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Adaptive Acquisition Framework: Effectiveness of the Middle Tier of Acquisition Pathway

June 2024

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Prepared for the Naval Postgraduate School, Monterey, CA 93943

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ABSTRACT

The Adaptive Acquisition Framework (AAF) was created to provide the warfighter with innovative technologies and new capabilities at the speed of relevance. While the AAF has six pathways, the middle tier of acquisition (MTA) pathway focuses on delivering rapid capabilities through rapid prototyping or fielding. However, due to the pathway's infancy, how effective it is at delivering its objective needs to be clarified. This limited the research and analysis to MTA rapid prototyping (MTRP) as the primary focus. The initial metric to measure effectiveness was to conduct a statistical analysis of all completed MTRP programs from the Defense Acquisition Visibility Environment (DAVE) in a pass/fail capacity. Through hypothesis testing and a sample size of 55 programs, the findings concluded that the probability of a system being transitioned/restructured would fall between 71.2% (39/55) and 92.2% (50/55). Additionally, the analysis tried to form a correlation between programs reported on by the Government Accountability Office (GAO) and those found in DAVE to identify trends, factors, or inconsistencies that could influence success, but to no avail. However, DAVE proved ineffective at providing enough information to evaluate effectiveness at this level. It is recommended that a case study be performed against two programs of similar nature, one considered a success vs. a failure, to determine best practices for gauging effectiveness.

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ABOUT THE AUTHORS

William Perdue enlisted in the United States Marine Corps (USMC) as an 0811 cannoneer in 2005. He has deployed to Japan in support of a Unit Deployment Program (UDP) and has two tours to Iraq in support of Operation Iraqi Freedom (OIF) as Task Force Military Police (MP). After enlistment, he pursued a bachelor's degree in Mechanical Engineering at Cal Poly Pomona and graduated during the summer of 2014. While attending school, he began an internship at the Naval Surface Warfare Center (NSWC), Corona Division. After graduation, he served as a combat systems analyst under the Performance Assessment (PA) Department for the USMC branch. He would later become the Analysis Lead for the Counter Battery block of the Ground/Air Task Oriented Radar (G/ATOR) Block 2 in 2018. This would translate into the overall Analysis Lead of G/ATOR in 2021. Since then, he married his wife Cory in September 2020, and they welcomed a baby girl in November 2022. In his free time, Perdue enjoys playing a round of golf with occasional video games here and there. He was selected as a Technical Project Manager (TPM) for NSWC Corona's Special Operations Division under the PA Department in January 2023. He will continue to serve in this position after graduation.

Tania I. Teissonniere-Almodóvar graduated from the University of Puerto Rico at Mayaguez in 2014 with a degree in Mechanical Engineering. After graduation, Tania worked as a Project Coordinator for the family's rigging and transportation company in Ponce, Puerto Rico. In May 2015, Tania was the first of her family to move to the mainland, where she would reside in Philadelphia, Pennsylvania, for the next eight years. In June 2015, Tania started her work in the Naval Surface Warfare Center (NSWC) Philadelphia Division, Combat Support Systems Branch as one of the In-Service Engineering Agents (ISEA) supporting the Sonar Dome Pressurization System (SDPS) aboard DDG-51 and CG-47 ship classes. Her primary role is managing shipboard overhauling efforts and training the Fleet on SDPS maintenance and operation. Tania currently resides in Pennsauken, New Jersey, where she lives with her partner and two dogs, Diego and Apolo. She enjoys the outdoors, going camping with friends, and has recently started learning to fish. After graduation, Tania plans to expand her leadership

competencies and seek new, challenging career opportunities. Furthermore, she aims to continue growing.

