This research develops actionable insights for acquisition professionals and policymakers. These insights will help improve the way contracts are structured and selected across various acquisition phases, from research and development to production and sustainment.

The objectives of the research are to: 1) identify how different contract types distribute financial and performance risk between the government and contractors, 2) assess how contract structure influences contractor incentives, particularly in environments with high uncertainty and asymmetric information, 3) propose a practical decision-making framework for selecting contract types in MDAPs, grounded in economic theory, and 4) recommend reforms or policy adjustments as needed.

Ultimately, this research seeks to bridge the gap between theory and practice. Boeing's retreat from FFP development contracts is not an anomaly, it is a symptom of broader structural issues in the defense acquisition system. This capstone proposes a practical path forward that aligns contract design with program risk, incentivizes performance, and minimizes waste in the pursuit of national defense objectives.

A. STRUCTURE OF THE STUDY

This capstone is organized into six chapters, each contributing to the overall objective of evaluating and improving contract design during the highest-risk portions of the acquisition life cycle specifically the pre–Milestone A, Technology Maturation and Risk Reduction (TMRR), and Engineering and Manufacturing Development (EMD) phases where uncertainty, information asymmetry, and technical immaturity are greatest in MDAPs:

- **Chapter I** outlines the context, scope, and goals of the study. It defines the problem, presents the research questions, and describes the significance and limitations of the research.
- **Chapter II** surveys prior research, including principal-agent theory, contracting policy, and GAO assessments. It establishes the academic and policy foundation for understanding contract effectiveness in MDAPs.
- **Chapter III** introduces the MDAP environment describes the institutional, regulatory, and operational landscape in which MDAPs are executed. It defines what constitutes an MDAP under U.S. law, outlines the acquisition life cycle phases, examines the contract life cycle used to structure contracting activities across those phases, and identifies key stakeholders involved in program oversight and execution. The chapter also discusses the unique risk characteristics of MDAPs and the institutional constraints that influence contract type selection such as congressional oversight and reporting mandates, the Planning, Programming, Budgeting, and Execution (PPBE) process, political optics surrounding contract types, industry influence on risk allocations, and workforce capacity and culture within the acquisition community.
- **Chapter IV** details the model and analytical framework. It explains how data were selected, how real-world examples were analyzed, and how economic theory is applied.
- **Chapter V** presents the evidence derived from the literature. It evaluates the outcomes of developmental efforts in MDAPs under different contract types using defined metrics and the effectiveness of mechanism design in combating information asymmetry. The recommendations section synthesizes findings and suggests practical policy recommendations for improving contract selection in future MDAPs.
- **Chapter VI** provides the summary, conclusions, and areas for further research.

B. POLICY RECOMMENDATIONS

This capstone recommends that the DoD formally integrate the cost-reimbursement incentive tool developed in Chapter V into existing acquisition and contracting processes. The model can be embedded within current cost-incentive frameworks under FAR Part 16 and used as a standardized analytical tool to calibrate profit pool and cost ratio based on measurable indicators such as technical maturity, cost-estimate variance, and oversight reliability. Implementation should occur through DAU training, milestone documentation templates, solicitation and source-selection procedures, negotiation guidance, and IPT risk assessments to ensure consistent application across programs. Periodic recalibration of profit pool and cost ratio parameters at major milestones would allow contracting officers to realign incentives as programs mature. Institutionalizing this model would strengthen data-driven contract type decisions, improve incentive alignment, and enhance risk-sharing efficiency across MDAPs without requiring regulatory overhaul.

C. LIMITATIONS

This research operates within defined boundaries of scope, data access, and analytical modeling while maintaining confidence in the applicability of its findings to the defense acquisition environment. While the findings provide meaningful insights into the dynamics of defense contracting, they are not intended to generalize across all programs, particularly those involving classified or proprietary data.

The economic framework presented in Chapter V applies principal-agent and mechanism design theory to the MDAP environment. To make the model operational within the constraints of available data, several simplifying assumptions were necessary, including stable preferences, rational behavior, and quantifiable measures of risk. These assumptions allow for analytical clarity and comparability but do not fully capture every behavioral or institutional nuance of real-world acquisition decision-making.

The study draws primarily on publicly available data from the GAO, the DoDIG, and other credible sources. Although these datasets are authoritative, differences in reporting methods, levels of aggregation, and timeframes may affect precision in some comparative analyses. These variations do not materially diminish the reliability of the conclusions but should be considered when applying findings to other acquisition contexts or programs outside the sample set.

Finally, this capstone is intended to enhance, not criticize the DoD's existing acquisition frameworks, including the FAR, Defense Federal Acquisition Regulation Supplement (DFARS), CAS, and DAU training. The recommendations offered are therefore meant as supportive refinements to established acquisition best practices, reinforcing rather than replacing the institutional mechanisms that govern defense contracting.

D. SUMMARY

The persistent challenges observed in MDAPs are not solely the product of procedural inefficiencies or regulatory gaps (Oakley, 2025a; Oakley, 2025b; DoDIG 2021; DoDIG 2022). Rather, they reflect a deeper economic misalignment between contract structures and the behavioral realities of defense contractors operating under conditions of uncertainty, asymmetric information, and shifting program requirements (Wang & San Miguel, 2013). The DoD employs a comprehensive suite of frameworks such as the FAR, CAS, DAU training, and IPTs that provide structured processes for selecting and managing contract types;these mechanisms effectively guide compliance, oversight, and procedural consistency across the acquisition enterprise (NCMA, 2023). However, these frameworks are grounded in regulatory compliance rather than economic theory and therefore do not address the incentive misalignments and information asymmetries identified in agency theory that often drive contractor behavior under conditions of risk and uncertainty. As a result, contracting decisions often rely on regulatory precedent rather than quantitative analysis of incentive effects and risk distribution. This capstone complements existing DoD policy tools by introducing a formal economic framework that integrates agency theory and mechanism design principles to analytically link contract type selection with program-specific risk profiles and contractor incentive alignment.

Building on this foundation, the research applies principal–agent theory to examine how contract structures influence contractor behavior across the phases of MDAP execution. It evaluates how economic assumptions regarding risk preferences, incentive compatibility, and information asymmetry affect the performance of fixed-price and cost-reimbursement contracts. The framework developed herein is intended to provide acquisition professionals with practical, data-driven methods for improving contract design, mitigating the effects of adverse selection and moral hazard, and strengthening the alignment between government objectives and contractor performance throughout the defense acquisition life cycle.

II. LITERATURE REVIEW

This literature review establishes the analytical foundation for the capstone by synthesizing research on principal–agent theory as it applies to MDAPs and linking that theory to practical contracting decisions. It identifies the key incentive and information problems in government-contractor relationships including conflicts of objectives, information asymmetry, adverse selection, and moral hazard that drive cost, schedule, and performance outcomes. It reviews contract types and incentive mechanisms to show how risk and profit-sharing instruments are intended to shape agent behavior. It examines risk attitudes across the defense industrial base and their implications for participation and execution. It evaluates truth-telling and mechanism-design approaches that seek to elicit accurate cost and technical information early in the life cycle. The chapter's goal is to convert these insights into criteria the capstone will use in later chapters to evaluate and recommend contract structures tailored to MDAP conditions.

A. PRINCIPAL AGENT THEORY

Principal–agent theory provides a powerful conceptual lens for understanding the challenges associated with contract design in MDAPs. According to Rendon (2025) the DoD, acting as the principal, delegates responsibility for complex acquisition efforts to contractors, who serve as the agents. He emphasizes that these relationships are foundational to the execution of MDAPs and lie at the core of federal acquisition strategies (Rendon, 2025). The investing by GAO indicates that the persistent underperformance of defense programs, despite the existence of formal contracting guidance, suggests a deeper misalignment between program needs and contract structure (DiNapoli, 2017). Within this theoretical framing, it has been argued that principal-agent theory helps to explain this misalignment and provides a framework for developing more effective contracting strategies (Wang & San Miguel, 2013).

Jesnsen and Meckling (1976) originally developed in microeconomics and organizational theory, principal-agent models explore the problems that arise when one party, the principal, delegates tasks to another party, the agent, whose actions the principal cannot fully observe or control. Within this framework, describes how the government seeks to acquire weapons systems, platforms, and other capabilities by contracting to deliver results according to specified terms (Wang & San Miguel, 2013). Rendon (2025) further explain that the agent, however, has distinct goals, risk preferences, and access to private information; because the principal cannot monitor all aspects of the agent's behavior, contracts become the primary tool for aligning objectives. The optimal contract design should provide incentive structured to motivate the agent to fulfill the government's objectives while minimizing opportunities for divergence or inefficiency (Rendon, 2025).

As shown in Rendon's (2015) model (Figure 1) the principal–agent relationship in defense contracting as a dynamic exchange between the government and the contractor, each driven by distinct but interdependent objectives. According to Rendon, the government (principal) seeks to obtain quality products and services that meet mission needs at the right cost and schedule, while the contractor (agent) pursues profit, growth, and market share. He explains that these conflicting objectives are mediated by imperfect information such as differing knowledge of requirements, costs, and technical capability and by the behavioral choices each party makes within the constraints of the contract. The model highlights that effective contract design must balance oversight and incentive mechanisms to align these behaviors over the contract life cycle, emphasizing that performance outcomes depend as much on managing incentives and information as on compliance with policy (Rendon, 2015).

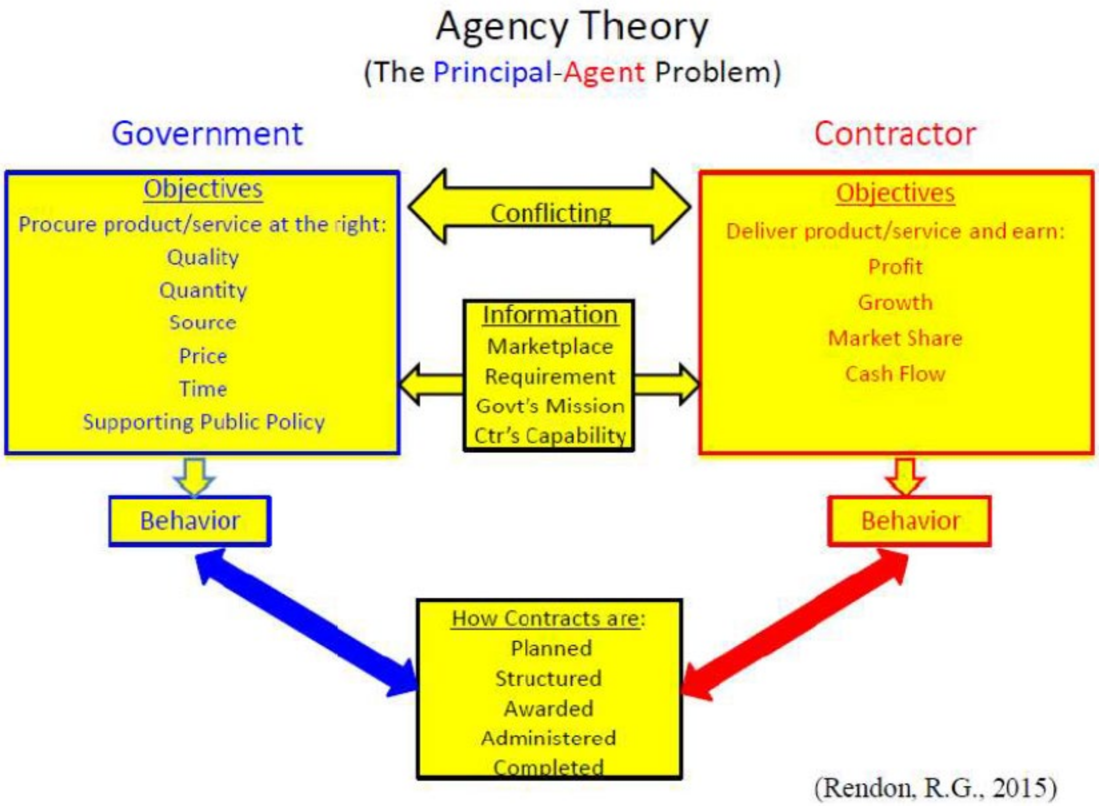

Figure 1. The Principal-Agent Problem. Source: Rendon (2015).

MDAPs offer a particularly compelling application of this theory because they involve long-term, high-value projects in which the complexity of tasks and uncertainty of outcomes make direct oversight difficult (Oakley, 2020a). According to principal-agent theory, the government cannot feasibly control every technical decision, engineering approach, or management choice the contractor makes over the life cycle of the program (Eisenhardt, 1989). As a result, the theoretical literature emphasizes that contract structure becomes essential in establishing a system of expectations, constraints, and incentives that encourage the agent to act in the principal's objective; when the contract does not reflect the specific conditions of the program or fails to account for the dynamics of delegation, predictable problems can occur (Laffont & Martimort, 2002). Empirical assessments, including GAO reporting, further documents that these include cost overruns, schedule delays, and reduced performance relative to initial requirements (Oakley, 2025a).

According to Laffont and Martimort (2002) a key insight is that principal-agent relationships require tailored contract structures depending on the environment. They explain that principals should design contracts by analyzing three interrelated conditions: the nature of the task, the amount of information asymmetry, and the risk tolerance of both parties. Although these concepts will be explored in later sections, these authors emphasize that their interaction within the basic principal-agent framework establishes the basis for determining when different contract structures are appropriate (Laffont & Martimort, 2002). For example, the literature suggests that if the task is novel or less defined, a more flexible contract type and structure is needed (Bajari & Tadelis, 2001). If performance is easy to measure and verify, stronger incentive mechanisms may be feasible (Reichelstein, 1992). Taken together, these studies highlight that the choice of contract type and structure should follow from these contextual factors rather than a one-size-fits-all policy preference.

In the defense acquisition context, the prevailing system does not explicitly incorporate principal-agent theory into formal contracting decisions. According to the FAR Part 16 (2025), while the FAR outlines contract types and the conditions under which they are appropriate, it does not translate the incentive and information problems described in agency theory into a quantitative decision framework for selecting among those types. Instead, FAR regulation indicates that contract type selection often relies on historical precedent, policy guidance, or administrative constraints (FAR 16, 2025). The result is a pattern of misalignment, where fixed-price contracts are sometimes imposed in high-risk settings or cost-reimbursement contracts are used without sufficient structure or rationale (Oakley, 2020b; Russell, 2021). These patterns are not failures of regulation, but rather failures of theoretical integration into practical tools.

The defense acquisition environment further complicates the principal-agent relationship due to internal fragmentation within the principal itself. The DoD is not a unitary actor but a network of interdependent organizations including contracting officers, program managers, quality assurance representatives, contracting officer's representatives (CORs), cost analysts, engineers, legal advisors, and senior acquisition executives each with specialized roles, incentives, and constraints; the DoD employs a variety of mechanisms such as the FAR, CAS, Quality Assurance Surveillance Plans (QASPs), IPTs, and DAU training to promote effective coordination and oversight (NCMA, 2023). However, Oakley (2025a) reports that structural inefficiencies, decentralized oversight, and fragmented decision-making continue to hinder the ability to deliver major capabilities effectively, reflecting systemic challenges beyond individual program actions. These internal dynamics do not reflect policy shortcomings but rather highlight the structural and behavioral challenges inherent in large-scale acquisition enterprises, reinforcing the value of incorporating theoretically grounded tools to complement existing practices (Oakley, 2025a).

According to Eisenhardt (1989) the persistence of contracting issues in MDAPs reinforces the relevance of the principal-agent model. The government's challenge is not just to select a contractor and establish terms, but to structure a relationship that guides behavior over time, through uncertainty and technological change; contracts must manage the trade-off between control and autonomy (Eisenhardt, 1989). As Laffont and Martimort (2002) explain, if a contract is too rigid, it may prevent adaptation and discourage innovation; if it is too permissive, it may invite inefficiency or opportunistic behavior. They argue that principal-agent theory frames this tension as a design problem that can be addressed analytically, not just procedurally (Laffont & Martimort, 2002).

According to Fox (2011) the economic power of the agent is further reinforced by structural features of the defense industrial base. He identifies in areas such as stealth technology, space systems, and advanced electronics, the government may have few viable substitutes if an agent underperforms; this limited substitutability increases the contractor's bargaining power and reduces the effectiveness of competitive pressure as a tool for accountability. As a result, Fox rgues that the principal becomes increasingly dependent on the agent as programs mature, particularly when proprietary technical data or system integration knowledge is controlled by the contractor (Fox, 2011).

According to Bajari and Tadelis (2001), principal-agent theory require different contract structures depending on the level of uncertainty and the need for adaptation. Their model shows that when project requirements are uncertain or evolving, more flexible contracting arrangements are optimal, whereas as uncertainty decreases and tasks become better defined, higher incentives and firmer commitments become more efficient (Bajari &

Tadelis, 2001). Applying this logic to defense acquisition outlined by DoDI 5000.85 (2021), early stages of a program may require greater flexibility and closer coordination between the government and contractor; as the program progresses and transitions into production, the relationship should shift toward firmer commitments, measurable outcomes, and cost containment. The contract structure must adapt to the shifting demands of the acquisition life cycle (OUSD[A&S], 2021). This dynamic approach to contracting reflects the idea that the principal-agent relationship is not static (Rendon, 2015).

According to Fox (2011), principal-agent dynamics in MDAPs also reflect the limitations of the government's regulatory and institutional posture. Fox documents that the department's loss of in-house technical capability and increasing reliance on contractors for system definition and engineering expertise weakened its ability to act as an independent principal; while the government is legally empowered to define rules and evaluate compliance, it often relies heavily on contractors to provide technical direction, system design input, and risk assessments. Fox's historical analysis shows that this dependence can blur traditional roles and expand contractor influence in program execution. Building on this logic, the government often functions as both a customer and a co-producer, complicating accountability and further validating the need for theory-based contract design (Fox, 2011).

Incorporating principal-agent logic into MDAP contract planning would not require a wholesale change in regulatory structure (Wang & San Miguel, 2013). Rather, it would involve building tools, training, and decision frameworks that help contracting officers assess delegation conditions at the outset of a program; these tools would help identify what type of contract best supports the principal's objectives given the characteristics of the agent and the program environment (OUSD[A&S], 2021). Consistent with the theoretical foundations outlined Wang and San Miguel (2013), a structured decision matrix based on task complexity, performance measurability, and risk distribution could guide the selection of appropriate contract types across the program life cycle (Wang & San Miguel, 2013).

The temporal aspect of MDAP delegation is also central to principal-agent analysis (Eisenhardt, 1989). At program initiation, the government may possess more leverage to shape terms and select among vendors (Laffont & Tirole, 1993). Over time, this leverage diminishes as the contractor's role becomes entrenched and system dependencies emerge; poorly structured early agreements can lock the government into relationships where the agent exerts increasing influence over cost, scope, and performance decisions (Bajari & Tadelis, 2001). Contract design should account for this dynamic by front-loading mechanisms that preserve flexibility and improve the government's ability to respond to performance drift or shifting mission needs (Reichelstein, 1992).

The underlying premise of principal-agent theory is that contracting is not merely a legal or administrative process, but an economic interaction shaped by incentives, expectations, and behavioral constraints (Jensen & Mecklin, 1976). Contracts must do more than comply with FAR provisions; they must solve a coordination problem between two parties with conflictive objectives and incomplete information (Laffont & Martimort, 2002). This insight is particularly important in the MDAP context, where the stakes are high and failures can have strategic consequences; programs that fall behind schedule or fail to deliver intended capabilities undermine military readiness and public trust in defense institutions (Fox, 2011). A better theoretical foundation for contract design can help reduce these risks (Wang & San Miguel, 2013).

In summary, according to Eisenhardt (1989) and Laffont and Martimort (2002), principal-agent theory offers a powerful framework for diagnosing and correcting misalignments in MDAP contracting. Eisenhardt (1989) explains that the theory clarifies why delegation to contractors is inherently challenging and why contract structures must be adapted to the conditions of that delegation. Eisenhardt and Laffont and Martimort emphasize that integrating principal–agent logic into contract planning can help acquisition professionals approach contract design as a strategic, data informed decision rather than a procedural task (Eisenhardt, 1989; Laffont & Martimort, 2002). In the defense acquisition environment, the DoD already employs robust policy instruments such as the FAR, DFARS, CAS, and DAU training that ensure consistency, oversight, and accountability in acquisition execution (NCMA, 2023). Building on these existing mechanisms, this capstone introduces a complementary economic decision framework grounded in principal-agent reasoning, which quantitatively links program-specific risk, contractor incentives, and contract structure.

1. Conflicts of Objectives

According to Eisenhardt (1989), conflicts of objectives are a predictable and analytically important feature of the principal-agent relationship, including federal contracting. Such conflicts arise because the principal depends on an agent to carry out tasks the principal cannot perform directly, giving the agent opportunities to pursue its own objectives). Within the MDAP environment, these conflicts are not only prevalent but are structurally embedded due to the government's dependence on contractors to fulfill critical functions that the state itself cannot perform internally (Eisenhardt, 1989). When the government accepts an offer from a contractor it creates a relationship in which the contractor's interests may diverge from the government's objectives, producing tension that must be addressed through contract design and oversight mechanisms; existing frameworks such as IPTs, CORs, QASPs, and CAS provide procedural oversight but do not fully reconcile the economic misalignment of objectives between the principal and agent (Rendon, 2015).

As Eisenhardt (1989) explains, under agency theory, the government acts as the principal seeking capability delivery within cost, schedule and performance constraints, while the contractor (agent) pursues profit maximization, revenue growth, and competitive positioning. These differing priorities create a persistent conflict of objectives that is not the result of unethical behavior but rather an outcome of structurally divergent motivations within the acquisition process (Eisenhardt, 1989).