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TABLE OF CONTENTS

LIST OF FIGURES

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LIST OF TABLES

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LIST OF ACRONYMS AND ABBREVIATIONS

AAF	Adaptive Acquisition Framework
ACAT	Acquisition Category
ADM	Acquisition Decision Memorandum
AIR	Acquisition Information Repository
AIS	Automated Information System
APB	Acquisition Program Baseline
ASD	Assistant Secretary of Defense
AVDF	Acquisition Visibility Data Framework
BA	Budget Activity
CAE	Component Acquisition Executive
CAP	Capstone Applied Project
CAPE	Cost Assessment and Program Evaluation
CDD	Capability Development Document
CDR	Capability Design Review
DA	Decision Authority
DAE	Defense Acquisition Executive
DAF	Department of the Air Force
DAMIR	Defense Acquisition Management Information Retrieval
DAS	Defense Acquisition System
DAU	Defense Acquisition University
DAVE	Defense Acquisition Visibility Environment
DOD	Department of Defense
DODD	Department of Defense Direction
DODI	Department of Defense Instruction
DOTE	Director, Operational Test and Evaluation
EMD	Engineering Manufacturing Development
FY	Fiscal Year
GAO	Government Accountability Office
IG	Inspector General
INA	Information Not Available

IOC	Initial Operational Capability
IOT&E	Initial Operational Test and Evaluation
IT	Information Technology
JCIDS	Joint Capabilities Integration and Development System
KA	Knowledge Attained
KNP	Knowledge Not Planned
KP	Knowledge Planned
LRIP	Low-Rate Initial Production
MCA	Major Capability Acquisition
MCAP	Major Capability Acquisition Program
MDA	Milestone Decision Authority
MDAP	Major Defense Acquisition Program
MDD	Materiel Development Decision
MRL	Manufacturing Readiness Level
MSA	Material Solutions Analysis
MTA	Middle Tier of Acquisition
MTRF	Middle Tier Rapid Fielding
MTRP	Middle Tier Rapid Prototyping
NA	Not Applicable
NDA	Non-disclosure Agreement
NDAA	National Defense Authorization Act
OSD	Office of the Secretary of Defense
OUSD(A&S)	Office of the Under Secretary of Defense for Acquisition and Sustainment
PE	Program Element
PEO	Program Executive Office
PID	Program Identification Data
PM	Program Manager
PMO	Program Management Office
PMRT	Program Management Resource Tool
POC	Point of Contact
POR	Program of Record
PPBE	Planning, Programming, Budgeting, and Execution

RFP	Request for Proposal
SAR	Selected Acquisition Reports
SecAF	Secretary of the Air Force
SECDEF	Secretary of Defense
SECNAV	Secretary of the Navy
So-p	Special Operations–Particular
SOFCIDS	Special Operations Forces Capabilities Integration and Development System
TMRR	Technology Maturation and Risk Reduction
TRL	Technology Readiness Level
U.S.	United States
UCA	Urgent Capability Acquisition
USC	United States Code
USD(A&S)	Under Secretary of Defense for Acquisition and Sustainment
USD(R&E)	Under Secretary of Defense for Research and Engineering
USMC	United States Marine Corps
USN	United States Navy
USSF	United States Space Force
USSOCOM	United States Special Operations Command
VCJCS	Vice Chairman of the Joint Chiefs of Staff

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I. INTRODUCTION

A. PROBLEM STATEMENT

The middle tier of acquisition (MTA) process began as a response to Section 804 of the National Defense Authorization Act (NDAA) Fiscal Year (FY) 2016, which required the Department of Defense (DOD) to establish guidance for an alternative acquisition process within the Defense Acquisition System (DAS), which is now referred to as the Adaptive Acquisition Framework (AAF) (National Defense Authorization Act, 2015). This is in an effort to keep pace with innovation and for the DOD to maintain its foothold in military advantage over its adversaries. It is through "The Law of Accelerating Returns" that society sees that technology is expanding exponentially (Hofstadter & Teuscher, 2005). The ability to predict its trajectory is slipping by the day and new methods by which programs are developed must adapt to meet this change. To combat this impact, the AAF process contains six pathways: urgent capability acquisition, the MTA, major capability acquisition, software acquisition, defense business systems, and acquisition of services, as seen in Figure 1.

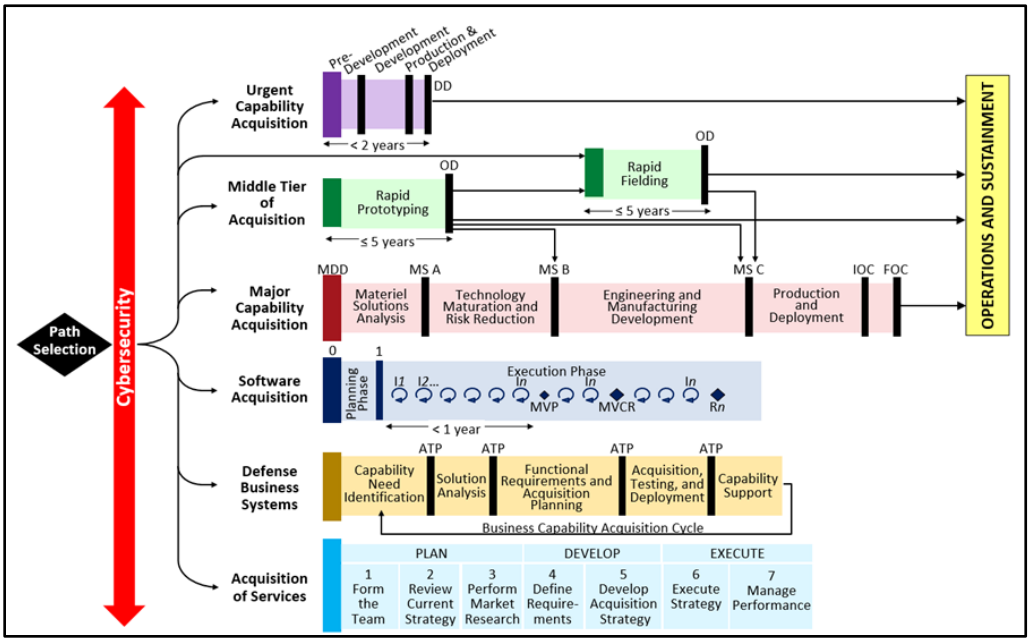

Figure 1. AAF. Adapted from Under Secretary of Defense for Acquisition and Sustainment (USD[A&S]), (2022a, 2022b).

While there is a surge of programs leveraging the MTA acquisition pathway, to date, there are limited studies and research to prove that it delivers rapid capabilities effectively to the warfighters (GAO, 2023, p. 2). The goal of the MTA pathway is to streamline and expedite those rapid capabilities within two to five years of an acquisition program's start. Programs that have recently leveraged the MTA pathway should achieve that five-year mark now or in the immediate future, expanding the data in this field.

> MTA pathways are distinct from the major capability pathway intended for [major defense acquisition programs] (MDAPs). These MTA pathways allow for programs to be exempted from the acquisition and requirements processes defined by DOD Directive 5000.01 and the Chairman of the Joint Chiefs of Staff Instruction 5123.01H, which outlines processes to implement DOD's traditional requirements process. (GAO, 2020, p. 14)

Another distinct caveat to the MTA pathways is that there is no dollar threshold currently in existence (Defense Acquisition University [DAU], n.d.). However, only programs exceeding the MDAP dollar thresholds require written approval from the Under Secretary of Defense for Acquisition and Sustainment (USD[A&S]) before using the MTA pathway (Office of the Under Secretary of Defense [OUSD], 2019b, p. 5). This research focuses on the MTA pathway as it employs rapid prototyping and rapid fielding to meet the new speed of acquisition to be effective for the warfighter.

B. RESEARCH QUESTIONS

The MTA pathway complements the other AAF pathways, specifically the major capability acquisition pathway. It delivers fieldable prototypes or produces and fields a full capability to the warfighter within two to five years. However, due to the infancy of the MTA pathway, it is debatable what is considered effective. Is it acceptable to sacrifice performance to meet the two-to-five-year schedule? Is not having a cost threshold still considered effective? This research intends to study the effectiveness of the MTA pathway. This will be evaluated from the following research questions:

1. Of the MTA efforts, what percentage have done rapid prototyping, and what percentage were rapid fielding?
2. Of the rapid prototyping efforts, what percentage was completed within five years?
3. Of the rapid prototyping efforts, what percentage transitioned to a program of record (POR)?