In MDAPs, conflicts of objectives exist along a spectrum ranging from minor incentive misalignments to major execution risks; these conflicts often arise in ways that are consistent with agency-theory predictions, particularly when contractors pursue strategies that are fully compliant with contract terms but still diverge from the government's broader objectives (Rendon, 2015). Laffont and Tirole (1993) demonstrate, differing incentive structures encourage agents to optimize against their own objectives rather than the principal's objectives. For instance, contractors may emphasize cost efficiency over technical robustness, prioritizing schedule adherence at the expense of design maturity, or maximizing allowable fee within the negotiated incentive structure rather than optimizing long-term sustainment outcomes (Laffont & Tirole, 1993). These behaviors can satisfy contract terms while still undermining government intent for innovation, efficiency, or timely capability delivery; without mechanisms that align incentives throughout the acquisition life cycle, contractors will act according to their own utility functions and risk preferences (Wang & San Miguel, 2013).

Kelman (1990) argues that conflict of objectives in public procurement must be viewed not simply as an ethical issue, but as a predictable feature of institutional design; the government's reliance on a limited number of highly specialized defense contractors increases the likelihood of concentrated market power, long-term relationships, and blurred boundaries between advisory and execution roles. Kelman contends that federal procurement creates an ecosystem where repeat interactions and information asymmetry produce chronic conflicts of objectives that resist simple regulatory fixes. Even the most well-structured oversight mechanisms cannot fully eliminate the divergence of objectives between principal and agent in this setting (Kelman, 1990).

Laffont and Tirole (1993) explain, one of the most prominent academic insights into this phenomenon comes from models that evaluate how contract type impacts the degree and intensity of conflict. In MDAPs, fixed-price contracts are often viewed as a tool to eliminate agency slack; theoretically, if the agent assumes cost risk, its cost-saving incentives will naturally align with the government's (Laffont & Tirole, 1993). However, Russell (2021) has repeatedly found that this logic begins to break down during the EMD phase when design maturity is still evolving or in early Production and Deployment when technical issues emerge. At these points, contractors may face technical complexity or shifting requirements that are not adequately priced into the contract; as documented in multiple GAO weapon-system assessments, when fixed-price terms are applied prematurely contractors may attempt to renegotiate terms, defer cost-intensive work, or prioritize minimum compliance over optimal outcomes (Russell, 2021; Oakley, 2025a). Each of these responses reflects an embedded conflict of objectives that is not resolved by the choice of contract alone.

According to FAR cost-reimbursement policies, cost reimbursement contracts are designed to encourage collaboration and accommodate uncertainty (FAR 16.3, 2025). However, the lack of cost risk on the contractor's part creates an environment where resource allocation decisions may favor the contractor's overhead, staff utilization, or internal investments rather than government performance priorities (Eisenhardt, 1989). These structural differences between contract types do not create conflict in themselves, but they do shape how conflicts of objectives emerge and how agents behave in practice (Laffont & Martimort, 2002). This reinforces the need to consider the economic relationship between government and contractor as an ongoing negotiation rather than a static agreement (Wang & San Miguel, 2013).

Capture theory, as described by Stigler (1971), is also relevant to this discussion because it describes what occurs when the agent exerts disproportionate influence over the regulatory or oversight body. While Stigler's work focuses on economic regulation broadly, the underlying mechanism applies to defense acquisition environments characterized by complex, long-term contractor relationships. Capture is more likely when a regulatory agency is dominated by the industry it is supposed to regulate; from an agency theory standpoint, this creates a reinforcing cycle of dependency in which the agent's influence is magnified, and the principal's ability to control outcomes is diminished (Stigler, 1971). Such conditions are not hypothetical. In the acquisition context, this may take the form of contractor influence over technical requirements, evaluation criteria, or budget justification; GAO reports that programs such as the F-35 Joint Strike Fighter have illustrated how long-term integration between contractors and government teams can obscure lines of authority and responsibility, contributing to systemic performance issues and oversight challenges (Oakley, 2024).

AsEisenhardt (1989) emphasizes, the structural features of the MDAP acquisition environment create multiple avenues for conflicts of objectives to emerge within the principal-agent relationship. These conflicts are not merely the result of poor oversight or bad actors; rather, they are a predictable outcome of a delegation structure that relies on agents with independent objectives (Eisenhardt, 1989). Although the government employs oversight mechanisms such as earned value reporting, technical reviews, and audit requirements to constrain opportunistic behavior, agency-theory scholars note that these tools cannot fully eliminate the underlying incentive and information asymmetries that drive persistent misalignment of objectives (Laffont & Martimort, 2002).

In summary, conflicts of objectives are an intrinsic part of the principal-agent relationship identified by Eisenhardt (1989) and these theories can be applied in MDAP contracting. They emerge from structural differences in objectives and persist despite regulatory efforts to mitigate them (Eisenhardt, 1989). A deeper understanding of how these conflicts manifest within the principal-agent framework can enhance contract planning, improve performance outcomes, and reduce the strategic and fiscal risks associated with large-scale defense acquisition programs (Wang & San Miguel, 2013).

2. Information Asymmetry

As Laffont and Martimort (2002) explain, a defining feature of the principal-agent relationship in defense procurement is the presence of information asymmetry; in their economic theory, information asymmetry refers to situations in which one party to a transaction holds private information that is not fully observable by the other. This asymmetry helps explain why the contractor typically holds superior information regarding internal cost structures, technical readiness, performance risk, and resource allocation (Laffont & Martimort, 2002). Conversely, the government as the principal maintains superior knowledge of the mission need, requirements definition, funding constraints, and broader programmatic priorities derived from Joint Capabilities Integration and Development System (JCIDS) and PPBE processes (OUSD[A&S], 2021). Applied to MDAP, this dual imbalance creates an enduring information gap that affects negotiation, cost estimation, and contract performance (Oakley, 2025a; Oakley, 2025b).

Laffont and Martimort (2002) emphasizes that asymmetric information leads to inefficiencies because it reduces the principal's ability to monitor, evaluate, and direct the agent's behavior. They explain in a perfect information environment, the principal could enforce performance standards directly and structure compensation with precision; however, in most real-world acquisition scenarios, including MDAP setting, the government must rely on indirect measures, estimates, and formal disclosures that may not reflect actual contractor behavior or program risk. This dependence on imperfect information weakens the link between contract inputs and desired outputs, especially when requirements evolve or technical challenges emerge mid-performance (Laffont & Martimort, 2002).

To mitigate information asymmetry in the pre-award phase, the government employs several mechanisms designed to improve transparency and decision quality. FAR Part 10 requires agencies to conduct thorough market research to understand industry capabilities and cost drivers before developing the solicitation (FAR 10, 2025). Similarly, the Truth in Negotiations Act (TINA) obligates offerors to submit and certify accurate, current, and complete cost or pricing data when applicable (FAR 15.4, 2025). These tools reduce the likelihood that the government will enter into a contract based on distorted or incomplete information, thereby addressing the adverse selection problem identified in principal–agent theory (Laffont & Martimort, 2002).

As reported by Oakley (2024; 2025a; 2025b) this information asymmetry problem intensifies in programs characterized by high complexity, low market competition, or emergent technology; in such environments, the government becomes increasingly dependent on contractor-provided information for technical validation, cost projections, and risk assessments. The contractor may then face incentives to withhold negative performance indicators, understate development risk, or overstate the maturity of a proposed solution (Oakley, 2024; 2025a; 2025b). As Laffont and Martimort (2002) predict, when the principal cannot independently verify the agent's claims, the agent has incentives to strategically present information in a way that advances its own objectives. These behaviors are not necessarily fraudulent but consistent with rational economic responses to asymmetric information in complex procurement settings; they reflect the difficulty of aligning objectives when the principal cannot verify the agent's claims without incurring significant cost or delay (Laffont & Martimort, 2002).

As defined by NCMA (2023), post-award phase, the government often depends on contractor submitted cost, schedule, and performance data to monitor progress, manage funding, and implement necessary contract adjustments; if the information provided is inaccurate, incomplete, or selectively framed, the government may make decisions that deviate from the optimal program path. The government mitigates this through oversight roles such as CORs and Defense Contract Management Agency (DCMA) surveillance, which provide continuous evaluation of contractor performance, compliance, and deliverable quality (NCMA, 2023). Additionally, contractors performing under cost-reimbursement contracts are required to maintain adequate cost estimating and accounting systems under FAR ensuring that reported costs align with verifiable accounting practices (FAR 16.3, 2025).

Wang and San Miguel (2013) identify contract structuring can provide partial remedies to information asymmetry, but it too faces constraints. The government may attempt to align incentives through award fees or shared savings clauses, but these mechanisms rely on accurate performance data and mutually understood evaluation criteria (Wang & San Miguel, 2013). The contractor can earn all or part of an established award-fee pool based on overall cost, schedule, and technical performance during an evaluation period (FAR 16.4, 2025. The evaluation process emphasizes the contractor's achievement of qualitative outcomes such as innovation, responsiveness, and mission support rather than strict adherence to cost or schedule baselines; this design provides flexibility in rewarding superior performance but introduces additional subjectivity that requires strong governance (DiNapoli, 2017). FAR prohibits awarding any fee for unsatisfactory performance (FAR 16.4, 2025).

FAR Part 34 (2025) focuses on enhanced transparency and objectivity in performance monitoring, the DoD mandates the use of Earned Value Management System (EVMS) for cost-reimbursement contracts that meet MDAP thresholds. EVMS integrates cost, schedule, and technical performance metrics to assess progress against baseline plans. By comparing earned value, planned value, and actual cost, EVMS enables program managers to identify performance variances early and take corrective action (FAR 34.2, 2025). When administered effectively, the award-fee mechanism serves as a behavioral incentive that complements objective measures such as EVMS by encouraging collaboration, quality, and proactive problem-solving (Wang & San Miguel, 2013).

According to Oakley (2020b), DoD program offices frequently operate without complete or fully reliable information about contractor performance, cost projections, and emerging risks. Oakley explains that, in the absence of full visibility into contractor operations, the principal must rely on indirect indicators such as deliverable-based milestones, technical reviews, and performance reporting to assess progress. Oakley further notes that these proxies introduce delays, create opportunities for overly optimistic framing, and make it difficult for the government to detect emerging problems in real time;the contractors can meet the letter of reporting requirements while masking underlying technical or schedule concerns, a practice facilitated by selective or incomplete disclosure (Oakley, 2020b). Consistent with Oakley's (2020a) findings, the government's ability to identify and respond to these issues depends heavily on the analytical capacity and independence of oversight entities such as program offices, DCMA, and independent cost estimators. This structural reliance on imperfect information is a central factor that constrains the principal's ability to manage program outcomes effectively (Oakley, 2020a).

A final consequence of information asymmetry is the erosion of trust in the contracting relationship. When the government repeatedly finds itself reacting to performance issues that were not previously disclosed, the working relationship between the principal and the agent can become adversarial, undermining the collaborative environment necessary for problem-solving in high-risk or developmental programs (Oakley, 2024). To counter these effects, the DoD employs performance documentation systems such as the Contractor Performance Assessment Reporting System (CPARS) (FAR 42.15, 2025). According to the FAR 42.15 (2025), CPARS is used to document contractor performance in areas including cost control, schedule adherence, quality, and management effectiveness. CPARS provides an institutional record that links past performance to future source selections, helping mitigate the consequences of information asymmetry by increasing transparency and accountability throughout the acquisition enterprise (FAR 42.15, 2025).

In summary, as supported by Laffont and Martimort (2002), information asymmetry is not a technical anomaly but a structural condition of MDAP contracting. Agency theory identifies this as a central challenge in contract design, one that cannot be fully eliminated but must be managed through thoughtful policy and robust economic analysis; By recognizing information asymmetry as a predictable source of inefficiency and misalignment, acquisition professionals can better anticipate where risks are likely to emerge and design contracts that account for these dynamics (Wang & San Miguel, 2013).

3. Adverse Selection: The Pre-Award Problem Resulting from Information Asymmetry

According to economic theorists Laffont & Martimort (2002), adverse selection arises when one party to a transaction possesses private information that the other party cannot accurately verify during the pre-award phase. In defense acquisition, this dynamic frequently occurs between the DoD as the principal and private offerors as agents; offerors may have superior knowledge of their true cost structures, technical capabilities, or risk postures especially during the pre-award phase of MDAPs (Laffont & Martimort, 2002). This information asymmetry presents a serious challenge because it increases the chance that the government may award a contract based on proposals that understate cost or execution risk; GAO assessments have repeatedly shown that such conditions contribute to the likelihood of selecting a contractor who offers an unrealistically low bid or conceals execution risks, resulting in cost overruns, delays, or contract terminations once the program is underway (DiNapoli, 2017; Oakley, 2020a; Oakley, 2022; Oakley, 2024; Oakley, 2025b).

According to the FAR Part 10 (2025), the DoD employs several statutory and regulatory tools designed to reduce information asymmetries prior to contract award. FAR Part 10 requires agencies to conduct market research, and this requirement serves as a fundamental tool to combat adverse selection. As FAR explains, market research include Requests for Information (RFIs), industry days, capability assessments, and analysis of historical contract performance; market research helps acquisition professionals uncover meaningful indicators of contractor viability and technical maturity. This regulatory guidance indicates that effective market research informs procurement decisions such as the availability of commercial products and services, the competitiveness of the marketplace, whether a requirement may need to be fulfilled through full and open competition or a justified sole-source strategy, and how industry cost structures and capability levels should influence contract type selection. Effective market research ensures that only well-qualified contractors are invited to compete and that decisionmakers possess a baseline understanding of pricing norms, capability differentials, and industry risk attitudes (FAR 10, 2025).

Under FAR Part 15.4 (2025) in cases where price competition is not feasible or when negotiating sole-source contracts, the TINA serves as a critical safeguard; TINA requires offerors to certify that their cost or pricing data are current, accurate, and complete. This FAR 15.4 requirement, and the legal liability that attaches to defective pricing, discourages contractors from deliberately misrepresenting their costs. As FAR explains, if a contractor is later found to have submitted inaccurate data, the government is entitled to a price reduction based on the extent of the discrepancy. Thus, TINA functions as a deterrent against strategic misreporting and supports better alignment of expectations between buyer and seller (FAR 15.4, 2025).

According to Wang and San Miguel (2013) these acquisition tools when integrated effectively serve as partial remedies to the adverse selection problem; however, procedural compliance with FAR required steps is not enough to address information asymmetry. They note effective contract design under asymmetric information requires the deliberate construction of incentive-compatible mechanisms. In theory this involves structuring pre-award evaluations and contract terms in ways that induce honest disclosure of private information, consistent with the economic logic they describe. In practice, this may include weighted evaluation criteria that reward credible cost narratives, past performance, or risk disclosures; it also involves using contract clauses that condition future payments or incentives on verifiable milestones. Taken together, these mechanisms reflect the incentive-compatibility theory (Wang & San Miguel, 2013).

In summary, the government's ability to reduce adverse selection in MDAPs depends on a blend of regulatory enforcement, economic reasoning, and intelligent solicitation design (Laffont & Martimort, 2002). While tools like market research and TINA are indispensable, their effectiveness increases when embedded within a broader economic framework that recognizes the strategic incentives facing each party at the outset of the contracting relationship (Wang & San Miguel, 2013).

4. Moral Hazard: The Post-Award Problem Resulting from Information Asymmetry

According to economic theory, moral hazard in defense acquisition arises after the contract is awarded, when the contractor's actions become difficult or impossible for the government to fully observe or verify (Laffont & Martimort, 2002). In the context of MDAPs, this is particularly acute due to program complexity, long development timelines, and the principal's lack of access to real-time information (Oakley, 2020a). As Laffont and Martimort explain, a central feature of moral hazard in this environment is hidden effort; contractors can comply with contractual requirements on paper while strategically reducing the actual labor, attention, or technical diligence invested in achieving program outcomes (Laffont & Martimort, 2002).

As Laffont and Martimort (2002) explain, effort is difficult for the principal to monitor because it is intangible and embedded in the agents daily engineering, management, and decision-making processes; in defense acquisition, while deliverables and milestone completions can be tracked, the quality and intensity of effort leading up to those outputs often cannot, creating the conditions for hidden effort. For example, a contractor may assign personnel in ways that remain fully compliant with the contract but do not reflect the government's preferred allocation of expertise; a contractor might also rely on lower-effort analytical approaches that still meet minimum technical requirements (Oakley, 2020b). In other cases, internal reviews may be timed in ways that preserve schedule status without revealing emerging risks; these actions may violate the letter of the contract and they degrade program performance (Calvaresi-Barr, 2005). Since the government does not observe all internal decisions or staff allocation processes, it cannot accurately assess whether the contractor is fully committed to the government's objectives or simply doing the minimum necessary to appear compliant (Laffont & Martimort, 2002).

A significant line of defense against moral hazard resides in post-award surveillance mechanisms executed by oversight personnel and formal surveillance planning tools; these include the DCMA, CORs, and the QASP (FAR 42, 2025). The QASP is a contractually required document that outlines how the government will assess contractor performance, including the use of surveillance methods, performance standards, and evaluation frequency (FAR 46.4, 2025). CORs serve as the designated government personnel responsible for monitoring contractor progress, inspecting deliverables, and documenting performance issues (FAR 1.6, 2025). DCMA personnel provide additional oversight, especially on high-dollar MDAPs, ensuring contractor EVMS are valid, business systems are compliant, and corrective actions are taken when performance lags (FAR 52.2234-4, 2025). When surveillance findings identify nonconformance, negligence, or misrepresentation, they can serve as the basis for contractual remedies such as withholding progress payments, issuing cure notices, or initiating termination for default procedures (FAR 49, 2025).

According to Laffont and Martimort's (2002) discussion of incentive structures, moral hazard is particularly acute in cost-reimbursement contracts because the agent's marginal return on additional effort is low. In the MDAP environment, the contractor is reimbursed for allowable, allocable and reasonable costs, the marginal return from exerting additional effort is limited unless additional profit incentives are explicitly tied to performance (FAR 31, 2025). As Laffont and Martimort note, exerting less effort can still generate the same revenue while preserving internal resources. In practice, contractors may rationally choose to conserve labor or reuse legacy approaches rather than commit additional engineering time to solving hard problems. When technical challenges emerge, the agent can attribute delays to unforeseen complexity rather than their own decisions to allocate fewer resources; the government, lacking full insight into internal effort levels, may be unable to verify these claims or take corrective action (Laffont & Martimort, 2002).

According to the CAS (2025), administered by the CAS Board, promotes transparency and consistency in cost estimation and reporting. CAS imposes uniform accounting rules on covered contractors, ensuring that cost projections are based on standardized treatment of indirect costs, overhead, depreciation, and other key elements. For the principal, this reduces the uncertainty associated with comparing offers across vendors and helps identify outliers or inconsistencies that may reflect attempts to manipulate pricing or obscure risk (CAS Applicability, 2025).

According to Oakley's (2024) annual review of major defense acquisition programs, the scale and duration of MDAPs amplify oversight challenges because long timelines and program complexity weaken the government's ability to consistently monitor contractor behavior. Oakley reports that frequent turnover within program offices reduce institutional memory and disrupts continuity in surveillance, particularly during critical phases of development. Contractors, by contrast, often maintain long-standing teams who understand how to navigate the acquisition system; this asymmetry in stability and organizational knowledge makes it more difficult for government to detect low-effort behavior or diagnose emerging performance problems, enabling the agent to mask hidden effort and shift blame when performance lags (Oakley, 2024).

To mitigate hidden effort risks, the government has attempted to incorporate specific performance-based incentives, such as Award Fee Contracts, Incentive Contracts, and EVMS (FAR 16, 2025; FAR 34.2, 2025). Award Fee Contracts are structured to provide contractors with additional compensation based on the government's subjective evaluation of performance; award-free criteria include cost control, schedule adherence, and technical achievement, management effectiveness, and overall contribution to program objectives (FAR 16, 2025). Incentive Contracts, such as Cost-Plus-Incentive-Fee (CPIF) and Fixed-Price-Incentive-Firm (FPIF), link financial outcomes directly to cost and performance objectives, encouraging contractors to exceed baseline expectations (FAR 16, 2025). EVMS is designed to provide early warning indicators of cost and schedule variances by integrating technical, schedule, and cost parameters (FAR 34.2, 2025). However, Powner (2010) reports have found that EVMS effectiveness is limited in practice because performance measurement baselines are typically developed and controlled by the contractor. This arrangement allows contractors to strategically shape baseline assumptions and reporting structures, which can mask emerging cost growth or schedule delays from the government (Powner, 2010).

As Laffont and Martimort (2002) explain, hidden effort is also difficult to confront contractually; the government cannot simply write provisions that require "high effort" without risking disputes or ambiguity. They explain, effort is inherently unobservable to the principal, meaning contracts must rely on outcomes that can be verified rather than the agents internal actions; instead, contracts must be designed to make effort observable indirectly through measurable outcomes. Accordingly, they argue these include verification of intermediate results, quality thresholds, test performance, and milestone achievement. Their work further emphasizes that to be effective, these outcomes must be tied to performance payments or future work options, giving the contractor a reason to exceed minimum expectations. Without incentive mechanisms, the contractor's rational strategy may be to minimize cost and preserve internal resources while deflecting attention from underperformance (Laffont & Martimort, 2002).

In summary, according to Laffont and Martimort (2002), moral hazard in MDAPs centers on the contractor's ability to exert low effort while appearing compliant, and on the government's limited ability to verify or reward genuine effort. As these authors explain, agency theory holds that surveillance mitigates but does not eliminate moral hazard (Laffont & Martimort, 2002). Identified by Wang and San Miguel (2013), the solution lies in contract design that anticipates the agent's incentives and aligns them with the principal's objectives this includes structuring reward systems that make effort profitable, designing verification mechanisms that detect low-quality work, and reducing information asymmetry through better data access and continuity in oversight. Addressing moral hazard is essential not only for improving program efficiency but also for ensuring that public funds generate real operational capability rather than minimal contractual compliance (Wang & San Miguel, 2013).

Agency theory not only explains behavioral dynamics between the government and contractors but also provides a framework for understanding how those dynamics are managed through contract structure (Laffont & Martimort, 2002). As the FAR 16 (2025) explains, in defense contracting, one of the most direct ways the principal seeks to align incentives and allocate risk is through the selection of contract type. Each form of agreement defined and governed by the FAR Part 16 embodies a distinct balance of cost, performance, and oversight responsibility (FAR 16, 2025). The choice of contract type is therefore not merely an administrative decision but a mechanism for translating economic theory into policy and practice (Wang & San Miguel, 2013). The following section examines these contract types in detail, emphasizing how FAR provisions shape risk distribution, incentive alignment, and accountability within MDAPs.

B. CONTRACT TYPES

According to FAR Part 16 (2025) and DoD acquisition policy (OUSD[A&S], 2021), contract type selection is a fundamental component of acquisition strategy in DoD procurement. As this guidance explains, in MDAPs, the decision regarding contract type is made during the pre-award phase, as part of developing the Acquisition Strategy and before releasing the Request for Proposals. Within the MDAP setting, the type of contract employed directly shapes the allocation of cost, schedule, and performance risk between the government and the contractor (FAR 16, 2025; OUSD[A&S], 2021). Because contract type is fixed at award, FAR guidance requires the government must rely on pre-award assessments such as market research, cost realism analysis, and technical evaluations to select the structure that best matches the program's risk profile (FAR 10, 2025; FAR 15, 2025). The choice of contract type not only determines how financial risk is distributed, but also how program objectives are pursued through execution and oversight (Russell, 2021). As multiple GAO reports have noted, because MDAPs operate at the intersection of long-term planning, large-scale investment, and technical uncertainty, the implications of contract type selection are magnified compared to smaller acquisition efforts (Oakley, 2025a; Oakley, 2025b).

As specified in FAR Part 16 (2025), the major contract types and the conditions under which each is suitable; the spectrum of contract types ranges from firm-fixed-price (FFP) arrangements, where the contractor bears most or all of the cost risk, to cost-reimbursement contracts, in which the government assumes most of the cost responsibility. As FAR further explains, intermediate forms such as fixed-price incentive (FPI) and CPIF contracts are designed to align contractor behavior with government objectives through profit adjustment formulas and share ratios that reward cost efficiency and performance achievement. These definitions and intended applications are explicitly established in FAR Part 16 (FAR 16, 2025).

As defined in FAR Part 15 and 16 (2025), each contract type imposes specific limitations on allowable profit or fee to prevent excessive earnings and maintain equitable risk sharing. Under FFP contracts, FAR explains that profit is negotiated but inherently capped by competitive market forces and the contractor's willingness to accept performance risk; in cost-plus-fixed-fee (CPFF) contracts, the fee is established at negotiation and does not vary with actual cost (FAR 16, 2025). As detailed in FAR Part 15, CPFF fees are also subject to statutory ceilings, including 10 percent for research and development, 15 percent for experimental or developmental work, and 6 percent for architect-engineer services. These fee limitations are explicitly mandated by FAR Part 15 (FAR 15, 2025).

According to FAR Part 16 (2025), CPIF contracts, the contractor's fee is adjusted according to a predetermined formula. As FAR explains, the contractor's fee increases when actual costs are below target and decreases when costs exceed target, subject to negotiated minimum and maximum limits; similarly, fixed-price incentive (FPI) contracts employ profit adjustment formulas and ceiling prices to share cost risk, with the maximum profit typically negotiated within statutory guidance to ensure it reflects reasonable performance incentives. In award-fee contracts, the government evaluates contractor performance periodically and awards additional fees based on criteria such as quality, schedule adherence, and innovation; however, no fee may be paid for unsatisfactory performance, and total fee amounts are capped under negotiated award-fee plans (FAR 16, 2025).

According to Laffont and Martimort (2002), these limits embody the core economic and policy rationale behind contract structuring in defense acquisition. From an economic perspective, constraining potential profit and linking it to measurable performance, the DoD seeks to balance the contractor's incentive for efficiency with the government's obligation to protect taxpayer resources (Laffont & Martimort, 2002). This regulatory intent is explicitly reflected under FAR Part 15 profit and fee provisions operationalized through the incentive mechanisms defined under FAR Part 16 (FAR 15, 2025;FAR 16, 2025).

Under FAR Part 16 (2025), FFP contracts are used when the requirement is well-defined and technical uncertainty is low. FAR specifies that, under this arrangement, the contractor is obligated to deliver the specified goods or services at an agreed-upon price regardless of actual cost incurred; FFP contracts are typically applied to commercial supplies and services, and they offer the highest degree of cost predictability for the government. FFP contracts are generally not appropriate for research and development efforts due to the inherent uncertainty and difficulty in precisely defining deliverables in advance (FAR 16, 2025). Consistent with GAO reporting, in MDAPs the premature use of FFP contracts during early development phases can result in cost overruns or default when contractors misjudge performance risk or intentionally underbid with the expectation of later adjustments (Russell, 2021).

According to the FAR Part 16 (2025), Fixed-Price with Economic Price Adjustment (FPEPA) contracts introduce an element of flexibility into the fixed-price structure by allowing price adjustments tied to specific market conditions such as inflation, labor rates, or material costs; this variant is typically used in long-term contracts where price volatility presents a significant risk to either party. FAR states that the price adjustment mechanisms must be based on established, objective indices, such as those published by the Bureau of Labor Statistics, and the scope of adjustment must be clearly limited to specific cost elements. FPEPA contracts are appropriate when there is a reasonable expectation of significant market or economic fluctuation during performance that could not have been accurately predicted at the time of award (FAR 16, 2025).

FAR Part 16 (2025) provides for the use of Fixed-Price Incentive (FPI) contracts when technical risk is moderate, and there is an opportunity to motivate cost-saving behavior; the government and contractor agree on a target cost, target profit, and a ceiling price, with profit or loss determined by a share ratio that defines how underruns and overruns are distributed between the parties. This share-ratio mechanism directly ties profit to cost performance and aligns contractor behavior with the government's cost objectives (FAR 16, 2025). For example, a 70/30 share ratio means the government shares seventy percent of any cost variance while the contractor shares thirty percent. For cost underruns, the contractor retains thirty cents of every dollar saved below the target cost and the government retains the remaining seventy cents; for cost overruns, the contractor is responsible for thirty cents of every dollar above the target cost, while the government covers the other seventy cents until the ceiling price is reached, after which the contractor bears all additional cost. Within the MDAP environment, FPI contracts are frequently employed during production phases of weapon systems where the design has been stabilized, but cost performance remains an active concern (Oakley, 2024).

Consistent with FAR Part 16 (2025), Fixed-Price Award Fee (FPAF) contracts are less commonly used but are applicable in situations where performance quality is subjective and must be evaluated through judgmental criteria; the contractor receives a fixed payment and becomes eligible for additional fees based on government assessment of performance. In practice, this contract type is often used for performance-based logistics or service support contracts where meeting user satisfaction criteria is important, but outcomes cannot be easily quantified. The subjective nature of award fee determinations can complicate administration, and poor implementation may reduce transparency or create disputes over evaluation fairness (FAR 16, 2025).

According to the FAR Part 16 (2025), Fixed-Price with Prospective Price Redetermination (FP3R) contracts are used when the government requires a firm pricing commitment for the initial performance period but recognizes that future pricing may need to be adjusted due to cost variability. In practice, this is often seen in long-term production efforts for parts or subsystems where future costs are difficult to estimate. After the initial fixed-price period, the contract allows for price renegotiation based on actual cost experience; while offering flexibility, this contract type requires well-defined deliverables and a mechanism for fair redetermination, which can be administratively burdensome (FAR 16, 2025).

On the cost-reimbursement side of the spectrum in FAR Part 16 (2025), CPIF contracts are structured to encourage performance improvement while allowing the contractor to recover allowable, allocable and reasonable costs. FAR allows the government and contractor agree on a target cost, target fee, minimum and maximum fee and share ratio that determines how the fee adjusts based on allowable, allocable and reasonable cost performance. The FAR further explains if actual costs come in below the target cost, the contractor’s fee increases according to the negotiated share ration; if actual costs exceed the target, the fee decreases but is not below the minimum fee. CPIF contracts require a contractor with adequate cost accounting systems and disciplined program management to ensure compliance (FAR 16, 2025). This contract type is well-suited to research and development phases of MDAPs where performance objectives are known but cost outcomes are uncertain; the contractor assumes some performance risk but remains insulated from full financial liability (Russell, 2021).

According to the FAR Part 16 (2025), Cost-Plus-Award-Fee (CPAF) contracts are applicable when performance objectives cannot be linked to measurable incentives; instead, the government evaluates contractor performance subjectively and awards additional fee accordingly. FAR regulation explains that the challenge in CPAF contracts lies in defining evaluation criteria and maintaining consistency in award fee boards (FAR 16, 2025). These contracts are common in large-scale R&D programs and support services where user satisfaction or team collaboration is more important than precise output metrics; if poorly managed, CPAF arrangements may provide fee without commensurate improvement in performance (DiNapoli, 2017).

FAR Part 16 (2025) indicates that Cost-Plus-Fixed-Fee (CPFF) contracts are used when technical uncertainty is high, and contractor effort is best compensated by a fixed fee rather than a performance-based structure; these are most appropriate in early-phase studies, exploratory research, or system concept development. FAR states the contractor is reimbursed for all allowable, allocable and reasonable costs and receives a pre-negotiated fee that does not vary with performance. FAR establishes that CPFF contracts can be structured as completion or term form; completion form requires a specified output, while term form obligates the contractor to a level of effort over a period of time. FAR regulation further specifies that both forms require close monitoring by the government to ensure progress toward objectives (FAR 16, 2025).

As specified by FAR 16 (2025), Cost and Cost-Sharing (C or CS) arrangements are typically reserved for cooperative efforts with academic institutions or nonprofit organizations where the contractor is not motivated by profit. In cost-sharing arrangements, both parties contribute resources and the government does not pay a fee (FAR 16, 2025). These contracts are most suitable for joint research where the outcomes benefit both parties and where the government wants to encourage participation without assuming full cost burden; NCMA indicate that their use in MDAPs is limited but can be appropriate in early technology demonstrations or basic research (NCMA, 2023).

FAR 16 (2025) provides that Time and Materials (T&M) contracts are used when it is not possible to accurately estimate the extent or duration of the work. These contracts provide for labor at specified hourly rates and for materials at cost; T&M contracts are commonly used for emergency repairs, rapid prototyping, or support services where flexibility is more important than cost containment (NCMA, 2023). FAR regulation indicate strict limitations on their use, requiring a determination and findings (D&F) that no other contract type is suitable;T&M contracts are typically used only in early experimentation phases or for non-developmental service support (FAR 16, 2025).

According to Rendon and Snider (2008), the contract type comparison chart (Figure 2) confirms that each form of agreement contains inherent trade-offs in terms of risk allocation, oversight burden, cost predictability, and administrative complexity. Figure 2 illustrates these relationships by showing how buyer's and seller's risk, as well as requirement definition, change across cost-reimbursement and fixed-price contract types. As Rendon and Snider emphasize, no single contract type is universally optimal, and each structure must be matched to program specific risk (Rendon & Snider, 2008). Consistent with Russell (2021), misapplication of contract types has been a recurring issue in major programs. Despite clear guidance on the intended uses and limitations of each structure, program offices may be driven by legacy practices, external pressure, or funding constraints that result in suboptimal choices; the overuse of fixed-price contracts in development or inappropriate reliance on cost-reimbursement structures in production continue to be sources of inefficiency (Russell, 2021).

Consistent with FAR Part 4 and Part 16 (2025) guidance on contracting structuring, MDAPs rarely operate under a single contract type; most use multiple arrangements implemented through multiple Contract Line Item Numbers (CLINs), each tailored to specific program elements. This structure allows program managers to align risk allocation and incentive mechanisms with the maturity and uncertainty of individual work segments (FAR 4, 2025; FAR 16, 2025). For example, a development contract might combine CPIF CLINs for research activities with FFP CLINs for low-risk production components or sustainment tasks.

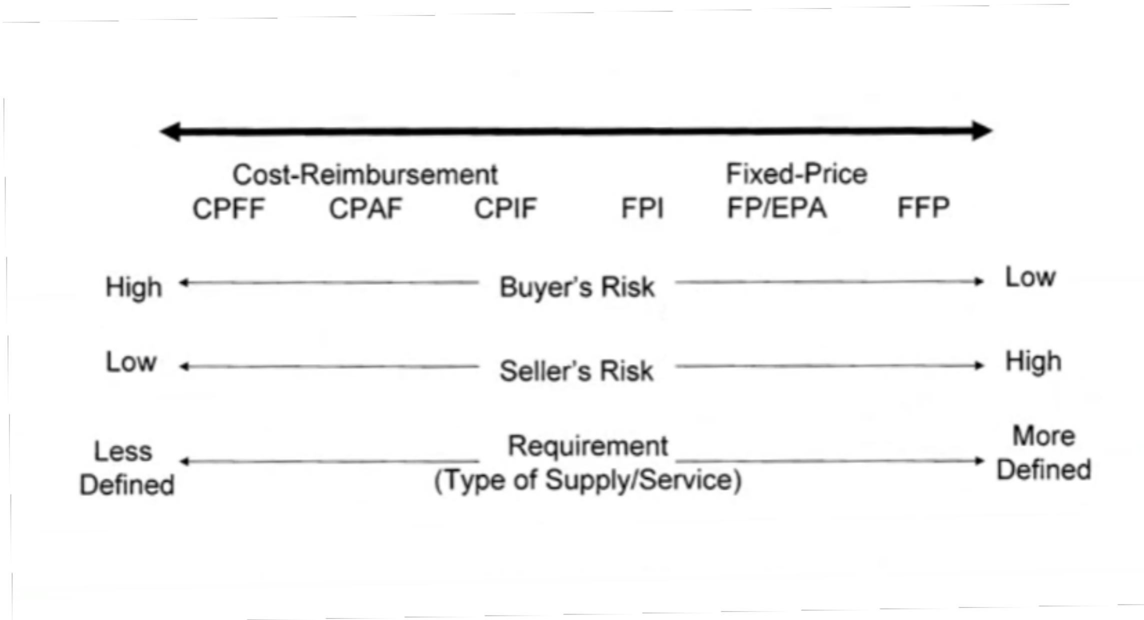

Figure 2. Relationship between Contract Type, Requirement, and Risk. Source: Rendon and Snider (2008).

In summary, understanding the structure and application of major contract types is essential for effective MDAP execution. Contracting officers and program managers must align contract type selection with technical maturity, program phase, and market conditions. The FAR provides the regulatory framework, but successful implementation requires analytic judgment and historical insight. As this capstone will demonstrate in later chapters, the interaction between contract type, risk, and acquisition outcome requires closer integration of policy, economics, and operational strategy in the defense acquisition process.

C. INCENTIVES

According to FAR Part 16 (2025) incentive structures play a vital role in aligning contractor performance with government objectives in defense acquisition; contract incentives are designed to influence behavior by linking contractor profit/fee to outcomes that matter to the government. FAR correlates these outcomes to include cost efficiency, adherence to delivery schedules, and achievement of specific technical performance standards. Within MDAPs, where uncertainty, technical risk, and financial stakes are high, incentives offer a structured means of managing risk and promoting productive contractor behavior; these characteristics are central to the incentive contract provisions established in FAR Part 16 (FAR 16, 2025).

FAR Part 16 (2025) structures compensation through incentive contracts that are fundamentally distinct from conventional contract types; rather than relying solely on fixed compensation or reimbursement of incurred costs, they provide a variable profit/fee mechanism that adjusts based on the contractor's performance. As FAR indicates, this structure introduces a feedback loop into the contractual relationship; when performance aligns with the government's priorities, the contractor receives additional compensation. When performance falls short, the contractor's profit/fee is reduced; by design, this alignment is intended to reduce the need for constant government oversight and to promote contractor initiative (FAR 16, 2025).

NCMA (2023) explains that incentive arrangements typically focus on three areas: cost, schedule, performance. Cost incentives are designed to encourage contractors to manage expenses efficiently (NCMA, 2023). A common example is a fixed-price incentive contract, where the contractor earns a share of cost savings if the actual cost falls below a predetermined target; if costs exceed the target, the contractor absorbs a portion of the overrun. This arrangement allows both parties to share risk while motivating the contractor to seek efficiency (FAR 16, 2025).

According to NCMA (2023), schedule incentives are applied when timely delivery is critical to operational readiness or program integration. NCMA explains these incentives can include early delivery bonuses or penalties for late performance; for these mechanisms to be effective, delivery milestones must be realistic and clearly articulated. If the contractor believes that schedule rewards or penalties will not be enforced, the incentive will have little impact on planning or resource allocation (NCMA, 2023).

NCMA (2023) provides that performance-based incentives are used when technical outcomes or qualitative metrics are of primary importance. As NCMA explains these incentives may be tied to criteria such as system reliability, survivability, or compliance with operational requirements; they are often implemented through award-fee or incentive-fee structures, where the contractor's compensation is partially based on performance evaluations conducted by government officials. While these arrangements provide flexibility, they require clearly defined metrics and consistent evaluation procedures; without this, the contractor may find it difficult to predict outcomes or understand how performance will be rewarded (NCMA, 2025).

According to NCMA (2023), the successful use of incentive structures depends on the clarity and credibility of the contract terms; contractors must be able to understand how their actions will affect their compensation. As NCMA explains this requires transparent formulas, measurable targets, and performance criteria that are stable over time. If targets are changed frequently or if rewards are paid despite poor performance, the incentive loses its value; similarly, if the contractor perceives the targets as unattainable or arbitrary, the structure can generate frustration or disengagement rather than motivation (NCMA, 2025).

DiNapoli (2017) report on the range of incentive effectiveness across MDAPs demonstrates that incentives perform best when they are clearly defined, consistently administered, and credibly enforced . At the high end of effectiveness, DiNapoli found that incentives tied to objective, measurable outcomes supported by tools such as EVMS and enforced through transparent award-fee determinations have produced measurable improvements in cost, schedule, and performance moderately effective incentives occur when contract terms are well-designed but the linkage between incentive criteria and measurable performance is only partially aligned, limiting their ability to drive stronger behavioral responses . At the low end of effectiveness, DiNapoli reported that incentives lose motivational value when fees are paid regardless of results or when evaluation criteria are subjective, vague, or unenforced . Together, these findings underscore that the structure, clarity, and enforcement of incentive terms directly determine their impact on contractor performance (DiNapoli, 2017).

Another factor influencing the success of incentives is the administrative capacity of the acquisition workforce; designing effective incentive structures requires a deep understanding of the program's technical characteristics, cost drivers, and performance risks (Oakley, 2020a; Oakley, 2024). According to FAR Part 16 (2025), contracting professionals must be able to structure incentives that reflect the realities of the contractor's business model and the government's priorities; this includes determining appropriate share ratios for cost incentives, setting reasonable ceilings, and drafting award criteria that can be evaluated objectively. These requirements show that effective incentive design depends on the contracting workforce ability to align incentive terms with technical and cost realities (FAR 16, 2025).

Under FAR Part 16 (2025), incentive contracts may integrate cost, schedule, and performance incentives into a single framework. While this approach allows the government to pursue multiple objectives simultaneously, GAO has found that combining incentives increases structural complexity and requires careful coordination among the incentive elements; tradeoffs must be made between the different incentive components (Oakley, 2020a; Oakley, 2024). For example, placing too much weight on cost savings may reduce the contractor's attention to performance quality; conversely, emphasizing schedule delivery at the expense of cost control can lead to budget overruns. The key is to ensure that the incentive structure reflects the strategic importance of each objective and maintains appropriate balance among them (Reichelstein, 1992).

According to DiNapoli's (2017), research across various acquisition programs has demonstrated that incentive contracts can produce significant benefits when applied correctly. DiNapoli GAO report of selected incentive fee contract actions found that most achieved cost underruns and generally reported positive schedule and technical outcomes when the incentives were clearly structured and objectively measured ; they can lead to cost reductions, improved delivery timelines, and higher performance standards. However, as DiNapoli reported they are not guaranteed to succeed; he also identified instances in which poorly designed award fee or incentive arrangements resulted in fees being paid without corresponding performance improvements or where criteria were insufficiently linked to outcomes. In some programs, poorly designed incentives have led to unintended consequences such as cost growth, strategic underperformance, or disputes over evaluation criteria; these outcomes are often the result of weak contract design, inadequate oversight, or misalignment between incentive terms and program realities (DiNapoli, 2017).

Historically, the DoD has struggled to ensure that incentive and award fees produce the intended behavioral and performance outcomes; a landmark review by Calvaresi-Barr

(2005) found that DoD paid billions of dollars in award and incentive fees to contractors despite programs being over budget, behind schedule, or failing to meet key performance objectives . These findings from Calvaresi-Barr revealed that award fees were often treated as an entitlement rather than as a true performance incentive, undermining their motivational value. The report prompted a major rewrite of the FAR Part 16, emphasizing that award fees should be tied to measurable results, withheld for substandard performance, and used sparingly where objective metrics are unavailable (Calvaresi-Barr, 2005). As a result, the DoD shifted toward more outcome-based incentive structures and introduced clearer guidance on linking fee determination to quantifiable performance criteria (FAR 16, 2025). Despite these reforms, subsequent GAO reporting continue to find inconsistent application of incentive mechanisms, suggesting that the effectiveness of these tools depends as much on enforcement and program culture as on contract structure itself (Oakley, 2022).