C. METHODOLOGY

The analysis to determine whether the MTA pathway is effective will cover a variety of methods such as qualitative, quantitative, statistical, cost-effective, root cause, and process mapping. Early analysis was conducted using the Defense Acquisition Visibility Environment (DAVE) database as the primary source for research. This database allowed the researchers to sort through a vast array of DOD programs to reflect the ones that have employed the MTA pathway. Once filtered, research was then able to determine which Services used the MTA pathway, rapid prototyping or rapid fielding, program description, and the active status of the program (i.e., active, terminated, transitioned/restructured, or residual capability). Additional analysis was built on the research base from DAVE and was further evaluated through past GAO reports and the DOD Inspector General (IG) audit. These reports provided substantiating documentation to support the analysis, such as root cause analysis for the activity status on most programs. GAO expanded on the lack of oversight for MTA programs from 2018 to 2023.

D. LIMITATION AND SCOPE

To limit the research, this analysis focuses only on programs leveraging rapid prototyping rather than rapid fielding. This allowed the researchers to have a clear vision and focus on the programs that were being evaluated. From the rapid prototype path, programs were then assessed by branches of service (United States Marine Corps [USMC], United States Navy [USN], United States Special Operations Command [USSOCOM], Army, Air Force, Space Force, and Coast Guard) and the nature of each MTA. Evaluation of each branch of Service created additional secondary research questions to evaluate effectiveness:

1. Which branch had the most success with MTAs?
2. Which branch had the most failures with MTAs?
3. Which branches are considered statistically relevant following the DAVE data?

The MTA pathway allows each branch to "tailor in" its implementation process, creating different exit criteria for rapid prototyping. Research was further limited to the Department of the Air Force (DAF) and USSOCOM as they were the only branches of Service with enough programs to be considered for statistical significance.

Another limitation considered was evaluating programs that had completed the MTA process only. Active programs from DAVE were excluded, as researchers could not conclude if these programs were effective since they were still being evaluated.

1. Definitions

The following are taken from the DODI 5000.80, *Operation of Middle Tier of Acquisition (MTA):*

- Rapid prototyping—provides for the use of innovative technologies to rapidly develop fieldable prototypes to demonstrate new capabilities and meet emerging military needs (OUSD[A&S], 2019b, p. 3).
- Rapid fielding—This method uses proven technologies to field production quantities of new or upgraded systems with minimal development required (OUSD[A&S], 2019b, p. 3).
- Residual capability—any military utility for an operational user that can be fielded (OUSD[A&S], 2019b, p. 14).

2. Assumptions

Some of the sources and references did not provide guidance on terminology definitions; therefore, assumptions were made to classify each program with the same terminology, as seen in Table 1.

Table 1. Program Status Terminology

Acquisition Status	Definition	Success / Partial Success / Non-Success
Transitioned/ Restructured	Moved to existing acquisition program	Success
	Transitioned to a new program	
	Moved to a different acquisition pathway	
	Transitioned to a rapid fielding MTA effort	
	Schedule slip or re-baseline greater than five years	Partial Success
Terminated	Failed	Non-Success
Residual Capability	Produced and fielded a capability	Success

There are several concepts of varying degrees of success and failure. The ones this capstone applied project (CAP) uses are from Harold Kerzner's *Project Management,* 13th edition, from March 2022:

- Complete Success—The project met the success criteria, created value, and adhered to all constraints.
- Partial Success—The project met the success criteria, the client accepted the deliverables, and value was created, although one or more of the success constraints were unmet.
- Partial Failure—The project was not completed as expected and may have been canceled early in the life cycle. However, knowledge and intellectual property were created that may be used on future projects.
- Complete Failure—The project was abandoned, and nothing was learned from the project (Kerzner, 2022, p. 64).

Kerzner associated "Termination" to a critical business decision that results in canceling a project and the negative impacts that decision (Kerzner, 2022, p. 64).

E. ORGANIZATION

This CAP is structured to provide the reader with details about the MTA process. The next chapter explains the AAF and MTA pathway. That information is then followed by the literature review chapter, which provides detailed documentation on the applied research and how it was used to support the CAP. Chapter IV is the center of gravity of this project; it gives the needed analysis to answer research questions. The last chapter summarizes the contents of this project and supports recommendations for the future of MTAs going forward.