DiNapoli (2017) clearly identifies that for incentives to be effective, they must also be enforceable; the government must be willing to follow through on both rewards and penalties. DiNapoli found that in prior award fee implementations, contractors sometimes received fees that were not clearly linked to measurable performance outcomes, which reduced the motivational value of the incentive; if contractors receive award fees regardless of performance, the incentive becomes meaningless. DiNapoli reported that inconsistencies in how award fee criteria were applied weakened the governments ability to hold contractors accountable ; similarly, if poor performance does not lead to a reduction in fee or a loss of future business opportunities, there is little reason for the contractor to adjust behavior. Enforceability is not just a legal issue; it essential to maintaining the credibility of incentive mechanisms within major acquisition programs (DiNapoli, 2017).

Rendon and Snider (2008) indicated that contractors are also sensitive to how incentives are implemented across programs and over time; inconsistent application or perceived unfairness can reduce trust and diminish the motivational impact of incentive structures. Rendon and Snider support establishing predictable and transparent evaluation practices reinforces contractor trust and supports a performance-based culture across the defense industrial base; therefore, the acquisition workforce must strive for consistency in how performance is evaluated and how rewards are distributed. This consistency builds a culture in which contractors believe that good performance will be recognized and poor performance will have consequences (Rendon & Snider, 2008).

In summary, incentives can also serve a broader strategic purpose by shaping contractor behavior over time; when used consistently across programs, they can create industry-wide expectations about cost control, innovation, and accountability (DiNapoli, 2017). This requires more than just individual contract clauses; it requires coordinated policy, acquisition workforce training, and programmatic discipline (Oakley, 2020a; Oakley 2024).

Having established how contract types allocate cost, schedule, and performance risk between the principal and agent; the next step is to examine risk attitudes, the differing tolerance for variance across the government and contractors, that determine how those contractually specified risk allocations are perceived and acted upon in practice (FAR 16, 2025). In MDAP settings, the same incentive formula or share ratio can elicit very different behaviors from risk-neutral versus risk-averse contractors, influencing participation decisions, effort levels, innovation choices, and ultimately the effectiveness of the contract structures just reviewed (Laffont & Tirole, 1993).

D. RISK ATTITUDES

Within the principal-agent framework as described by Eisenhardt (1989), the allocation and perception of risk are central to how contracts are designed and executed in MDAPs. Risk attitudes shape the way contractors evaluate uncertain outcomes, which in turn affects how effort is applied, how incentives are interpreted, and how effectively program goals are achieved; the relationship between a risk-bearing principal and a risk-sensitive agent creates the need for contract structures that anticipate and accommodate differing utility preferences (Eisenhardt, 1989).

These preferences are not uniform across the defense industrial base, and failing to align contract type with contractor risk attitudes produces different problems across the contract life cycle (Oakley, 2025a). In the pre-award phase, misalignment can lead to adverse selection or disengagement from competitive solicitations, as risk-averse offerors avoid proposals with unfavorable risk allocation (Russell, 2021). In the post-award phase, misalignment contributes to inefficient effort or risk-minimizing behaviors that reduce performance (DiNapoli, 2017). Risk attitudes in this context are generally categorized as risk-neutral or risk-averse. Laffont and Martimort (2002) discuss risk neutrality as it implies that the agent evaluates decisions based solely on expected monetary outcomes; the agent is indifferent to variability around the expected value and is willing to engage in uncertain activities as long as the mean outcome meets or exceeds a threshold of acceptability. This simplifies the principal's problem of incentive alignment; a risk-neutral contractor can be incentivized directly through outcome-based payoffs, such as award fees or shared cost savings, without concern for how the agent perceives variance (Laffont & Martimort, 2002). However many contractors, particularly those with limited cash flow or heavy overhead burdens, exhibit risk aversion; as a result, they prefer contracts that reduce the likelihood of financial loss, even if that limits the possibility of higher rewards (Calvaresi-Barr, 2005).

Risk aversion is economically rational for contractors that operate under financial constraints, high internal accountability, or competitive environments that penalize poor performance; a risk-averse contractor may avoid proposals that include uncertain technical baselines or ambiguous requirements (Wang & San Miguel, 2013. Even when the expected value of a contract is positive, the potential for loss, reputational harm, or internal disruption may outweigh the projected gains; consequently, these contractors will seek fixed-price arrangements only when technical maturity is high, performance risk is low, and cost estimates are credible (Insinna, 2025).

This divergence in risk preference between the government and the contractor has several implications. First, it affects participation (Insinna, 2025). Risk-averse contractors may not compete for contracts structured in a way that transfers too much uncertainty to the performer; this reduces the number of viable proposals, increases the cost to the government due to pricing buffers, or incentivizes risk-tolerant contractors that may not be operationally mature or cost-effective (Bajari & Tadelis, 2001). Second, it alters execution behavior; risk-averse contractors may engage in risk-avoidance strategies that reduce technical innovation, delay decision-making, or increase the likelihood of requests for equitable adjustments (Rendon & Snider, 2008). These actions are often rational responses to the contracting environment but can result in delays, inefficiencies, or misalignment with government objectives (Russell, 2021).

Effort distortion is one of the most significant behavioral responses driven by risk aversion; when a contractor perceives that additional effort could lead to failure due to external factors, such as unstable requirements or shifting priorities, the incentive to exert discretionary effort is diminished (Laffont & Martimort, 2002). As Fox (2011) indicates in development contracts where the outcome is sensitive to engineering iteration and experimentation, risk-averse contractors may avoid exploring alternative designs or integrating novel solutions; instead, they will default to safe, proven approaches that reduce downside exposure. This behavior is consistent with minimizing expected loss but may limit the program's access to superior technologies or more efficient designs; in this way, risk attitudes influence not only bid strategy but also the nature and quality of delivered capabilities (Fox, 2011).

According to Laffont and Martimort (2002), the presence of hidden effort complicates this further; under conditions of moral hazard, the principal cannot directly observe how much effort the agent is applying. They further explain if the agent is risk-averse, the effort level becomes sensitive to the perceived volatility in performance rewards. They explain that unless the contract structure includes a payment mechanism that reduces variability or offers compensation for risk, the agent may reduce effort to preserve certainty; for example, if award fees are tied to ambiguous criteria or susceptible to subjective government evaluation, a risk-averse contractor may not invest in behaviors that increase the chance of high reward because the path to achieving it is unclear or too volatile. Instead, the contractor may invest effort only in activities that preserve minimum performance, which creates inefficiencies and misalignment with the program's broader objectives (Laffont & Martimort, 2002).

This tension is further complicated by differences in risk and uncertainty across phases of the acquisition life cycle; early phases of an acquisition program often involve high uncertainty regarding technical feasibility, integration complexity, and evolving requirements (Oakley, 2020a; Oakley, 2024). These phases require contractors to engage in behavior that is inherently uncertain and frequently unprofitable in the short term (Bajari & Tadelis, 2001). A risk-neutral contractor may accept this, calculating that eventual production contracts or downstream work will offset early losses; a risk-averse contractor, in contrast, may hesitate to engage unless the contract structure compensates for the early-stage uncertainty (Laffont & Martimort, 2002). If the government fails to recognize this and applies fixed-price contracts prematurely, the result can be bid inflation, strategic withdrawal, or worst-case scenarios involving default or litigation (Sullivan, 2017).

Incentive alignment becomes more challenging as the variance of outcomes increases; when performance metrics are difficult to quantify or tie directly to contractor effort, the utility loss associated with unpredictable results weighs heavily on risk-averse agents (Laffont & Martimort, 2002). Contractors may perceive high variability in government assessments of performance, inconsistent application of award criteria, or external political factors that influence program direction (Calvaresi-Barr, 2005). All of these introduce exogenous risk, which cannot be controlled by contractor behavior; if these sources of risk are not mitigated through contract design, they can suppress effort, distort investment decisions, and erode the contractor's willingness to participate in future programs (Wang & San Miguel, 2013).

Contract design must therefore account for both observable outcomes and unobservable effort; when effort cannot be directly observed, principals rely on outcome based incentives and risk shifting mechanisms to influence agent behavior (Wang & San Miguel, 2013). In fixed-price arrangements, this typically requires accurate estimation of cost and schedule to reduce uncertainty and allow the agent to manage risk internally; in cost reimbursement contracts, this may involve incorporating performance incentives that align with government priorities while remaining achievable given the uncertainty involved (FAR 16, 2025). One approach is to include graduated fee structures that reward incremental progress, thereby reducing the perceived risk of investing effort (Eisenhardt, 1989).

Early acquisition life cycle phases can absorb more risk on the government side, while later phases shift responsibility as uncertainty decreases and technical maturity improves; risk attitude is not static across contractors or even within a single contractor

(OUSD[A&S], 2021). Organizational structure, recent performance history, leadership turnover, and financial conditions all influence how a contractor perceives and responds to risk; therefore, DoD acquisition professionals must avoid assuming uniform behavior across the industrial base (Fox, 2011). Market research, industry engagement, and historical data on contractor performance under different contract types can inform better alignment between contractor terms and contractor behavior (FAR 10, 2025). Where possible, contracts should include provisions that allow for renegotiation or realignment as risk attitudes shift, particularly in programs that span multiple years or experience changes in strategic direction (FAR 43, 2025).

In summary, understanding contractor risk attitudes is essential to effective contract design in MDAPs; as agency theory explains, differences in risk preferences such as an agent is risk averse or risk neutral directly shape how contractors respond to incentives and uncertainty (Eisenhardt, 1989). Agency theory Laffont and Martimort (2002) provides the analytical tools to model and predict how these attitudes influence behavior, effort, and performance; by recognizing that not all contractors respond to risk in the same way, and by embedding this recognition into the structure of contracts, the government can better align incentives, preserve competition, and improve acquisition outcomes. Risk attitude, while often considered a behavioral nuance, has material implications for cost, schedule, and performance; risk preferences affect how agents evaluate effort, rewards, and uncertainty (Laffont & Martimort, 2002). They warrant close consideration in any economic framework aimed at improving the efficiency and reliability of defense procurement (Wang & San Miguel, 2013).

Building on the discussion of contract structures and risk attitudes, the remaining determinant of outcomes is the quality of information that flows between principal and agent specifically, whether contractors disclose cost, risk, and technical readiness truthfully when incentives cut the other way. In MDAPs, the government's ability to align behavior depends not only on how risk is allocated on paper but on whether disclosure is incentive-compatible in practice; thus, beyond FAR Part 16's menu of contract types, mechanisms such as Truthful Cost or Pricing Data requirements, CAS, and surveillance by DCMA/ DCAA must be paired with screening, signaling, and payment rules that make honesty the contractor's best response (FAR 15, 2025; FAR 16, 2025; CAS Applicability, 2025). The next section examines "truth telling" as a design problem, outlining how mechanism-design tools can convert pre-award claims and post-award reporting into reliable inputs for contract type selection, milestone funding, and risk management across the acquisition and contract life cycles.

E. TRUTH TELLING

In the framework of principal-agent theory, truth telling represents a critical element in the design of contracts where the principal lacks perfect information about the agent's capabilities, intentions, or constraints; within MDAPs, the government as principal often relies on agents to report private information truthfully, particularly during the early phase of pre-award and award (Wang & San Miguel, 2013). These reports include cost estimates, technical risk assessments, design maturity levels, and progress reports; the accuracy of these disclosures can significantly affect contract type selection, milestone funding decisions, and overall program risk posture (NCMA, 2023).

In an idealized principal-agent environment with symmetric information, truth telling would be a default condition because both parties operate from the same understanding of the task, constraints, and performance parameters; however, in reality, the government cannot observe or verify all the variables that shape the agent's internal planning and execution (Laffont & Martimort, 2002). Wang & San Miguel (2013) explain this condition of asymmetric information creates an incentive for the agent to misrepresent its private knowledge in ways that serve its economic interests. These distortions are not necessarily illegal or unethical; they are predictable behaviors that emerge when contract structures fail to align truthful reporting with the agent's profit motives (Wang & San Miguel, 2013).

Economic models grounded in mechanism design theory explore how contracts can be structured to induce truthful reporting as an equilibrium behavior (Laffont & Martimort, 2002). Wang and San Miguel (2013) explain these models seek to construct incentive-compatible mechanisms where the agent's optimal strategy is to reveal accurate information about costs, risk exposure, or technical readiness. Within MDAPs, truth telling becomes critical in areas such as source selection, award fee evaluation, engineering change proposal, and the negotiation of equitable adjustments; in each of these settings, the contractor has more information than the government in some areas only, and the contract must be designed to discourage misrepresentation (Wang & San Miguel, 2013).

According to Wang & San Miguel (2013) truth telling is particularly difficult to induce when the agent faces conflicting objectives. They indicate an offeror bidding on a contract may have an incentive to overstate technical complexity to justify the use of a cost-reimbursement structure; conversely, when competitive pressures favor fixed-price proposal, a offeror may understate risk or offer unrealistically low bids in order to win the award, expecting to recoup losses through future contract modifications. Both behaviors are rational responses to poorly aligned contract incentives. They demonstrate that without proper design, contracts encourage agents to manage perceptions rather than deliver transparent cost and risk data (Wang & San Miguel, 2013).

According to Laffont & Martimort (2002), truth-telling mechanisms attempt to address these challenges by aligning the agent's economic interests with the disclosure of accurate information. One strategy is to use screening tools that differentiate offerors based on their internal cost structures or risk profiles (Laffont & Martimort, 2002). Wang and San Miguel (2013) establish that these tools can include tiered contract structures where contractors must commit to progressively more accountable terms as program maturity increases. In doing so, contractors signal their confidence in the technical feasibility and cost estimates they provide; a contractor that expects to face difficulties is less likely to commit to a schedule or cost target that it cannot meet without later seeking relief (Wang & San Miguel, 2013).

Another approach is to link reported information directly to financial outcomes, consistent with incentive-compatible contract design under asymmetric information (Laffont & Martimort, 2002). For example, FAR Part 16 (2025) authorizes the use of milestone payments that can be tied to data disclosures that are subject to third-party verification. If a contractor claims a particular subsystem is at a specific technology readiness level, payment can be conditioned on independent validation of that claim; Similarly, award fees can be structured to reward timely and accurate reporting, not just output-based performance (FAR 16, 2025). In these models, honesty becomes the path to higher compensation, and misleading the government is penalized through reduced fee eligibility or loss of future work (Wang & San Migeul, 2013).

The aquisition life cycle dynamics of MDAPs further complicates the implementation of truth-telling mechanisms. According to Sullivan (2017) during the Materiel Solution Analysis (MSA) and TMRR phases, contractors have significant flexibility to frame technical uncertainty as manageable within their existing processes; in these early phases, the contractor's narrative carries substantial weight in shaping baseline cost, schedule, and performance expectations. Consequently, his report indicates, contractors may delay the disclosure of technical problems, suppress unfavorable test results, or provide optimistic projections to maintain program momentum and preserve funding credibility. By the time discrepancies become visible during later phases such as EMD or production, course correction often entails substantial cost growth, schedule delays, and reputational damage (Sullivan, 2017). To mitigate these dynamics, contracts should incorporate early-phase incentives that reward timely risk reporting and accurate disclosure of performance data, even when such information may be politically or organizationally inconvenient (Wang & San Miguel, 2013).

Contractors operating under cost reimbursement contracts may be required to submit earned value data, cost performance reports, or contractor cost data (FAR 34.2, 2025). However, Oakley (2020b) has found that underlying cost models, labor assumptions, or subcontractor projections may remain proprietary or unaudited due to no unified data collection approach. This informational opacity identified in Oakley's GAO report allows the agent to manipulate cost projections or shift risk through accounting classifications. Unless the contract structure includes mechanisms that link cost transparency to fee eligibility or future source selection competitiveness, the agent has little reason to disclose unfavorable cost dynamics proactively (Oakley, 2020b).

Contractors operating under cost reimbursement contracts are required to maintain transparent accounting and reporting practices governed by the TINA and CAS; TINA, implemented through the FAR Part 15.4, requires contractors to submit certified cost or pricing data to ensure that contract prices reflect accurate, complete, and current information (FAR 15.4, 2025). Likewise, CAS establishes uniform standards for measuring, assigning, and allocating costs to government contracts (CAS Applicability, 2025). Oversight by the DCMA and the Defense Contract Audit Agency (DCAA) provides additional assurance that contractor cost estimating systems and accounting practices are adequate and compliant (NCMA, 2023). However, despite these mechanisms, the government does not always have visibility into the contractor's internal cost modeling assumptions, proprietary labor rate projections, or subcontractor pricing dynamics; these elements often remain partially opaque due to competitive sensitivities or limitations in data submission requirements (Oakley, 2020b). Unless contract structures explicitly link cost transparency to fee eligibility or source selection competitiveness, the contractor retains some discretion to frame cost information strategically during negotiation and execution (Wang & San Miguel, 2013).

As Wang and San Miguel (2013) argue from the principal's perspective, promoting truth telling requires more than contract clauses; it involves a broader acquisition strategy that builds trust, institutional credibility, and consistency in evaluation practices. If the agent believes that truthful reporting will lead to excessive scrutiny, budget cuts, or loss of future work, then the rational strategy is to withhold or manipulate information (Eisenhardt, 1989). The government must therefore signal a commitment to using disclosures constructively, not punitively; this aligns with agency theory, which holds that credible signaling and aligned incentives are essential for mitigating information asymmetry (Laffont & Martimort, 2002). One method is to pair incentives for accurate reporting with opportunities for technical rebase lining or scope adjustment when risk materializes; this helps mitigate the fear that honesty will be punished, making disclosure a viable strategic option for the contractor (Wang & San Miguel, 2013).

Laffont and Tirole (1993) indicate the defense industrial base also shapes the dynamics of truth telling. In markets with few competitors or highly specialized suppliers, the agent may perceive itself as indispensable, reducing the pressure to be transparent; this dynamic aligns with economic theories of market concentration, where limited competition increases information asymmetry and weakens the principal's leverage (Laffont & Tirole, 1993). In such cases, the government must leverage alternative tools, including competition at the subcontractor level, use of independent cost estimators, or modular program structures that limit the agent's control over system integration; these approaches reduce the contractor's ability to monopolize information and increase the government's capacity to verify claims through independent channels (Powner, 2010).

Finally, agency theory highlights that the cost of truth telling is borne primarily by the agent; whether that cost is reputational, organizational, or financial, contractors will only reveal private information when the expected benefit exceeds the perceived risk (Eisenhardt, 1989). This principle aligns with Laffont and Martimort (2002) mechanism design theory, which explains that truthful disclosure only occurs when honesty maximizes the agent's expected utility under the contract's incentive structure. Contracts should include provisions that make early disclosure of risk or performance shortfalls less costly than concealment; this could involve neutral arbitration mechanisms, safe harbor provisions for early warnings, or performance credits for transparent behavior (Laffont & Martimort, 2002). This suggests that acquisition professionals must think strategically about how to shift that calculus; by explicitly rewarding honesty, rather than simply penalizing dishonesty, contracts can shift the incentive structure toward truthful interaction (Wang & San Miguel, 2013).

In summary, according to Wang and San Miguel (2013) truth telling is an essential but often underappreciated component of contract design in the MDAP setting; it is a precondition for effective risk sharing, accurate cost estimation, and program accountability. Within principal-agent theory, the ability to elicit truthful reporting from agents under asymmetric information is both a theoretical and practical challenge (Laffont & Martimort, 2002). Overcoming this challenge requires carefully crafted mechanisms that align agent incentives with the principal's need for reliable information; in doing so, acquisition professionals can create a more transparent, predictable, and efficient contracting environment that is better suited to the demands of modern defense acquisition (Wang & San Miguel, 2013).

The analysis so far has demonstrated that MDAP contract performance is heavily influenced by structural features such as incentive strength, risk allocation, surveillance effectiveness, and the timing of contractor disclosures. These challenges underscore the difficulty of designing contracts that both protect the government's interests and motivate contractors to reveal accurate cost, schedule, and technical information. Building on this foundation, the next section surveys related research that critiques traditional contract types and offers alternative mechanisms for enhancing transparency, improving risk-sharing, and strengthening government decision-making.

F. OTHER RELATED RESEARCH

The article that inspired this study is Chong Wang and Joseph San Miguel's (2013) article "Are Cost-Plus Contracts (Justifiably) Out of Favor?" published in the Journal of Governmental and Nonprofit Accounting. The key research question in this article is, "does dissatisfaction with cost-plus contracts in the context of MDAP necessarily justify switching to fixed-price arrangements?" (Wang & San Miguel, 2013, p. 2). The authors argue that fixed-price contracts do not provide adequate risk-sharing benefits in early acquisition phases, lead to higher government payments, and promote inefficient industry structure. They recommend that cost contract types remain the primary mechanism during technology maturation and early development phases, where technical uncertainty and cost variability are highest. Two policy recommendations are provided; cost-plus contracts should remain the major contract type for MDAPs to promote risk-sharing, and the Budget-Based Cost-Plus Scheme (BBCPS) should be used to disincentivize information asymmetry. The contributions of this research include dispelling the focus of U.S. policy encouraging fixed-price contract use, introducing BBCPS as a practical way to induce "truth-telling," and leads to considerations for the ideal structure of the defense industry (Wang & San Miguel, 2013).

The approach and goal of this study are similar to those in Victor Lewis and Daniel Pupich's MBA Professional Report from 2007, "Combating Principal-Agent Relationship Problems: Use of the Truth Revealing Incentive Mechanism." The goal of this report was to "introduce the Truth Revealing Incentive Mechanism (TRIM) and explain how the TRIM can be used to control program costs by revealing: contractor's true cost and program budget shortfalls." The authors argue that the TRIM combats both adverse selection and moral hazard due to information symmetry in the principal-agent framework through incentive mechanism design. Recommendations include implementing the TRIM within the DoD for cost-reimbursement type contracts in the sole-source environment and follow on research to expand applicability into competitive environments and to further analyze the effects of risk attitudes on contracting outcomes using the TRIM; the contributions of this research are introducing the TRIM as a practical way to induce "truth-telling" and align the objectives of both the principal and agent (Lewis & Pupich, 2007).

A portion of this recommendation was studied by Peter Coughlan and William Gates (2010) in their Acquisition Research Sponsored Report "Innovations in Defense Acquisition: Asymmetric Information and Incentive Contract Design" published by the Naval Postgraduate School. The goal of this research was to reveal how implementation of the TRIM could be modified for use in the competitive environment. The authors argue that the TRIM does combat issues presented by the principal-agent relationship between the government and contractors and that a multi-phased process where the agent proposes the target cost and is then offered a menu of contracts using the TRIM would be better suited for the competitive environment. This research provides valuable insight into both government and contractor behaviors that must be considered in order effectively operationalize theoretical frameworks in the acquisition environment (Coughlan & Gates, 2010).

This capstone adds to the current literature by introducing a quantitative, incentive-based framework that links program risk, contractor behavior, and contract-type selection within the MDAP environment. Existing research identifies problems such as misaligned incentives, information asymmetry, and uneven risk allocation, but it does not provide a standardized analytical tool that acquisition officials can use to evaluate contract structures under different technical or cost conditions. This study addresses that gap by integrating principal–agent theory with DoD acquisition policy and developing a calibrated model for determining profit pools and cost-sharing ratios. The result is a practical method that supports real-world decision-making during contract formulation. The capstone also contributes new insight into how contract type should align with life cycle phase and technical maturity, which is an area of the literature that is often treated in broad policy terms rather than through a risk-sensitive analytical approach.

G. SUMMARY

This chapter presented a synopsis of the literature on principal-agent theory as it applies to MDAPs. The literature presented the nature of the principal-agent relationship in the MDAP environment—the government delegates tasks and responsibility to the contractor involving an exchange of compensation for capability – and the resultant problems—conflicting objectives, information asymmetry, adverse selection, and moral hazard. This chapter identified contract types in the DoD, described how contract type selection shapes risk distribution and accountability, and illustrated how properly implemented incentives impact alignment of objectives. This chapter also isolated truth telling as the critical component to combating the risks in principal-agent relationships. The synthesis of existing scholarly work presented in this chapter will serve as the foundation for the framework this study will use during analysis. The next chapter will describe the foundations of and relationships between the MDAP and contracting life cycles.

III. MAJOR DEFENSE ACQUISTION PROGRAM

This chapter examines the MDAP framework from multiple perspectives: its statutory foundations, life cycle structure, and governance processes; the distinct categories of risk that shape performance outcomes; the contract life cycle that translates acquisition strategy into executable agreements; and the institutional, political, and industrial constraints that affect contract type selection. Together, these sections illustrate how risk management and contracting decisions are embedded within a complex, interdependent system that balances mission urgency, technological innovation, and budgetary control. The analysis highlights that while MDAPs are governed by a well-defined regulatory framework anchored in the Adaptive Acquisition Framework and guided by the policies of DoDI 5000.85 (OUSD[A&S], 2021); their real-world execution often diverges from policy intent (Oakley, 2025a). External oversight, evolving mission demands, and cultural factors within the acquisition workforce frequently shape program behavior as much as formal rules do (Sullivan, 2017). Understanding this dynamic environment is essential to assessing how risk is identified, allocated, and mitigated through contract structures; the discussion that follows builds the foundation for linking economic theory and contract design principles to the realities of MDAP execution (Wang & San Miguel, 2013).

A. OVERVIEW

MDAPs, represent the largest and most complex undertakings within the DoD acquisition system, requiring significant investments of time, resources, and technical expertise. According to Title 10, U.S. Code § 4201, MDAPs are defined as follows:

> a DoD acquisition program that is not a highly sensitive classified program (as determined by the Secretary of Defense) and – (1) that is designated by the Secretary of Defense as a MDAP; or (2) in the case of a program that is not a program for the acquisition of an automated information system, that is estimated by the Secretary of Defense to require – (A) an eventual total expenditure for research, development, test, and evaluation of more than $300,000,000 (based on fiscal year 1990 constant dollars); or (B) an eventual total expenditure for procurement, including all planned increments or spirals, of more than $1,800,000,000 (based on fiscal year

1990 constant dollars). (Major Defense Acquisition Programs [MDAP]: definition; exceptions, 2025)

The management of MDAPs is embedded within the Defense Acquisition System, which DoDI 5000.85 (2021) provides the policy and outlines the framework for delivering capabilities that are operationally effective, suitable, survivable, affordable, and supportable. The DoDI 5000.85 system is designed to integrate capability requirements, resource allocation, and acquisition execution into a single coherent process; this integration is achieved by coordinating the JCIDS, the PPBE process, and the Defense Acquisition System itself. MDAPs proceed through these interconnected systems so that validated capability needs, budgetary resources, and acquisition strategies remain aligned; the Adaptive Acquisition Framework allows tailoring of program structures and decision points to the specific risk profile, urgency, and operational requirements of each effort, which is particularly important given the diversity of MDAP technologies and mission objectives (OUSD(A&S), 2021). Figure 3 presents the Major Capability Acquisition life cycle used to structure these phases.

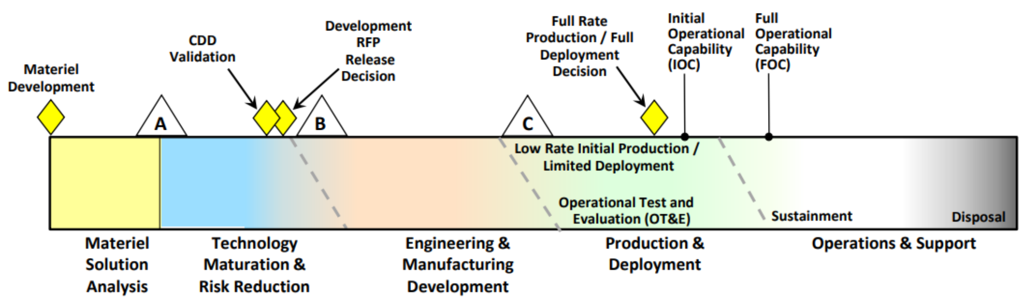

Figure 3. Department of Defense Instruction 5000.85: Major Capability Acquisition Model. Source: Office of the Under Secretary of Defense for Acquisition and Sustainment (2021).

DoDI 5000.85 (2021) defines the life cycle of an MDAP is organized into sequential phases separated by key decision points known as milestones, each of which represents a formal review of the program's readiness to proceed. As shown in Figure 3, the initial phase, known as MSA, begins after the Materiel Development Decision and focuses on evaluating alternative solutions to an approved capability gap. The instruction further establishes that analyses of alternatives (AoA), affordability assessments, and the development of a preliminary acquisition strategy take place in this stage. Once a preferred solution is identified, the program can enter the TMRR phase, which the instruction describes as seeking to mature critical technologies, conduct competitive prototyping, and complete preliminary design reviews, ensuring that technical risk is reduced to an acceptable level before requesting approval to proceed to EMD; during EMD, the system design is finalized, manufacturing processes are established, and developmental testing is conducted to verify that the system meets requirements. Toward the end of this phase, DoDI 5000.85 outlines low-rate initial production may begin to validate the manufacturing approach and support operational testing. The Production and Deployment phase follows, with full-rate production commencing after successful operational test and evaluation confirms the system's suitability and effectiveness; finally, the Operations and Support (O&S) phase ensures the system is sustained over its service life, encompassing maintenance, modernization, and eventual disposal, with the aim of minimizing total life cycle cost while maximizing readiness (OUSD[A&S], 2021).

According to DoDI 5000.85 (2021) oversight and decision-making authority in MDAPs is organized through a hierarchy of stakeholders. DoDI 5000.85 explains the Milestone Decision Authority holds ultimate responsibility for approving advancement through the acquisition phases and for overall program direction; for the largest and most visible programs, this role is typically filled by the Defense Acquisition Executive, while for other programs it may be held by the Service Acquisition Executive or Component Acquisition Executive. Program Executive Officers oversee portfolios of acquisition programs and are accountable for their collective cost, schedule, and performance outcomes; Program Managers are responsible for day-to-day program execution, ensuring that acquisition strategies are implemented effectively, risks are managed, and coordination with stakeholders is maintained (OUSD[A&S], 2021). Contracting Officers provide the legal authority to enter into, administer, and terminate contracts, safeguarding the government's interests (FAR 1.6, 2025). Industry contractors perform the technical development, manufacturing, and sustainment work according to contractual obligations, making them essential partners in the execution of MDAP objectives (Oakley, 2025b).

As specified by DoDI 5000.85 (2021), this structure of roles and responsibilities is supported by formal oversight mechanisms. The DoDI 5000.85 structure for the largest programs, the Defense Acquisition Board advises the Milestone Decision Authority, reviewing independent cost estimates, test results, and capability validations before milestone decisions are made; at the service level, acquisition boards perform similar reviews for programs under their jurisdiction. This layered oversight balances centralized authority with distributed execution, ensuring that major investments are reviewed rigorously before resources are committed further; it also provides a means of integrating strategic priorities, fiscal constraints, and technical realities into acquisition decision-making (OUSD[A&S], 2021).

In addition to formal oversight authorities, the execution of MDAPs relies heavily on collaboration across functional disciplines through IPTs. NCMA (2013) explains IPTs serve as structured, cross-functional working groups composed of representatives from engineering, logistics, test and evaluation, cost analysis, contracting, and user communities who collectively support program planning and execution. According to NCMA, IPTs are the principal mechanism for achieving integration and communication among stakeholders, ensuring that acquisition decisions are both informed and executable; program-level IPTs, often chaired by the Program Manager, oversee coordination across subordinate working-level IPTs that focus on specific technical, functional, or risk areas. This structure enables early identification and resolution of issues that could impact cost, schedule, or performance objectives (NCMA, 2023). Under DoDI 5000.85 (2021) IPTs also facilitate the use of systems engineering principles, risk management frameworks, and test planning integration throughout the acquisition life cycle. By fostering collaboration among diverse expertise areas, IPTs enhance transparency, support timely decision-making, and strengthen the alignment between program objectives and execution strategies (OUSD[A&S], 2021).

In summary, MDAPs are more than just large contracts; they are instruments of national defense strategy whose effects often extend across decades. The systems they deliver can shape force structure, influence deterrence postures, and sustain critical elements of the defense industrial base (Fox, 2011). Oakley (2025a) has reported that cost growth, schedule delays, and technical shortfalls in MDAPs can undermine readiness and disrupt modernization timelines. The scale, complexity, and strategic importance of these programs require disciplined governance that balances the flexibility to address evolving needs with the statutory oversight requirements established in 10 U.S.C 4201 and the life cycle management responsibilities outlined in DoDI 5000.85 (2021). This combination of statutory definition, structured life cycle management, and stakeholder accountability forms the foundation of MDAP execution and underscores their central role in the DoD's approach to acquiring and fielding advanced military capabilities (NCMA, 2023).

While MDAPs are designed to deliver strategic capabilities through disciplined governance and structured oversight, their success ultimately depends on how effectively risk is identified, allocated, and managed throughout the acquisition life cycle. DoDI 5000.85 (2021) shows each phase of an MDAP introduces distinct sources of uncertainty via technical, schedule, cost, and political that shape decision-making and influence contract strategy. The DoD emphasizes that risk management is integral to the acquisition process, requiring early identification, continuous assessment, and deliberate mitigation efforts tailored to program complexity and maturity (OUSD[A&S], 2021). The following section examines the defining risk characteristics of MDAPs and their implications for program performance and contract design.

B. RISK CHARACTERISTICS

MDAPs can be understood as inherently shaped by a variety of risks that are both broader in scope and deeper in impact than those present in smaller-scale or commercial acquisition efforts. These risks are not isolated, and they often interact in ways that compound their effects. From an acquisition and contracting perspective, understanding their characteristics and trajectories is essential for improving the alignment between program realities and contractual approaches, particularly in the context of designing economically sound risk-sharing arrangements.

According to DoDI 5000.85 (2021) at the early stages of many programs, critical subsystems or enabling technologies may still be in research development or exist only in laboratory prototypes. Oakley (2025a) describes a persistent and well-documented feature of MDAP risk is technical immaturity. In some of Oakley's cases, the technologies have not reached a sufficient Technology Readiness Level to justify integration into a full system design. This immaturity can introduce unforeseen engineering challenges, integration difficulties, and performance shortfalls once the program transitions into later phases; technical risk is especially acute in programs that seek to achieve multiple revolutionary advancements simultaneously, as problems in one subsystem can cascade into delays or redesigns in others (Oakley, 2025a). The pursuit of cutting-edge capabilities means that these risks are rarely avoidable, but their magnitude varies with the level of technological ambition and the adequacy of risk reduction efforts before milestone decisions (OUSD[A&S], 2021).

Oakley (2025a) found schedule uncertainty is another defining characteristic of MDAP risk. The report notes that the long timelines required for development, testing, production, and fielding expose programs to numerous variables that can affect delivery dates; these include technical setbacks, supply chain disruptions, shifting operational requirements, and changes in testing protocols. As Oakley identifies, MDAP schedules often span multiple budget cycles and changes in leadership; even modest delays can ripple through dependent programs or operational plans. In some cases, the timing of capability delivery is tied to larger modernization strategies or to anticipated retirement of legacy systems, which increases the consequences of slippage; when schedule risk materializes, it can drive cost growth as fixed overheads extend and as production lines must be re-sequenced to accommodate new timelines (Oakley, 2024).

Mission evolution over time also shapes the risk environment for MDAPs; defense programs are initiated based on a set of validated capability requirements, but these requirements can evolve in response to changes in the operational environment, emerging threats, or advances in allied and adversary capabilities (Fox, 2011). Oakley (2022) shows as defense programs mature, changes to mission priorities can lead to design modifications, scope expansion, or performance upgrades that were not anticipated during initial planning.

While such adjustments are sometimes necessary to ensure relevance, they often disrupt established baselines and create additional technical and schedule risk; programs that began as targeted solutions to specific threats can grow into multi-role platforms, significantly increasing complexity and cost (Oakley, 2022).

Political risk is an equally important dimension, particularly in the form of budgetary instability and shifting policy priorities. MDAPs depend on sustained funding over many years, making them vulnerable to annual appropriations cycles, continuing resolutions, and sequestration events (Young & Gilmore, 2019). Political changes can lead to shifts in defense strategy that either accelerate or curtail program funding; some programs are subjected to heightened scrutiny or funding pressure because of their size, visibility, or cost overruns in prior phases (Oakley, 2025a). The optics of acquisition performance can be as influential as actual progress, and programs perceived as underperforming may face political pressure to change contract types, restructure, or even terminate, regardless of technical or operational justification (Neenan, 2025).

According to DoDI 5000.85 (2021) the interaction of these risks is not static; their relative weight changes across the phases of the acquisition life cycle. The policy In the MSA and TMRR phases, technical immaturity is the dominant concern; the emphasis is on maturing technologies to a level that supports integration and on validating that the proposed solution is feasible. DoDI 5000.85 shows as programs enter EMD, integration and production readiness risks increase in significance, even as some early technical risks are resolved. Additionally, by the Production and Deployment phase, schedule certainty and manufacturing stability become critical, and political risk can intensify if delays threaten to impact planned force structure or deployment timelines. In the O&S phase, sustainment risks emerge, including the availability of parts, obsolescence management, and cost control for long-term maintenance (OUSD[A&S], 2021).

Each category of risk has direct implications for contracting decisions in MDAPs. Technical immaturity suggests the need for contract structures that allow flexibility to address design challenges without imposing excessive cost burdens on either party (OUSD[A&S], 2021). High schedule uncertainty may warrant performance incentives tied to milestone completion rather than strict delivery dates; mission evolution implies that change mechanisms and scope control clauses should be incorporated to manage inevitable modifications without destabilizing the program baseline (Oakley, 2025b). Political risk influences not only the availability of funds but also the choice of contract type, as fixed-price arrangements may be favored for their perceived cost certainty even when conditions suggest that a more flexible arrangement would be economically and technically appropriate (Wang & San Miguel, 2013).

The difficulty lies in anticipating how these risks will manifest and interact over time. Historical data shows that early optimism in technical readiness often leads to aggressive schedules and cost targets that are vulnerable to slippage (Calvaresi-Barr, 2005). Likewise, political pressures to demonstrate progress can lead to milestone approvals before adequate risk reduction is complete (Oakley, 2022). When such conditions are paired with inappropriate contract structures, the consequences can include cost growth borne disproportionately by the government, schedule delays that reduce operational value, and performance shortfalls that diminish the program's return on investment (Younossi, Arena, Leonard, Roll, Jain, & Sollinger, 2007).

Effective management of MDAP risk requires a forward-looking approach that accounts for both the individual and combined effects of technical, schedule, cost, and political uncertainties. Risk assessment should not be treated as a one-time exercise at milestone reviews but as a continuous process that informs program and contracting decisions throughout the acquisition life cycle. Aligning contract type selection with the evolving risk profile of the program is central to avoiding the kinds of misapplications described in the problem statement of this capstone. This alignment can help ensure that risks are allocated to the party best positioned to manage them, that incentives promote behavior consistent with program objectives, and that the government retains the flexibility to adapt as conditions change.

In summary, the risk characteristics of MDAPs are a product of their technological ambition, long timelines, evolving mission contexts, and exposure to political decision-making. These risks do not exist in isolation and their influence changes across acquisition phases. The ability to recognize, anticipate, and respond to these shifting dynamics is essential for structuring contracts that both manage risk effectively and support the delivery of operationally relevant capabilities. Later sections of this chapter will explore how these risk characteristics are addressed or in some cases neglected in actual contract type selection practices.

The foregoing risk profile spanning technical immaturity, schedule volatility, evolving mission requirements, and political uncertainty sets the conditions that contracting must manage in practice. Moving from analysis to execution, the contract life cycle outlined by NCMA (2025) translates these risks into concrete choices about requirement definition, market engagement, source selection, negotiation, performance oversight, and eventual closeout. In other words, pre-award activities shape how risks are allocated and measured, award decisions lock in pricing and incentive structures that govern behavior, and post-award administration monitors outcomes and adapts to change through modifications and governance (NCMA, 2025). Framing the contract life cycle in this way links MDAP risk characteristics to the specific levers of competition strategy, contract type, incentives, data rights, configuration control, and performance reporting that determine whether programs can absorb uncertainty while still delivering capability on cost and on schedule (Wang & San Miguel, 2013).

C. CONTRACT LIFE CYCLE

The contract life cycle within MDAPs reflects both the regulatory structure of the DoD acquisition framework and the professional principles codified in the Contract Management Standard by the NCMA (2025). Together, these systems establish a continuous process spanning pre-award, award, and post-award phases each with distinct objectives, tasks, and oversight mechanisms that align contractual outcomes with program cost, schedule, and performance expectations (NCMA, 2025). Figure 4 provides an overview of the Contract Management Standard life cycle used within MDAP contracting.

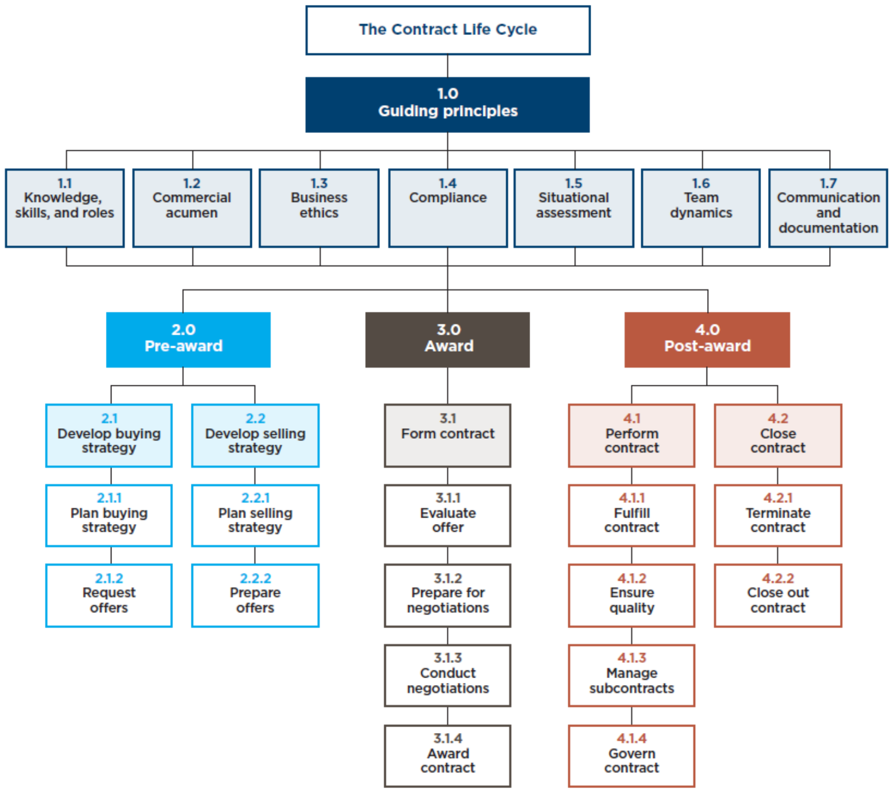

Figure 4. Contract Management Standard Contract Life Cycle. Source: National Contract Management Association (2025).