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II. BACKGROUND

This chapter aims to provide the reader with information on rapid prototyping within the MTA pathway. There is a common misconception that only the private sector is responsible for innovation in cutting-edge technologies. However, this is not the case, as specific regulations and procedures, such as the DOD Instruction (DODI) 5000 series, must be followed for a program to be approved for development. While a program would meet government specifications, it would be nearly out-of-date to the present state of innovation according to the *Law of Acceleration* (Hofstadter & Teuscher, 2005). Government acquisition was transitioned to the AAF to correct this issue with the use of the Urgent Capability Acquisition (UCA) pathway and MTA's rapid prototyping and fielding. These instructions are described in DOD Directive (DODD) 5000.01, titled *The Defense Acquisition System,* and the subcategory of the AAF is defined in DODI 5000.02, titled *Operation of the Defense Acquisition Framework* (OUSD[A&S], 2022a, 2022b).

A. CONTEXT

The Defense Acquisition System (DAS) is one of three decision support systems, often called "little a" acquisition, that works together to execute a program's life cycle (Sloane, 2022, p. 11). The remaining support systems are the Joint Capabilities Integration and Development System (JCIDS) and the planning, programming, budgeting, and execution (PPBE). Together, these form the overarching process commonly known as "Big A" acquisition (Mortlock, 2021). Each plays a vital role in delivering needed capabilities to compete in the modern threat environment. PPBE is the process of allocating resources and budgeting, JCIDS is the process of identifying requirements, and DAS is the development or buying of the desired item. See Figure 2 for the integration and relationship of each decision support system.