According to NCMA (2025), the contracting life cycle aligns directly with the MDAP acquisition life cycle because each acquisition phase (MSA, TMRR, EMD) has its own contract, and the pre-award, award, and post-award processes repeat for every new contractual action. NCMA outlines the pre-award activities for the contract supporting the Materiel Solution Analysis (MSA) phase: the program office conducts market research, defines initial requirements, and develops the acquisition strategy that governs that phase's contract. At this point in the program, technical and cost uncertainty remain high, so cost-reimbursement contract types are typically employed to enable trade studies, early prototypes, and risk reductions tasks appropriate to the MSA contract (OUSD[A&S], 2021; FAR 10, 2025). When the program transitions to TMRR, a new contract is initiated, requiring a new pre-award process, a new contract award, and new post-award oversight tailored to the maturing technical baseline; this pattern continues into EMD, where a separate contract supported by its own contracting life cycle reflects improved technical readiness and may allow a gradual shift towards fixed-price arrangements as risks are better understood (NCMA, 2025).

DoDI 5000.85 (2021) states that Milestone A authorizes release of the final RFP for TMRR, and the Development RFP Release Decision occurs before Milestone B. Further, as the program approaches Milestone B and transitions into Engineering and Manufacturing Development (EMD), the technical baseline becomes more stable, allowing more flexibility in contract structure. Many programs continue to use cost-reimbursement contracts during early EMD to manage integration and manufacturing risks, but fixed-price approaches can be considered when technologies have matured, and cost drivers are better understood (OUSD[A&S], 2021).

After Milestone C, when the program enters Production and Deployment, DoD guidance states that system designs and manufacturing processes are sufficiently stable to support low risk production activities (OUSD[A&S], 2021). At this point, uncertainty has diminished, making fixed-price contracts appropriate when the government can reasonably describe the required supplies and associated performance risks (FAR 16, 2025). These contract structures emphasize predictable execution, cost control, and delivery performance where technical maturity has been demonstrated; across the life cycle, the contracting process supports the program manager's ability to shift from cost-reimbursement instruments in high-risk developmental environments to fixed-price instruments in production environments as the system matures (Rendon & Snider, 2008).

The pre-award phase sets the strategic foundation for program success through requirement definition, market research, and acquisition strategy development (FAR 7, 2025; FAR 10, 2025). Within the contract management discipline, pre-award, award and post-award activities are recurring functions that support each major acquisition decision point rather than discrete, single use stages, as programs refine requirements, update risk assessments, and adjust acquisition strategies in accordance with acquisition life cycle (OUSD[A&S], 2021). Pre-award activities focus on developing the governments acquisition objectives and competitive approach, while offerors assess their capabilities, costs, and risks in preparing to respond to a solicitation (FAR 15, 2025). This centers on developing both the buying and selling strategies where the government defines its acquisition objectives and potential contractors evaluate capability, cost, and risk alignment.

In the MDAP environment, pre-award activities during the MSA phase include the AoA, Technology Readiness Assessments (TRAs), and acquisition planning required by DoDI 5000.85 (2021). The AoA is conducted only during the MSA phase because its purpose is to compare potential material solutions before a preferred approach is selected; once the program enters later phases, requirements are more fully defined, and the set of alternatives has been narrowed and approved (OUSD[A&S], 2021). Compliance with FAR Parts 7 and 15 ensures integration of competition, cost realism, and source-selection standards (FAR 7, 2025; FAR 15, 2025). IPTs and Contracting Officers collaborate to translate technical requirements into solicitations that balance performance flexibility with fiscal accountability (NCMA, 2025). Decisions made during this phase, particularly in selecting an appropriate contract type such as a cost-reimbursement vehicle for early developmental uncertainty or a fixed-price contract when technical maturity supports firm cost commitments, and incentive design directly influence the program's ability to manage risk throughout execution (Wang & San Miguel, 2013).

In accordance with FAR Part 15 (2025), the award phase formalizes the contractual relationship through a structured source-selection evaluation in which the government assesses offerors' proposals against the solicitation's stated technical, cost, and past-performance criteria. This process includes evaluation, discussions when applicable, negotiation, and contract award (FAR 15, 2025). Sound contract formation mitigates performance and cost risk by ensuring that obligations, pricing structures, and deliverables are clearly defined (FAR 16, 2025). For MDAPs, negotiations often extend beyond price to include intellectual-property rights, incentive mechanisms, and EVMS provisions (FAR 34.2, 2025). A well executed award establishes a clear baseline of expectations and reduces the likelihood of downstream disputes, providing a stable transition into contract performance (NCMA, 2025).

The post-award phase is the most extended and resource-intensive portion of the contract life cycle, encompassing execution, administration, and closeout (Oakley, 2024).

It involves monitoring performance, managing modifications, and ensuring compliance with technical, cost, and quality requirements (FAR 42, 2025; FAR 43, 2025). Within the professional contract management framework, this period integrates the tasks of performing and closing the contract governing changes, resolving issues, and documenting lessons learned (NCMA, 2023).

The post-award phase is a continuous management period focused on ensuring that contracted work is performed to cost, schedule, and quality requirements. Oversight is provided by DCMA and the DCAA, which review cost reports, evaluate performance metrics, and validate earned-value data (FAR 42, 2025). This oversight function is essential to managing execution risk and ensuring alignment between contacted requirements and delivered outcomes (Powner, 2010). Tools such as the Contract Data Requirements List (CDRL), EVMS reports, and Contractor Performance Assessment Reporting System (CPARS) are used to monitor execution (NCMA, 2025). Engineering change proposals and contract re-baselining are frequent features as programs evolve to address emerging requirements or technical challenges (FAR 43, 2025).

The post-award phase concludes with contract completion or termination, after which lessons learned are captured and fed into future acquisition planning; this feedback loop supports institutional learning and improves the alignment between contract structures and program realities in subsequent MDAPs (NCMA, 2025). In addition, performance data documented in the CPARS feeds into the Past Performance Information Retrieval System, providing the DoD with a consolidated and enduring record of contractor performance (FAR 42, 2025). This integrated past-performance information is later used in source selections, strengthening the government's ability to evaluate offerors based on demonstrated cost, schedule, and technical performance (FAR 15, 2025).

In summary, pre-award, award, and post-award activities are interdependent and collectively form a continuous governance cycle. Successful contract management depends on consistent application of key principles ethical conduct, technical knowledge, collaboration, and communication throughout the life cycle (NCMA, 2025). In the MDAP setting, these practices foster cohesion among program managers, contracting professionals, engineers, and industry partners. Integrating a standardized life cycle framework with the DoD's acquisition system enhances transparency, strengthens accountability, and ensures that contracting remains a strategic instrument for delivering national defense capabilities (OUSD[A&S], 2021).

After outlining how the contract life cycle shapes requirements in pre-award, structures agreements at contract award, and governs performance in post-award, the next question is which contract type best fits the program as it moves through the acquisition life cycle. Contract type is the primary economic lever that translates technical maturity, schedule certainty, and cost-estimate fidelity into enforceable incentives and protections (Bajari & Tadelis, 2001). In MDAPs, selecting among fixed-price, cost-reimbursement, and incentive variants is not a procedural checkbox; it is a risk-allocation decision that must reflect readiness, design, stability, producibility, test status, budget realities, PPBE timing, and oversight demands (Wang & San Miguel, 2013). The following section examines how FAR requirements grounded in statutory authority and DoDI 5000.85 (2021) as a DoD policy shape program execution, contribute to early misalignments, and determine how contract type choices mitigate or magnify the risks outlined earlier.

D. CONTRACT TYPE SELECTION

The regulatory framework governing contract type selection is explicitly defined across multiple statutory and policy references, each emphasizing alignment between contract type and risk. According to FAR Part 16 (2025), contracting officers must consider requirement complexity, price competition, and cost analysis when selecting the appropriate contract type, and cost-type contracts may only be used when uncertainties prevent accurate cost estimation under fixed-price arrangements (FAR 16, 2025). Similarly, FAR Part 35 (2025) underscores that cost-reimbursement contracts are generally appropriate for research and development when specifications are imprecise or cost estimation is difficult (FAR 35, 2025). Complementing these provisions, DoDI 5000.85 (2021) directs program managers to consider transitioning to fixed-price arrangements only after technical risk has been sufficiently reduced (OUSD[A&S], 2021). Collectively, these provisions establish the principle that contract type selection must reflect the maturity of the program, the quality of cost estimates, and the ability of both parties to manage risk effectively.

FAR Part 16 organizes contract types into two broad families: fixed-price contracts and cost reimbursement contracts, with incentive and award-fee variants occupying positions between these two points on the risk spectrum (FAR 16, 2025). In theory, the choice between these forms should be informed by factors such as the maturity of the requirement, the stability of the technical baseline, and the ability to accurately estimate costs; cost and performance risk are intended to be allocated to the party best positioned to manage them (Bajari & Tadelis, 2001). However, in MDAP practice, the timing of this choice and the factors driving it are often influenced by considerations unrelated to optimal economic decision-making (Wang & San Miguel, 2013).

One limitation of the regulatory framework is that it specifies the eligibility conditions for each contract type without guiding how those choices should adapt to changing program circumstances. FAR Part 16 establishes the structural prerequisites for both fixed-price and cost-reimbursement contracts, such as requiring adequate cost or pricing data when certified data are mandated under FAR Part 15 TINA and requiring an adequate accounting system for cost-reimbursement arrangements (FAR 15, 2025; FAR 16, 2025). These criteria help ensure compliance but do not inherently lead to optimal allocation of risk; when contract types are locked in too early without built-in mechanisms for reassessment, mismatches between contract type and program condition can persist for years (Oakley, 2024).

Contracting officers, program managers, and oversight bodies may rely on past precedent or service-specific preferences when selecting a contract type. In some cases, there is a default tendency toward cost reimbursement contracts in early development phases, even when certain subsystems or production elements are mature enough to support fixed price arrangements, and a tendency toward fixed-price contracts in later phases when political or budgetary pressures demand visible cost control, even if technical uncertainty remains high (Oakley, 2020b). The latter is particularly evident in the government's recurring preference for FFP contracts in the production and deployment phase, where such contracts are frequently portrayed as symbols of fiscal responsibility, despite mixed performance outcomes (Russell, 2021).

Oversight reports from Russell (2021) and the DoDIG (2022) have documented instances where contract type selection was inconsistent with program conditions. Russell's GAO report (2021) has found examples of fixed-price contracts being applied to development work before design stabilization, resulting in cost growth, claims, or restructured agreements. DoDIG (2022) audit has identified production-phase cost-reimbursement contracts where requirements were sufficiently defined to permit more disciplined risk sharing. These findings point to a pattern in which formal contract type definitions are not misinterpreted but rather selectively applied in ways that respond to short-term pressures or administrative convenience rather than long-term program health (Russell, 2021; DoDIG, 2022).

In principle, the acquisition life cycle allows for contract modifications or successive contracts to adjust the type as the program matures. In practice, however, Oakley (2020b) reports Program offices may be reluctant to introduce new negotiations that could delay progress or require additional approvals. There is also a tendency to treat the initial contract type as a binding commitment, even though circumstances may justify a transition to a different form; this rigidity can undermine the ability to realign risk allocation as conditions change (Oakley, 2020b).

A critical yet often overlooked factor influencing contract type success is the accuracy of early cost estimates. Congressional pressure to employ fixed-price contracts during early phases such as the MSA and the TMRR has frequently been a response to frustration with cost overruns and poorly executed estimates rather than a reflection of program maturity (Calvaresi-Barr, 2005). However, this approach does not correct the underlying issue but often exacerbates it. When cost estimates are immature or based on incomplete data, shifting risk to the contractor through a fixed-price mechanism can lead to renegotiations, claims, and restructured agreements once actual costs materialize (Russell, 2021). Conversely, cost-type or incentive-based contracts, when paired with rigorous cost-estimating discipline and continuous validation, can promote transparency and more realistic budgeting outcomes (Oakley, 2020b). Ultimately, the fidelity of cost estimation, not merely the contract structure, determines how effectively risk is shared and managed across the program (Wang & San Miguel, 2013). Improving cost-estimating methodologies and aligning them with the appropriate phase of the acquisition life cycle remain essential to avoiding the recurring pattern of cost growth in MDAPs.

In summary, the interplay between contract type selection and program performance is further complicated by the perception of certain contract types in external oversight and political environments. Russell (2021) identified fixed-price contracts are often viewed as a safeguard against government cost exposure, and their use can be politically advantageous in signaling fiscal responsibility. However, when applied prematurely such as MSA or TMRR phases, when requirements are still evolving, technical baselines are immature, and cost estimates are highly uncertain, they can produce the opposite result by creating conditions for cost overruns that ultimately fall back on the government through claims or restructured terms (Russell, 2021). Cost-reimbursement contracts, on the other hand, are sometimes criticized for lacking cost discipline, yet they can provide essential flexibility in research and development work (Oakley, 2020b). The challenge lies in communicating the rationale for contract type selection in a way that addresses both programmatic needs and external expectations.

The logic of contract type selection anchored in risk, technical maturity, and cost-estimate fidelity does not operate in a vacuum. Once choices leave the program office and enter the arena of oversight, budgeting, and public accountability, the optimal contract structure is filtered through congressional priorities, PPBE timing and funding profiles, leadership optics, industrial base considerations, and the capacity of the acquisition workforce to execute tailored strategies (Oakley, 2024). These forces can reinforce good practice or, at times, bend decisions toward expedience (Young & Gilmore, 2019). The next section examines how these institutional and political constraints shape, enable, and sometimes distort contract strategies in MDAPs, and why acknowledging them explicitly is essential to aligning incentives with program realities.

E. INSTITUTIONAL AND POLITICAL CONSTRAINTS

The selection and structuring of contracts in MDAPs occurs within an environment shaped not only by technical and economic considerations but also by institutional and political constraints documented in oversight analysis by Congressional Research Service (CRS). McGarry's (2024) CRS report show these constraints influence decision-making in ways that may limit the ability of acquisition officials to select the contract type that most effectively aligns risk allocation with program realities. While statutory and regulatory frameworks establish the formal process for contract selection, the actual practice reflects a complex interplay of congressional oversight, budgetary processes, which CRS identifies as core structural drivers of defense acquisition and resource allocation (McGarry, 2024).

Russell's (2021) GAO report shows congressional involvement in defense acquisition extends beyond appropriating funds and authorizing programs. He reports that through committee oversight, legislative mandates, and reporting requirements, Congress exerts significant influence on the structure and execution of MDAPs; this influence can include directing the use of particular contract types or imposing conditions on milestone approvals. Further, in some cases, congressional directives stem from the desire to demonstrate fiscal discipline to constituents by favoring fixed-price contracts, which are perceived as limiting government exposure to cost growth. While this approach can serve a political purpose, it may disregard program-specific conditions such as technical immaturity or cost-estimation uncertainty, leading to arrangements that increase rather than decrease long-term risk (Russell, 2021). Congressional pressure can also accelerate program timelines, compelling the DoD to commit to contract awards before adequate risk-reduction activities are complete and prior to the next key milestone approvals and decision points (Neenan, 2025).

The DoD must also operate within the constraints of the PPBE process. McGarry's (2024) CRS analysis explains that this cycle imposes multi-year planning horizons and annual funding authorizations, both of which can create challenges for aligning contract types with the natural progression of program maturity. Additionally, funding profiles established during early planning, specifically during the Program Objective Memorandum build and initial budget formulation that occur years before key milestone decision points, may not align with actual technical readiness at the time of contract award, leading to the use of contract structures that fit available funding rather than program needs. Further, continuing resolutions, reprogramming actions, and year-end funding pressures can further distort the timing of awards, which in turn affects contract selection. The budget process can also encourage the front-loading of optimistic cost and schedule estimates to secure funding, setting unrealistic expectations that limit flexibility in subsequent contracting decisions (McGarry, 2024).

Industry influence also shapes the environment in which contract type decisions are made. McGarry's (2024) CRS report indicates long-term relationships between the DoD and major defense contractors create a shared history that can inform, and sometimes bias, expectations about performance under different contract types; within this context, contractors may lobby for arrangements that align with their internal cost structures, risk tolerance, and strategic objectives. Industry associations and advocacy groups may also engage with Congress and the Department to promote contract types perceived as favorable to sustaining the industrial base, particularly in sectors with few competitors (McGarry, 2024). For example, a contractor may resist a fixed-price contract during early development phases to avoid assuming technical risk but may later support such a structure in production when cost variables are more predictable and profit margins can be secured (Fox, 2011).

In summary, the environment in which MDAP contract types are selected is not purely a technical or economic arena. It is a complex space where congressional oversight, budgetary processes, political perceptions, industry relationships, and workforce capacity intersect. These factors exert tangible influence over contracting decisions, sometimes reinforcing and sometimes undermining the goal of aligning contract structures with program realities. Recognizing these constraints and incorporating them into a structured decision-making process is essential to improving risk allocation, incentivization, and overall acquisition outcomes in the DoD's largest and most critical programs.

F. SUMMARY

This chapter demonstrated that MDAPs operated under a highly structured but dynamic acquisition framework where risk management, governance, and contracting were deeply interconnected. The overview described statutory definitions, acquisition and contracting life cycle phases, and the hierarchical oversight of key decision authorities and ITPs that ensured accountability and coordination across program functions (OUSD[A&S], 2021). The risk characteristics section showed how technical immaturity, schedule uncertainty, evolving mission priorities, and political pressures interacted across phases, shaping contract and program performance (Russell, 2021; Oakley, 2024). The contract life cycle illustrated how pre-award planning, award negotiations, and post-award management collectively determined how risk was shared and controlled (NCMA, 2025). Effective oversight by DCMA, DCAA, and IPTs reinforced performance accountability through data-driven mechanisms such as EVMS and CPARS (FAR 34.2, 2025; FAR 42.15, 2025). The contract type selection discussion revealed that although FAR 16 (2025), FAR 35 (2025), and DoDI 5000.85 (2021) provided clear criteria, practical decisions were often shaped by premature lock-ins, political optics, and inconsistent cost estimates conditions that frequently distorted optimal risk allocation. Finally, institutional and political constraints showed how congressional oversight, PPBE timing, industrial base influence, and workforce limitations collectively constrained rational contracting decisions (McGarry, 2024). The chapter concluded that aligning contract structures with evolving program risk required not only adherence to statutory and regulatory guidance, but also deliberate recognition of the institutional constraints that shape real-world acquisition decisions.

IV. METHODOLOGY

This chapter presents the methodological foundation to determine the optimal contract structure to achieve effective risk-sharing and incentivize cost-saving efforts in MDAPs. Grounded in agency theory and informed by mechanism design, the methodology is structured to diagnose contractor behavior in terms of cost control, schedule adherence, and technical performance. The central objective is to determine a quantifiable contract design to combat information asymmetry that leads to cost growth, schedule overruns, and insufficient performance outcomes in high-risk defense acquisitions by aligning contractor behavior with government interests. This is achieved by combining theoretical modeling and mathematical simulation to develop a tool with real world applicability.

A. METHODOLOGY

This study draws from authoritative secondary data sources, including GAO Reports, RAND Corporation Reports, academic literature, and the FAR. The GAO provides timely, fact-based information at the request of congressional committees or direction of public law that can be used to improve government efficiency and reduce Treasury outlays. GAO reports used in this study focus on evaluation of contracting methods and environment in the DoD as well as cost, schedule, and performance outcomes of MDAPs. The RAND Corporation is a non-profit non-partisan research and analysis institution focused on quality and objectivity in policy research. The RAND reports analyzed in this study include analysis of DoD acquisition methods and performance. The academic literature selected in this study includes books and peer reviewed journal articles based in principal-agent theory. These sources provide the data necessary to establish evaluation frameworks for qualitative comparative analysis and development of risk-sharing and incentive alignment recommendations. The FAR standardizes statutes and policies for federal procurement. The FAR provides perspectives on the government's current contracting methods as well as restrictions for future contracting strategies including contract type and contract design. This study does not include interaction with human subjects. Data collection will rely on open-source documents and published studies and literature. Theoretical evaluation sources are representative of the current body of literature. These data sources support both qualitative evaluations and theoretical model application.

This study employs a qualitative comparative analysis, rooted in economic theory, focusing on the principal-agent problem, information asymmetry, and contract incentive design. A background and conceptual framework are developed through a literature-based analysis of economic and contracting theories. The framework is then applied to real-world MDAP contracting simulation to determine how risk allocation and incentive mechanisms influence procurement outcomes. The design allows for both normative theory application and descriptive evaluation of real-world performance.

The methodology proceeds in two interdependent phases. The first phase is literature integration, economic model selection, and model adaptation to the MDAP environment. This phase identifies key principles from agency theory, moral hazard, and adverse selection literature. The research evaluates how well standard DoD contract types induce truthful cost reporting or incentivize efficient performance in the developmental stages of MDAPs. The study then identifies the contract type best suited for developmental efforts with high levels of risk and uncertainty. Once a contract type is selected, the study then selects a model from mechanism design theory that explicitly addresses deficiencies resulting from asymmetric information. This study applies quadratic and convex penalty functions to the contractor's utility function to analyze incentivize effectiveness in truthful reporting of cost projections and cost-saving behavior. This approach is consistent with contract literature that frequently adopts algebraic penalty structures to deter misreporting and align objectives between the principal and agent (Laffont & Martimort, 2002; Reichelstein, 1992).