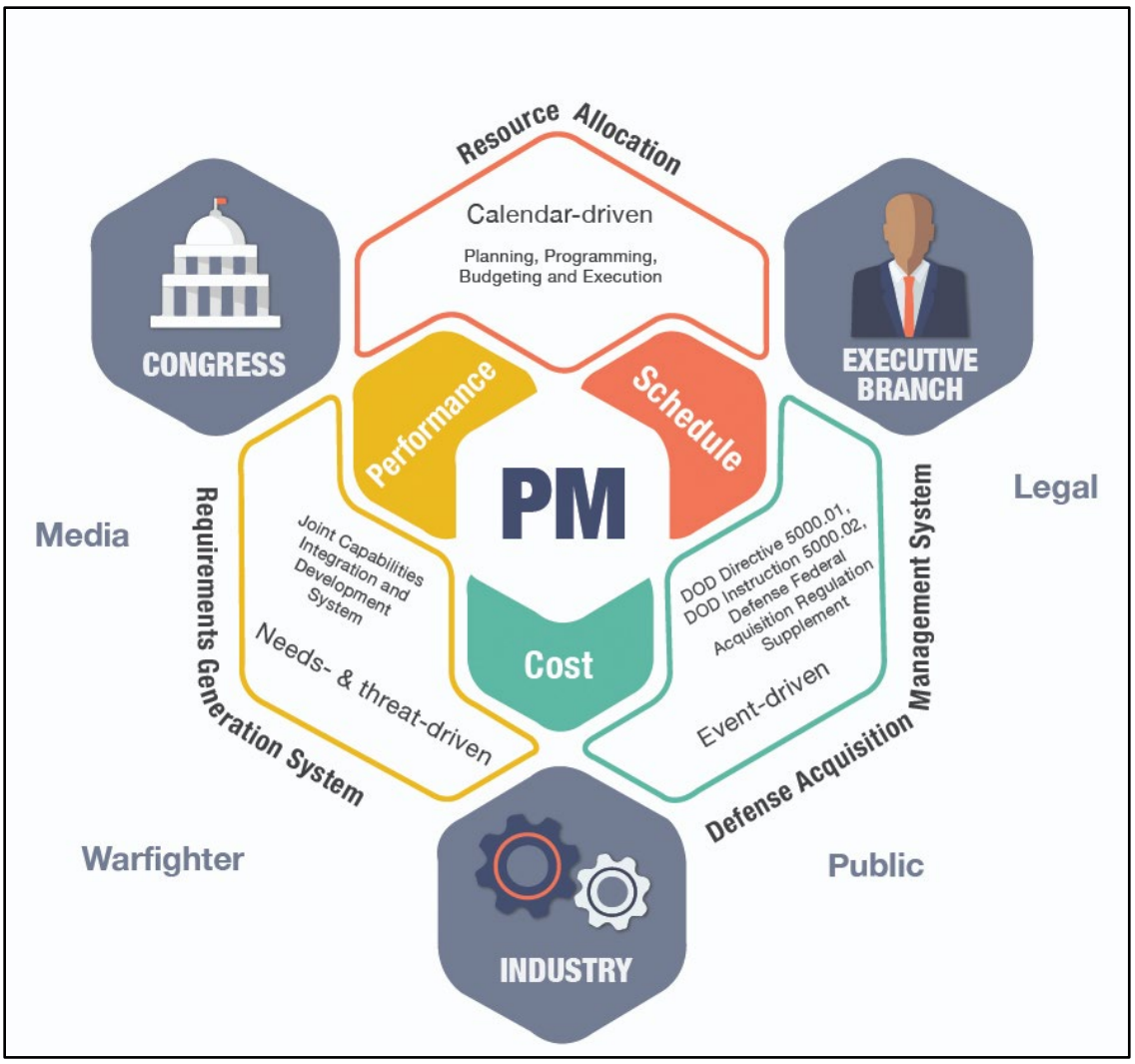

Figure 2. Acquisition Decision Support System. Source: Mortlock (2021).

According to DODI 5000.80 *Operation of Middle Tier Acquisition*, the objective of the DAS is to support the *National Defense Strategy* by developing a more lethal force based on United States (U.S.) performance culture that yields a "decisive and sustained U.S. military advantage" (OUSD[A&S], 2019b, p. 3). "Section 804 of the National Defense Authorization Act for Fiscal Year 2016 (Public Law 114-92) provides authority to the DOD to rapidly prototype and/or rapidly field capabilities under a new pathway, distinct from the traditional acquisition system" (OUSD[A&S], 2018, p. 1).

B. THEORETICAL FRAMEWORK

Kevin Fahey, Assistant Secretary of Defense (ASD) for Acquisition, stated, "The goal of the Adaptive Acquisition Framework is to empower innovation and common-

sense decision-making through the decision-making process while also maintaining discipline in our practices and procedures" (Fahey, 2019). The DAS splits its development programs into Acquisition Categories (ACATs). A program is assigned an ACAT either by the expected cost, level of interest, or both (refer to Figure 3) (OUSD[A&S], 2021, p. 19).

ACAT	Reason for ACAT Designation	Decision Authority

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

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

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

Figure 3. Description of Decision Authority for ACAT I–III Programs. Source: OUSD(A&S) (2021).

Each pathway within the AFF provides the milestone decision authorities (DA), milestone decision authorities (MDAs), and program managers (PMs) the opportunity to match capabilities and requirements to unique acquisition strategies (OUSD[A&S], 2022b, p. 4). The MTA pathway falls between the UCA and Major Capability Acquisition Programs (MCAP) pathways. The following two sections briefly describe the UCA and MCAP pathways.

1. Urgent Capability Acquisition

By the authority in DOD Directive (DODD) 5134.01 and the July 13, 2018, Deputy Secretary of Defense Memorandum, "this issuance establishes policy, assigns

responsibilities, and provides procedures for acquisition programs that provide capabilities to fulfill urgent operational needs and other quick reaction capabilities that can be fielded in less than two years" below ACAT I spending thresholds (OUSD[A&S], 2019c, p. 1).

> The programs under the UCA pathway are highly tailored to expedite the deployment of fielding capabilities to "warfighters currently involved in conflict or preparing for imminent contingency operations with the capabilities needed to overcome unforeseen active threats, achieve mission success, and reduce risk of casualties, as described in *Rapid Fulfillment of Combatant Commander Urgent Operational Needs and Other Quick Action Requirements DODD 5000.71* (OUSD[A&S], 2019c, p. 3).

This is accomplished by streamlining the documentation and reviews required for the deliberate acquisition process (OUSD[A&S], 2019c, p. 10). A drawback of this pathway is the advancement of technical maturity. The "urgent need" does not allow for technology development to be given the same priority to meet the level of threshold requirements as the MTA. "Getting an 80% solution to the warfighter in seven or eight weeks is much more valuable than getting a 95% solution in two years" (DAU, n.d.). Figure 4 describes the notional schedule and milestone activities supporting fielding a quick reaction capability.

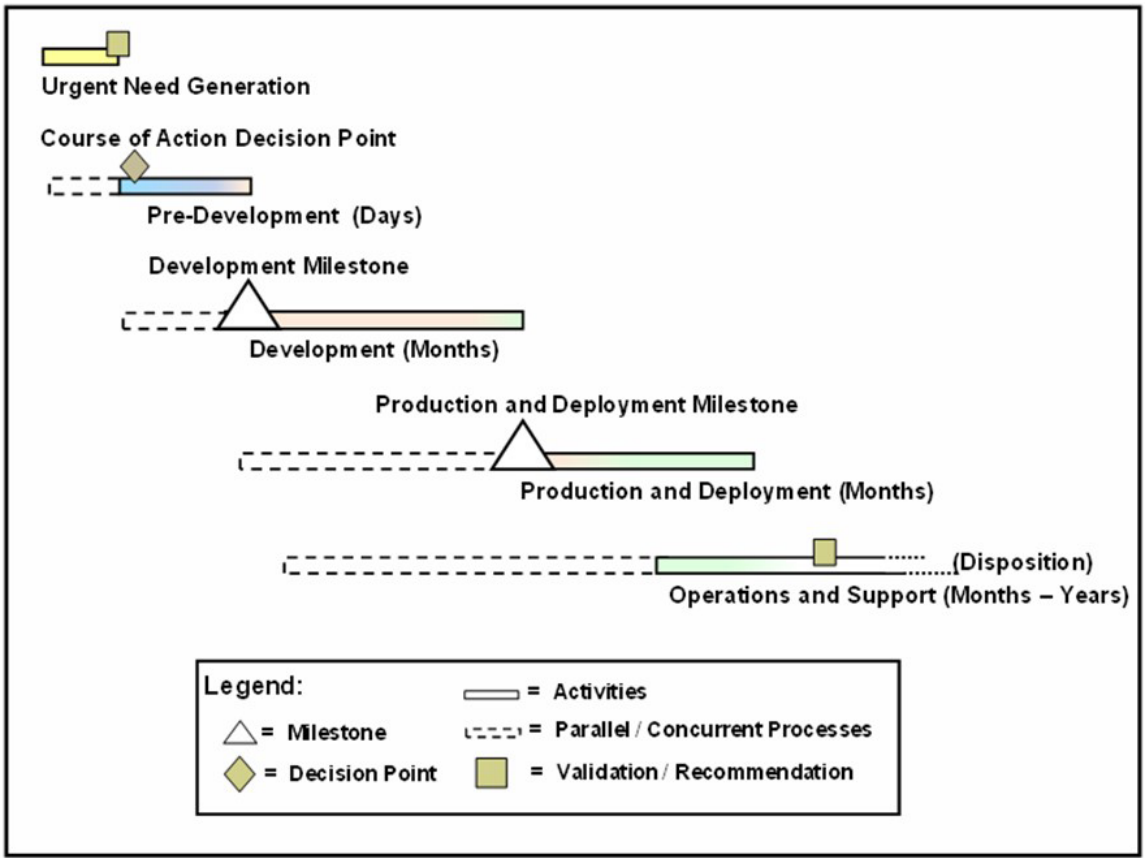

Figure 4. Urgent Capability Acquisition Pathway. Source: OUSD(A&S) (2019c).

2. Major Capability Acquisition Programs

Programs are classified as MDAPs by the MDA or USD(A&S) when they meet or exceed the ACAT I requirements as defined in DOD Instruction 5000.85 "Major Capability Acquisition" (OUSD[A&S], 2021, p. 20). This systematic process requires certain milestones to be met before a project can enter the next phase, as seen in Figure 5. This systematic process begins with a materiel development decision (MDD). DODI 5000.85 also states that when a JCIDS analysis identifies a capability gap/need, the MDD will review and determine if a materiel solution is warranted for that gap/need (p. 7). At the MDD, the MDA decides the milestone to enter (either A, B, or C) depending on the urgency of need, resources, technology readiness levels (TRLs), and manufacturing readiness levels (MRLs) (Mortlock, n.d.). Milestone A is the first decision review; it "approves program entry into the technology maturation and risk reduction (TMRR) phase" (OUSD[A&S], 2021, p.12). This phase is meant to give the project time to further

develop technology to reduce the risk associated with engineering, integration, and life-cycle costs.