The practical motivation for using such constructs is reflected in Chong Wang & Joseph San Miguel's (2013) analysis of defense outcomes, which illustrates how weak cost discipline under cost-reimbursable contracts could be mitigated by embedding stronger incentive alignment tools. The application assumes a setting where the government cannot perfectly observe the contractor's true expected cost but can modify the traditional CPIF contract in a strategic way to motivate the contractor to truthfully report their expected cost in maximizing their own interests. Doing so effectively mitigates information asymmetry and accordingly reduces information rents. Moreover, since the revised CPIF contract retains the basic framework of CPIF, it simultaneously rewards cost-saving efforts. The bottom line is: limiting information rents and inducing cost-saving efforts, as two main objectives of efficient contracting, can be simultaneously achieved through such contract design. The model is selected not merely for theoretical coherence, but also for its compatibility with statutory and regulatory environments that permit customized incentive arrangements under FAR Part 16 (2025).

The mechanism is then adapted to suit the MDAP context. This requires customizing the model's parameters and assumptions to reflect acquisition in the developmental stages of the MDAP environment. The model assumes that both the contractor and government aim to maximize their net utility where the contractor's utility is the difference between received payment and the actual costs and the government's objective is to obtain the best value (i.e., a system that fulfills the requirements while minimizing financial exposure and schedule delays).

The second phase is the real-world application. This phase develops a tool using the model identified in the first phase to combat adverse selection and moral hazard due to information asymmetry. Similar to the research presented by Victor Lewis & Daniel Pupich (2007), this tool will provide contracting officers a menu of options to present to contractors during contract negotiations. The tool will use an excel file with equations to create a menu of contracts based on inputs from contracting officials. Inputs will include the value of the independent government cost estimate, expected variance of target cost, expected target fee, and budget constraints. The tool will provide stakeholders total government cost as well as contractor profit. After the tool is built it will be tested using simulated realistic program data. By assigning values to the modified parameters and testing variability, the tool simulates the utility outcomes for both truthful and misreported estimates as well as variable independent government cost estimates. Finally, this study will analyze additional benefits of the tool as well as limitations and constraints.

B. SUMMARY

This chapter described the methodology that will be used to examine how defense procurement contract types and contract structure affect risk allocation, contractor behavior, and program outcomes in developmental efforts of MDAPs. It identified the sources that will be used to establish evaluation frameworks for comparative analysis, conduct theoretical model application, and develop risk-sharing and incentive alignment recommendations. The analysis will be conducted in two phases. The first phase will use economic theory to evaluate and identify the best contract type for developmental efforts in MDAPs, evaluate and select an arithmetic mechanism that rewards cost-saving and truth-telling efforts, and adapt the mechanism for the MDAP environment. The second phase will develop a tool and identify an appropriate contract method to support real world application of the mechanism. The tool will produce a menu of contract options to present to offerors during negotiations.

V. ANALYSIS, FINDINGS, AND RECOMMENDATIONS

Chapter V builds upon the theoretical and institutional foundations established in Chapters II through IV to connect economic analysis with practical contract design within MDAPs. Earlier chapters identified information asymmetry, adverse selection, and moral hazard as persistent sources of inefficiency in defense contracting. The regulatory framework outlined in the FAR (2025) and DoDI 5000.85 (2021) provides procedural guidance but does not supply an explicit economic model for aligning incentives and allocating risk. Chapter V applies principal-agent and mechanism-design concepts to the practical problem of contract type selection, using mathematical modeling and policy analysis to demonstrate how an incentive-compatible structure, specifically the CPIF model augmented by the Wang and San Miguel (2013) mechanism can promote truth-telling, mitigate hidden effort, and improve risk-sharing. This analytical foundation enables the chapter to propose recommendations for incorporating incentive-compatible mechanisms into MDAP acquisition strategies.

The analysis directly addresses the first research question—*What is the optimal contract structure for achieving effective risk-sharing and incentivizing performance in MDAPs*—by modeling how hidden information and hidden effort create cost growth and weaken cost discipline under traditional contracting approaches. The chapter demonstrates that these issues cannot be addressed through policy compliance alone and require an economic structure capable of inducing truth-telling and effort; we demonstrate how incentive-compatible mechanisms can correct the behavioral distortions identified in earlier chapters. The analysis shows that a CPIF framework augmented by the Wang and San Miguel (2013) mechanism provides a structure that rewards cost discipline, induces truthful reporting, and supports appropriate contractor effort across varying risk environments.

The chapter also examines each secondary research question. The first—*How does contract type affect contractor behavior in terms of cost control, schedule adherence, and technical performance*—is addressed through modeling that demonstrates how hidden information and hidden effort create predictable inefficiencies when incentive structures are weak or misaligned. The second—*How does asymmetric information between government and contractors affect contract outcomes, and what mechanisms can help mitigate cost growth, schedule overruns, and insufficient performance*—is answered through the application of the truth-telling and performance-motivating components of the mechanism, which reduce information rents and strengthen post-award cost-saving incentives. The chapter shows how this mechanism uses a cost-sharing ratio, fee structure, and truth-telling incentive to reduce information asymmetry while remaining fully compliant with FAR (2025) and DFARS guidance.

The third secondary research question—*How can contract structure be designed to better align incentives and share risk throughout the life cycle of an acquisition program*—is addressed by demonstrating how the mechanism's parameters can be adjusted as an MDAP progresses from development into production. This provides program offices with a structured method for transitioning between contract types based on measurable changes in technical readiness and cost-estimate fidelity.

Together, these analyses show how a mechanism-based approach can strengthen MDAP acquisition strategies by improving cost realism, reducing information asymmetry, and supporting risk-appropriate contract structures. This chapter therefore bridges the gap between the theoretical foundation in Chapters II through IV and the practical recommendations presented at the end of the capstone.

A. LINKING ECONOMIC THEORY TO CONTRACT TYPE SELECTION

According to Wang & San Miguel (2013) agency theory provides the economic foundation for understanding the persistent inefficiencies in MDAPs; in the MDAP environment, the government serves as the principal and the contractor as the agent, with both parties possessing divergent objectives and unequal access to information. This asymmetry—manifested through hidden information and hidden efforts—creates conditions in which contract design is directly correlated with measures of efficiency, cost control, and incentive alignment (Wang & San Miguel, 2013).

Developmental phases of MDAPs, such as TMRR and EMD, are characterized by significant technical uncertainty and evolving performance requirements (Oakley, 2025a).

Under such conditions, outcome predictability is low, risk allocation is complex, and contractor behavior is highly sensitive to incentive structure (Laffont & Tirole, 1993). Fixed-price contracts, though politically attractive for their perception of cost control, often transfer excessive risk to the contractor when cost or technical baselines are uncertain (Oakley, 2020b). The result is either inflated pricing to cover risk premiums or contractor withdrawal from high-risk projects, both of which reduce government value and innovation potential (Najari & Tadelis, 2001).

Agency theory predicts that when uncertainty is high and the principal cannot fully observe the agent's efforts or cost structure, efficient contract design should include risk-sharing mechanisms that ensure contractor participation while aligning incentives between the contractor and the government (Wang & San Miguel, 2013). Table 1 shows the relationship between risk indicator and recommended contract type. When developmental risk and information asymmetry are high, cost reimbursement contract strategies are most efficient. As technical maturity improves, programs should flow from right to left in the table, moving towards fixed price contract strategies. The incentive parameters should be modified to reflect the risk environment throughout the life cycle. The DoD's experience with FPI and CPAF contracts demonstrates that partial risk sharing can mitigate moral hazard, but each remains imperfect when asymmetric information dominates (Calvaresi-Barr, 2005; DiNapoli, 2017). Consequently, the CPIF contract type emerges as a theoretically superior structure for developmental efforts where technical risk and information symmetry are both high (Lewis & Pupich, 2007).

Table 1. Contract Type: Risk Indicator Matrix. Adapted from National Contract Management Association (2023).

Risk Indicator	Low Risk	Moderate Risk	High Risk
Technical Maturity (TRL)	7–9	4–6	1–3
Cost Estimate Variance	≤ 5 %	5–15 %	> 15 %
Requirements Stability	Stable	Partial Churn	High Churn
Oversight Reliability	Strong	Mixed	Weak
Integration Complexity	Low	Medium	High
Recommended Contract Form	FFP → FPI	FPI → CPIF	CPIF / CPFF

The CPIF contract type aligns with agency theory's prescription for efficient risk allocation under uncertainty (Laffont & Martimort, 2002). In CPIF arrangements, the contractor is reimbursed for allowable, allocable, and reasonable costs and receives a variable fee based on cost performance relative to the negotiated target cost (FAR 16.4, 2025). This mechanism encourages cost discipline while preserving contractor willingness to undertake high-risk development efforts. From an economic standpoint, CPIF contracts achieve three desired outcomes: 1) they ensure contractors' participation by allocating majority of the risk to the government, 2) they preserve the contractor's incentive to exert efficient cost-saving effort, and 3) they maintain government flexibility to adjust requirements as technology matures.

Empirical evidence reinforces the theoretical justification. Russell (2021) found that MDAPs using incentive-type cost-reimbursement contracts achieved greater transparency and technical progress during early development than comparable programs using fixed-price contracts (Russell, 2021). Likewise, Wang and San Miguel (2013) argue that cost-reimbursement contracts are justifiably favored in environments characterized by high technological uncertainty because they minimize deadweight loss associated with poor risk allocation. By internalizing both parties' marginal utilities of risk, CPIF contracts maximize joint surplus while maintaining truth-telling incentives—an essential feature of mechanism design under asymmetric information.

The principle of adaptive contract design is also embedded within contemporary acquisition policy and frameworks. DoDI 5000.85 (2021) directs program managers and contracting officers to tailor contract structures based on technological maturity and risk exposure—explicitly encouraging incentive-based contract types early in development and transitioning toward fixed-price contract types as uncertainty decreases. Similarly, FAR Part 16.103 (2025) requires contracting officers to select the contract type that provides the greatest incentive for efficient and economical performance while considering the nature of the requirement, uncertainties involved, and the contractor's risk capacity. The NCMA Contract Management Body of Knowledge (2023) reinforces this risk-informed approach to contract-type selection, outlining factors such as requirement definition maturity, cost and performance risk, competition, and the need for incentives. Collectively, these frameworks operationalize the same economic principle of dynamic efficiency described in economic theory that is, contract efficiency improves when incentive and risk structures evolve proportionally with information maturity (Laffont & Tirole, 1993; Laffont & Martimot, 2002). Thus, the transition from cost-reimbursement arrangements in early developmental phases to fixed-price contract types in later production phases of the acquisition life cycle is not only theoretically efficient, but also institutionally reinforced across both regulatory and professional standards.

B. COMBATING ADVERSE SELECTION WITH MECHANISM DESIGN

The early phases of MDAP exhibit high technical immaturity and unstable requirements (OUSD[A&S], 2021). These conditions elevate the probability of moral hazard and adverse selection, making rigid fixed-type contract strategies economically inefficient (Bajari & Tadelis, 2001). A cost reimbursement with incentive-type contract strategy allows flexibility and learning while still embedding outcome-based motivation through targeted incentive parameters tied to cost, schedule, and performance metrics (Reichelstein, 1992). Therefore, the central objective of contract design in this setting is to align the contractor’s incentives with the government’s goals in three key ways: 1) the structure must distribute financial risk between the parties in a way that corresponds to the program’s technical maturity and level of uncertainty, 2) the contract must encourage the contractor to truthfully disclose its cost projections and risk exposure at the outset, and 3) the contract must reward cost-efficient behavior, ensuring that higher levels of productive effort translate into higher payoffs for the agent while delivering better value to the government (Laffont & Tirole, 1993; Laffont & Martimort, 2002). The previous section used economic theory to justify that the CPIF contract type achieves the appropriate distribution of risk between the principal and agent in developmental efforts of MDAPs.

To formally combat adverse selection, this study applies a quadratic penalty function as a truth-telling mechanism within the CPIF framework. Adverse selection arises when contractors possess private information about true costs or risk exposure that the government is not well suited to observe before contract award. The mechanism’s purpose is to make truthful cost reporting the contractor's optimal strategy. The model includes utility functions for both parties:

Government utility:

$$Ug = V - t.$$

Contractor utility:

$$Uc = t - C - C(e),$$

where V is the value of the system delivered to the government, t is the transfer/payment to the contractor, C is the actual cost, $\hat{C}$ is the reported cost estimate, λ is the penalty weight for misreporting, and $C(e)$ is the cost function depending on the contractor's unobservable effort. To induce truthful reporting, the contract embeds a quadratic penalty function:

$$t = C + b - \lambda(C - \hat{C}).$$

The contractor maximizes:

$$Uc = b - \lambda(C - \hat{C})2 - C(e),$$

where b is the participation bonus.

The government's payment function incorporates two parameters: a participation bonus (b) that ensures voluntary participation, and a penalty term (λ), which penalizes deviations between reported and actual cost (Laffont & Tirole, 1993; Laffont & Martimort, 2002). The participation bonus and penalty coefficient correspond to measurable risk indicators such as technical readiness levels, cost estimate variance, and earned value management reliability. Lower maturity or weak oversight justify smaller penalties and larger bonus whereas stable baselines and high observability are better suited to larger penalties and smaller bonus. This mapping enables program managers to adjust contract parameters as a program matures in order to align incentive strength and penalty with current risk profile.

In the context of economic modeling, particularly when analyzing incentive contracts in a principal-agent setting, the first-order condition (FOC) is a mathematical expression derived by taking the derivative of the agent's utility function with respect to the decision variable (such as reported cost or effort) and setting it equal to zero. The first-order condition is a mathematical tool used to find the best decision someone can make in each situation.

Solving the first-order condition:

$$\frac{dUc}{d\hat{C}} = 0 \Rightarrow \hat{C} = C.$$

Thus, the agent is incentivized to truthfully report the cost estimate. Table 2 displays the contractor's expected profit based on variable estimated and actual costs. In all cases, contractor profits increase as the accuracy of their cost estimate increases. Because the government's utility is maximized when truthful cost estimates lead to budget fidelity, the equilibrium condition that maximizes the contractor's utility simultaneously improves government efficiency.

Table 2. Contractor Profit Using Quadratic Penalty

Contractor Profit											
Cost Estimate (Ĉ)	Actual Cost (C)										
	90	92	94	96	98	100	102	104	106	108	110
90	20	18	12	2	-12	-30	-52	-78	-108	-142	-180
92	18	20	18	12	2	-12	-30	-52	-78	-108	-142
94	12	18	20	18	12	2	-12	-30	-52	-78	-108
96	2	12	18	20	18	12	2	-12	-30	-52	-78
98	-12	2	12	18	20	18	12	2	-12	-30	-52
100	-30	-12	2	12	18	20	18	12	2	-12	-30
102	-52	-30	-12	2	12	18	20	18	12	2	-12
104	-78	-52	-30	-12	2	12	18	20	18	12	2
106	-108	-78	-52	-30	-12	2	12	18	20	18	12
108	-142	-108	-78	-52	-30	-12	2	12	18	20	18
110	-180	-142	-108	-78	-52	-30	-12	2	12	18	20

Following the derivation of the truth-telling condition ($\hat{C} = C$), the model must be operationalized within the MDAP environment. While the mathematics demonstrate incentive compatibility, translating these relationships into actionable policy requires linking each parameter to observable acquisition data. The participation bonus, b, and penalty weight, λ, act as management levers that contracting officers can adjust in proportion to program risk, technical maturity, and monitoring capability. Low TRL systems have substantial technical uncertainty. In this case, the penalty weight should remain small to avoid penalizing normal variance while the participation bonus should be increased to promote participation. High cost estimate variance is another signal of uncertainty. In this case the penalty weight should be moderate and more emphasis may be placed on milestone achievement rather than cost estimate accuracy. When oversight quality is high the penalty weight should be increased in order to strengthen the link between the participation bonus and truth-telling behaviors. Therefore, shifts in uncertainty and risk should influence changes in both the participation bonus and penalty weight as the program moves through the MDAP life cycle.

In the earliest phases of development, technical and cost uncertainty are highest and government visibility into contractor activity is lowest. Under these conditions, the government should apply a low penalty weight ($\lambda = 0.1$–0.3) to avoid discouraging truthful cost reporting through excessive penalty exposure. Simultaneously, the participation bonus should be set relatively high to compensate the contractor for entering into an agreement with high uncertainty. As programs progress into the EMD phase, information asymmetry begins to decline and designs are more stable. At this stage, the penalty weight can be increased ($\lambda = 0.3$–0.6), adjusting the risk ratio and tightening the tie between truth-telling and incentive outcomes. The participation bonus may also be reduced as risk decreases and cost estimates become more reliable. When the program is approaching LRIP/FRP, technical maturity and observability are typically sufficient to justify high penalty coefficients ($\lambda = 0.7$–1.0) with minimal to no participation bonus. At this maturity level, the model naturally transitions toward a FFP contract strategy where the incentive mechanism is largely embedded in profit. This evolution preserves incentive alignment without imposing excessive administrative burden.

While the quadratic penalty function effectively addresses adverse selection by incentivizing truthful cost reporting during the pre-award phase, it does not resolve the related but distinct issue of moral hazard that arises in the post-award phase of the contract life cycle. Once performance begins, the contractor's internal level of effort, resource allocation, and managerial decisions are difficult for the government to observe. Because the penalty term in this model depends solely on the difference between reported and actual costs, the contractor's utility is unaffected by how diligently effort is applied so long as final costs remain near target costs. In this way, the model encourages truth-telling during the pre-award phase, but does not reward post-award efforts. Rather, it encourages shirking. The result is a contract that aligns information, but not motivation.

While the quadratic penalty function improves ex ante efficiency through inducing truth-telling, it does not guarantee (and, in some cases, discourages) ex post efficiency in execution. The absence of a direct linkage between the contractor's exerted effort and compensation leaves the moral hazard problem unresolved. To address both hidden information and hidden efforts, an augmented mechanism that integrates the penalty function's truth-telling property with performance-contingent reward structure is necessary. The mechanism presented by Wang and San Miguel (2013) satisfies this requirement by embedding both information and effort incentives. The next section will demonstrate how their model corrects for both adverse selection and moral hazard within the CPIF framework.

C. COMBATING MORAL HAZARD WITH MECHANISM DESIGN

The government is unable to perfectly observe how the contractor allocates resources or manages technical challenges (i.e., contractor performance) during the post-award phase. This unobservable action—known as moral hazard—creates a second layer of inefficiency in which the contractor may exert less effort while still earning satisfactory profit if cost targets are met. To resolve both hidden information and hidden efforts, this study incorporates the BBCPS developed by Wang and San Miguel (2013).

This model begins with the standard CPIF structure where:

$$P = c + \pi(c),$$

and:

$$\pi\ (c) = \ \alpha + \beta * (TC - c).$$

Upon review of the previous model, it can be seen that P (price) is similar to t (transfer/payment to the contractor), c (cost) is similar to C (actual cost), α (target profit, an incentive term) is similar to b (participation bonus), β (cost share parameter) is similar to λ (penalty weight coefficient), and TC (target cost) is similar to $\hat{C}$ (reported cost estimate). In both the standard CPIF structure and the previous model, the target profit/ participation bonus and cost share parameter/penalty weight coefficients are constants. While the variables and structures of the two equations are very similar, this traditional CPIF structure does not include a quadratic function for cost variance. Thus, the contractor shares in cost overruns/underruns as a built-in penalty/reward function to encourage cost-saving behavior post-award. The risk associated with the traditional CPIF structure is that the government generally does not have adequate information to determine an accurate target cost. If the target cost is set too high, then the government pays too much and the contractor receives unfair profits. If the target cost is set too low, then cost overruns are unavoidable and the contractor is unfairly penalized.

The goal of the mechanism is to retain the appropriate cost sharing and incentive to exert cost saving efforts provided by the standard CPIF structure and to modify the parameters to induce truth-telling. Instead of applying a quadratic penalty, the BBCPS modifies this equation to make both the incentive term (α) and the cost share parameter (β) variable functions of target cost. Wang and San Miguel (2013) use Reichelstein (1992) to produce the following equation:

$$\pi(c, \overline{TC}) = \ \alpha(\overline{TC}) + \beta(\overline{TC}) * (\overline{TC} - c),$$

and the following restrictions are applied:

$$\alpha\prime(\overline{TC}) < \ 0, \alpha\prime\prime(\overline{TC}) > \ 0, and\ \beta(\overline{TC}) = \ -\alpha\prime(\overline{TC}).$$

Since the first derivative is the slope of the original function, the conclusion can be drawn that target profit decreases as target cost increases. Similarly, since the second derivative is the slope of the first derivative, the rate of profit change decreases as target cost increases. This is visually depicted in Figure 5.

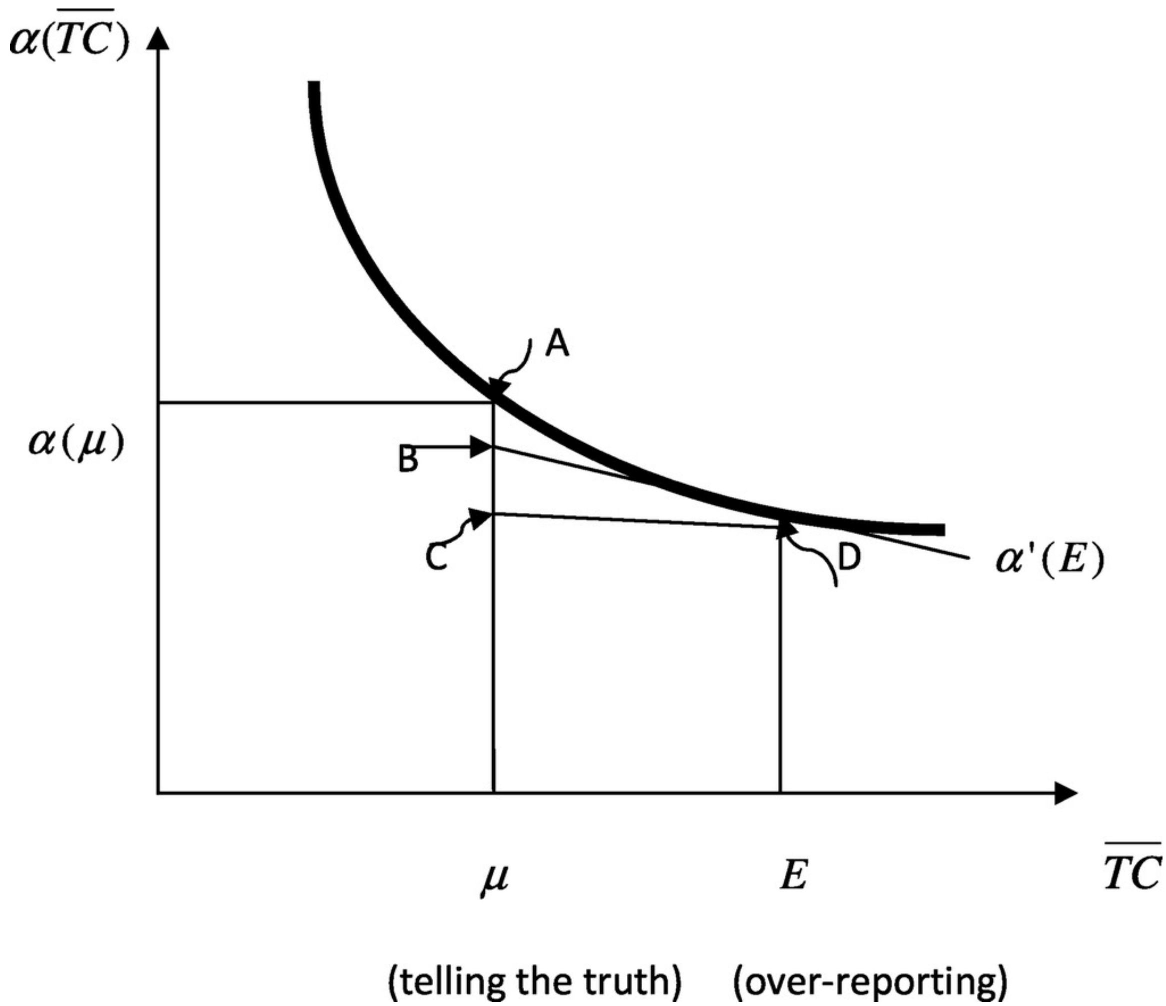

Figure 5. Incentive Term in Relation to Target Cost and Example of Over-Reporting. Source: Wang and San Miguel (2013, p. 12).

Figure 5 also displays an example of over-reporting. In this case, target cost is represented by E and real expected cost (i.e., the truth) is represented by μ. The result is the incentive term decreases as target cost increases, $\alpha(E) < \alpha(\mu)$ if $E < \mu$. In order for this mechanism to promote truth-telling, the reward for cost underruns must be less than the potential increase in the incentive term if the contractor provided accurate target cost. Graphically, the truth-telling mechanism is proven true because $BC < AC$. ΔBCD can also be used to validate the truth-telling mechanism mathematically. By substituting equations into the inequality $BC < AC$, Wang and San Miguel (2013, p. 11) derive the following:

$$\alpha(E) + \beta(E) * (E - \mu) < \alpha(\mu).$$

In the case of under-reporting the truth-telling mechanism continues to hold true because the penalty for cost overruns is greater than the potential increase in the incentive term. Therefore, truth-telling is the dominant function which addresses the adverse selection problem inherent to principal-agent relationships. Furthermore, allowing the contractor to share in cost-savings promotes efficient contractor behavior. This alignment of objectives addresses the moral hazard associated with post-award contractor performance. Therefore, it can be said that this mechanism improves ex ante efficiency through inducing truth-telling and promotes ex post cost-saving efficiency in execution.

This section demonstrated how the BBCPS mechanism presented by Wang and San Miguel (2013) embeds both information and effort incentives. In order to use this mechanism in practice, the incentive term and cost share parameter must be defined and an execution strategy must be established. The next section will demonstrate how the mechanism can be operationalized by defining the variables and developing an employment strategy.

D. OPERATIONALIZING THE BBCPS

The BBCPS mechanism is capable of combating both hidden information and hidden efforts. The practical application of this tool relies on derivation of the incentive term (α) and cost share parameter (β). Furthermore, an effective contract method, where contract method "refer [s] to the process used to solicit, request, or invite bids, quotes, or offers with the intent to award a contract" (NCMA, 2023, p 165), must be used to maximize effectiveness.

Wang and San Miguel (2013) propose the following variable definition (p. 12):

$$\alpha(\overline{TC}) = \frac{N}{\overline{TC}},$$

$$\beta(\overline{TC}) = \frac{N}{\overline{TC}^2},$$

$$\pi(c, \overline{TC}) = \frac{N}{\overline{TC}} + \frac{N}{\overline{TC}^2} * (\overline{TC} - c).$$

In this expression, N is the critical truth inducing element. In order for the mechanism to function properly, N must be constant. N is calculated using the target cost and target profit using the following calculation:

$$N = \overline{TC} \times target\ profit \times 100.$$

Therefore, if target cost is 100 and target profit rate is 10% then N is calculated as 1,000. Table 3 shows the contractor profit pool as target cost and actual cost vary when N = 1,000. For every actual cost column, the most profitable option is to provide an accurate target cost. This numerically justifies that the mechanism is truth-inducing. In addition, for every target cost row, the contractor has an opportunity to increase profits by reducing actual costs. This numerically justifies that the mechanism aligns cost-saving objectives of both parties.

Table 3. Contractor Profit Pool Utilizing Budget Based Cost-Plus Incentive Scheme

Contractor Profit (N = 1,000)											
Target Cost	Actual Cost										
	$85.00	$88.00	$91.00	$94.00	$97.00	$100.00	$103.00	$106.00	$109.00	$112.00	$115.00
$85.00	$11.765	$11.349	$10.934	$10.519	$10.104	$9.689	$9.273	$8.858	$8.443	$8.028	$7.612
$88.00	$11.751	$11.364	$10.976	$10.589	$10.201	$9.814	$9.427	$9.039	$8.652	$8.264	$7.877
$91.00	$11.714	$11.351	$10.989	$10.627	$10.264	$9.902	$9.540	$9.178	$8.815	$8.453	$8.091
$94.00	$11.657	$11.317	$10.978	$10.638	$10.299	$9.959	$9.620	$9.280	$8.941	$8.601	$8.262
$97.00	$11.585	$11.266	$10.947	$10.628	$10.309	$9.990	$9.672	$9.353	$9.034	$8.715	$8.396
$100.00	$11.500	$11.200	$10.900	$10.600	$10.300	$10.000	$9.700	$9.400	$9.100	$8.800	$8.500
$103.00	$11.405	$11.123	$10.840	$10.557	$10.274	$9.992	$9.709	$9.426	$9.143	$8.860	$8.578
$106.00	$11.303	$11.036	$10.769	$10.502	$10.235	$9.968	$9.701	$9.434	$9.167	$8.900	$8.633
$109.00	$11.194	$10.942	$10.689	$10.437	$10.184	$9.932	$9.679	$9.427	$9.174	$8.922	$8.669
$112.00	$11.081	$10.842	$10.603	$10.364	$10.124	$9.885	$9.646	$9.407	$9.168	$8.929	$8.689
$115.00	$10.964	$10.737	$10.510	$10.284	$10.057	$9.830	$9.603	$9.376	$9.149	$8.922	$8.696

A multi-stage contract method is most appropriate in order to utilize the mechanism. The first stage is variable determination and solicitation. During this stage, the government must propose a value for N. The government will complete a comprehensive cost-estimate and determine target profit using DD Form 1547 Record of Weighted Guidelines Application. Once the value of N is established, then the government can solicit contractors for proposals. The second stage is variable review and negotiations. Variable review is necessary because the contractor is better equipped to produce cost estimates and the government wants to ensure the industrial base is compensated adequately. During this stage, the government must also determine the anticipated cost variance. Some factors to consider when determining anticipated cost variance can be seen in Table 1 and include technical maturity, requirements stability, and integration complexity among others. With updated values for N, target profit, and cost variance, the government can now prepare a menu of contract options to propose to vendors during negotiations using the tool developed by this study. Table 4 is an example menu where the updated values were $100 for target cost, 15% for cost variance, and 10% for target profit.

Table 4. Budget Based Cost-Plus Incentive Scheme Menu of Contracts

Inputs	
GCE	$100.00
Cost Range	15%
Target Profit	10%

Target Cost	N	Share Ratio	Target Fee	Cost Total (TC = c)
$85.00	1,000	0.138	$11.76	$96.76
$88.00	1,000	0.129	$11.36	$99.36
$91.00	1,000	0.121	$10.99	$101.99
$94.00	1,000	0.113	$10.64	$104.64
$97.00	1,000	0.106	$10.31	$107.31
$100.00	1,000	0.100	$10.00	$110.00
$103.00	1,000	0.094	$9.71	$112.71
$106.00	1,000	0.089	$9.43	$115.43
$109.00	1,000	0.084	$9.17	$118.17
$112.00	1,000	0.080	$8.93	$120.93
$115.00	1,000	0.076	$8.70	$123.70

The tool provides additional insights into the cause and effect of each variable in relation to contractor profit. First, as actual cost increases, contractor profit decreases. In addition, cost underruns result in a reward and cost overruns result in a penalty regardless of the value of N. These observations prove the tool promotes cost-saving behavior. Next, when actual cost is held constant, contractor profit is maximized when target cost is equal to actual cost. This proves the tool promotes truth-telling behavior. Finally, contractor profit decreases as the value of N decreases. This highlights the importance of reviewing the N value after the contractor has provided a truthful cost estimate.

The BBCPS is operationalized by determining values for the incentive term and cost share parameter using variable N and implementing a multi-stage contract methodology. This ensures the truth-telling mechanism is preserved throughout the pre-award phase and the cost-saving mechanism is preserved in the post-award phase. The next section will discuss additional benefits resulting from BBCPS implementation

E. OTHER BENEFITS

The mechanism-based framework presented in this chapter offers several additional benefits that extend beyond improved risk allocation and incentive compatibility. Although the primary objective of the model is to balance cost responsibility and performance motivation between the government and the contractor, its structure produces positive secondary effects that strengthen overall program execution.

One benefit involves greater transparency in cost-performance tradeoffs. By quantifying the relationship between cost-sharing ratios, incentive slopes, and expected contractor effort, the model enables program offices to articulate the economic logic behind contract terms with clarity and precision. This transparency reduces ambiguity during internal reviews, milestone decisions, and congressional oversight, which often demand clear justification for contract structures selected in high-visibility MDAPs.

A second benefit involves the model's contribution to institutional learning. The mechanism's structured formulation requires program offices to document assumptions regarding technical maturity, cost variance, and risk posture. These documented assumptions create a durable record that can be revisited in later phases or in subsequent programs. As a result, program offices gain a more consistent basis for comparing planned incentive effects with observed outcomes, strengthening the acquisition community's ability to learn from past contract performance rather than relying on informal institutional memory.

F. RECOMMENDATIONS

The findings in Chapter V show that integrating mechanism-based analysis into defense contracting can enhance MDAP acquisition strategies by strengthening cost discipline, reducing information asymmetry, and improving the alignment between incentives and program risk. Based on this analysis, several recommendations emerge for acquisition practitioners. First, program offices should incorporate mechanism-based risk assessments early in the acquisition process, using economic indicators of information asymmetry, technical maturity, and cost-estimate variance to inform incentive structures alongside traditional risk tools. For MDAP programs, especially in their developmental stage, a risk neutral government, rather than a risk-averse contractor, should bear the majority of the risk. This implies that cost reimbursement contracts should be the primary contracting type in this context. Moreover, traditional cost reimbursement contracts can be modified to a BBCPS scheme to mitigate the drawbacks associated with traditional cost-reimbursement arrangements.

This leads to the second recommendation that, during development, the CPIF structure can be improved by calibrating the incentive term and cost-sharing ratio using the BBCPS mechanism, ensuring more meaningful incentives for truthful reporting and effort when uncertainty is highest. As programs mature, these incentive parameters should be adjusted to reflect greater technical stability and improved cost-estimate fidelity, allowing program offices to transition toward more risk-appropriate contract structures based on measurable indicators rather than precedent or external pressure. Additionally, source selection and negotiation strategies should incorporate mechanism-based logic by using the BBCPS structure to inform incentive tables, cost-sharing ratios, and performance fee arrangements so that negotiations are anchored in quantifiable economic reasoning. To enable wider adoption of these practices, contracting officers, program managers, and cost analysts would benefit from expanded workforce training focused on incentive compatibility, economic modeling, and the practical application of mechanism-based approaches within existing FAR and DFARS authorities. Finally, program offices should integrate mechanism-derived metrics into post-award monitoring by comparing predicted incentive effects with observed outcomes, using these data to recalibrate parameters in later phases and to strengthen institutional learning across programs. Collectively, these recommendations provide a practical pathway for applying the mechanism-based insights developed in this chapter to real-world MDAP acquisition strategies.

G. SUMMARY

Chapter V synthesized the theoretical, regulatory, and institutional insights developed in earlier chapters to evaluate how economic mechanisms can improve incentive alignment in MDAPs. The chapter demonstrated that adverse selection and moral hazard remain persistent challenges in defense contracting because traditional approaches do not fully address hidden information or hidden effort. By applying principal-agent and mechanism-design concepts, Chapter V showed how the Wang and San Miguel (2013) mechanism can be integrated into a cost-plus-incentive-fee structure to strengthen truth-telling incentives, enhance cost realism, and improve effort inducement during early development. The analysis further illustrated how adjusting key parameters such as the cost-sharing ratio, participation bonus, and target-cost baseline allows the mechanism to evolve with an MDAP's technical maturity and cost-estimate precision. This mechanism-based logic provided a structured means of linking risk characteristics to incentive design and offered program offices a more analytically grounded approach to setting and managing incentive arrangements. The chapter concluded by outlining practical recommendations for incorporating these insights into acquisition planning, negotiation, and post-award execution. Together, these findings formed the foundation for translating economic theory into actionable guidance for improving incentive compatibility in defense contracting, thereby preparing the groundwork for the concluding chapter.

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VI. SUMMARY, CONCLUSIONS, AND AREAS FOR FURTHER RESEARCH

This chapter synthesizes the research conducted throughout this capstone and provides a consolidated assessment of the key insights related to risk sharing, incentive structures, and contract design within developmental efforts of MDAPs. Building on the problem identified in Chapter I and the theoretical foundations established in Chapters II through III, this chapter distills the major findings from Chapter V and evaluates their implications for both government acquisition professionals and industry partners. It further presents the overarching conclusions drawn from the research and highlights the practical significance of the proposed recommendations. The chapter concludes by proposing several areas for future research that can continue to advance the understanding and application of economically informed contracting practices.

A. SUMMARY

Despite decades of acquisition reform, MDAPs are consistently criticized for exceeding budget estimates, slipping timelines, and underperforming relative to initial expectations. While the DoD employs a robust set of frameworks to inform contract type selection, there is often a misalignment between contract structure and program maturity. Policymakers often suggest that FFP contracts can be used to mitigate cost, schedule, and performance issues. While this may be an appropriate contract type in later phases of the acquisition life cycle, it contradicts the DoD frameworks for contract type selection in developmental efforts of MDAPs. Furthermore, multiple major defense contractors have reported that they will no longer bid on fixed price developmental contracts reducing competitions and increasing the risk of a no-deal scenario. The frameworks suggest that cost reimbursement contract types provide better risk allocation when levels of uncertainty are high. Even still, cost reimbursement contracts are often used without strong incentive mechanisms to align the objectives of the agent with the principal.

This capstone is motivated by a persistent question: Why do MDAPs so often fall short of cost, schedule, or performance expectations despite available regulatory tools?

This research contends that the absence of a coherent, theory-based framework linking program risk, contractor behavior, and contract type selection is a key contributor. By applying economic models and analyzing historic patterns, this study proposes solutions to equip acquisition professionals with a practical tool for improved contract structure and risk allocation. A central aim of incentive-compatible contract design is to promote truth telling, where contractors disclose accurate cost and technical information rather than concealing or distorting it.

The primary purpose of this capstone is to examine how defense procurement contract types and contract structure, specifically fixed price and cost reimbursement, affect risk allocation, contractor behavior, and program outcomes in MDAPs. This research builds on economic theories to help the government select and design contracts that better align incentives and share risks appropriately across the life cycle of an acquisition program.

This section identified the root cause and motivation for this study. Theoretical modeling and mathematical simulation were used to analyze and solve these issues and provide acquisition professionals with a practical tool to combat information asymmetry when contracting for developmental efforts of MDAPs. The following section provides the significant conclusions resulting from the analysis.

B. CONCLUSIONS

We accomplished the purpose of this study by answering the research questions:

1. What is the optimal contract structure for achieving effective risk-sharing and incentivizing performance in MDAPs?

Our research found that no single contract type is universally optimal for MDAPs. Instead, the most effective structure is a dynamic, risk-adaptive incentive model that evolves with program maturity. Early development phases where technical risk and uncertainty are highest require cost reimbursement contract types with strategic incentive design that promote truth telling and share risk appropriately. As the program matures and risk decreases, fixed price contract types become more appropriate and efficient. The core solution is aligning contract structure to the actual risk profile for each phase of the acquisition life cycle.

2. How does contract type affect contractor behavior in terms of cost control, schedule adherence, and technical performance?

The research demonstrated that contract type directly influences contractor behavior in cost management, schedule adherence, and performance quality. Fixed price contracts motivate aggressive cost control and schedule discipline but can cause risk-averse behavior. Cost reimbursement contracts encourage contractor participation in high-risk efforts but weaken cost discipline unless proper contract structure is applied through meaningful incentives. The solution is designing incentive-compatible parameters (i.e., target profit and share ratio) that reward desirable efforts and align objectives without shifting excessive risk onto industry prematurely.

3. How does asymmetric information between government and contractors affect contract outcomes, and what mechanisms can help mitigate cost growth, schedule overruns, and insufficient performance?

Information asymmetry was shown to be a primary driver of cost growth, schedule overruns, and technical shortfalls in developmental efforts of MDAPs. Offerors/contractors possess private knowledge about true costs, risks, and effort levels, allowing for strategic bidding or delayed disclosure under poorly designed contracts. Our research found that truth-telling mechanisms, such as BBCPS, significantly reduce information rents and improve reporting accuracy. This mechanism, combined with the appropriate contract type selection and contract method mitigate the effects of asymmetric information and will produce more reliable program outcomes.

C. AREAS FOR FURTHER RESEARCH

Given additional time for research, implementation, and experimentation, the authors recommend the following areas for further research. These topics would expand the applicability of the BBCPS tool, validate real-world performance of the BBCPS tool, and provide insights to further improve the government's position while combating information asymmetry due to the principal-agent relationship in acquisitions.

1. Adapt Budget Based Cost-Plus Incentive Scheme as an Incentive for Performance and Schedule

Further research should explore how the BBCPS could be adapted specifically to incentivize measurable improvements in schedule adherence and technical performance. Current incentive tools often fail to create strong, timely signals that motivate contractors to prioritize schedule or performance outcomes. Using the BBCPS tool, as structured in this study, primarily aligns objectives for cost adherence. Studying adaptations to BBCPS would reveal how incentivizing multiple outcomes can better align contractor efforts with government objectives when schedule and technical performance are the focus. This research would help the DoD create more balanced, multi-dimensional incentive models that further reduce delays and enhance capability delivery.

2. Applicability of Budget Based Cost-Plus Incentive Scheme outside of Developmental Efforts in Major Defense Acquisition Programs

Research is needed to determine whether the BBCPS tool can be effectively applied in other phases of the acquisition life cycle where risk dynamics and contractor behavior differ in order to improve cost, schedule, and/or performance outcomes. This research shows that an adaptive contract design is required to maximize efficiency and properly allocate risk. However, exploring the effectiveness of incentive alignment using the BBCPS tool in other efforts and phases of MDAPs could reveal where the structure enhances cost realism or performance outcomes and where it might create distortions or unnecessary administrative complexity. This work would provide scalability of BBCPS across the MDAP life cycle and inform broader contracting strategy.

3. Test and Implement Budget Based Cost-Plus Incentive Scheme in Developmental Efforts for Major Defense Acquisition Programs

Testing the BBCPS tool and contract method in early development phases would allow researchers to evaluate how well the model truly performs in high-uncertainty environments where asymmetric information and technical risk are prevalent. Pilot implementations could measure impacts on forecasting accuracy, contractor risk-sharing behavior, and transparency in reporting. The findings would not only validate the model, but also offer evidence-based guidance for refinement, training, or policy integration. Ultimately, this research would determine whether the BBCPS tool can serve as a viable, standardized incentive tool for future developmental efforts.

4. Evaluate Contractor Rationality when Presented with Budget Based Cost-Plus Incentive Scheme

The conclusions of this study assume rational contractor behavior. However, because contractor behavior directly impacts incentive effectiveness, research must evaluate whether contractors perceive the BBCPS tool and the menu of contracts as rational, fair, and profit-maximizing within their decision frameworks. Understanding contractor rationality would help the DoD appropriately design incentives that align objectives. This research is essential to determine whether the BBCPS tool will function as intended in real-world negotiations.

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