> The Milestone B decision authorizes a program to enter the engineering manufacturing development (EMD) phase and commit the required investment resources to support the award of EMD phase contracts. The purpose of the EMD phase is to develop, build, test, and evaluate a materiel solution to verify that all operational and implied requirements, including those for security, have been met, and to support production, deployment, and sustainment decisions (OUSD[A&S], 2021, p, 15).

Milestone B requirements will be satisfied upon releasing two documents: the EMD Request for Proposal (RFP) decision and an approved capability development document (CDD). Lastly, Milestone C is the decision at which a program is authorized to enter the production and deployment phase. This is where a program is granted low-rate initial production (LRIP) approval or starts limited deployment for automated information systems (AISs).

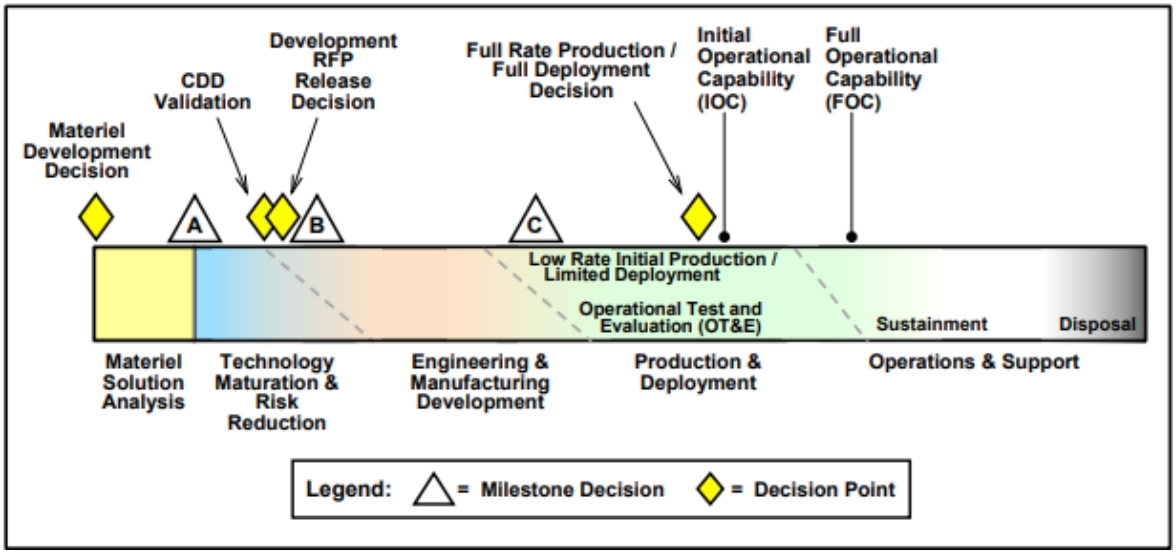

Figure 5. Major Capability Acquisition. Source: OUSD(A&S) (2021).

C. CONCEPTUAL FRAMEWORK

While the AAF has six pathways, this capstone limited its scope to the MTA pathway. This pathway addresses the lack of capabilities within the DAS to procure projects with a level of technical maturity that allows for rapid acquisition. It is defined in DODI 5000.80, *Operations of the Middle Tier of Acquisitions,* and consists of two subset

pathways: rapid prototyping and fielding (OUSD[A&S], 2019b, p. 3). Both paths are designed to streamline the testing and deployment of capabilities in an operational environment within five years. These paths are not subject to the JCIDS Manual and DODD 5000.01 unless specific instructions are provided to do so (OUSD[A&S], 2019b, p. 4). The Office of the Under Secretary of Defense for Acquisition and Sustainment determines when a program is inappropriate for the MTA pathway. It may disapprove programs that exceed the dollar threshold for an MDAP or direct a program using an alternate acquisition pathway (OUSD[A&S], 2019b, p. 5).

1. Rapid Prototyping

The purpose of rapid prototyping is to "provide for the use of innovative technologies to rapidly develop fieldable prototypes to demonstrate new capabilities and meet emerging military needs" (OUSD[A&S], 2019b, p. 3). These needs start with a performance-based process for considering emerging technological advancements communicated by the user community, requirements owner within the services, Joint Chiefs of Staff, or combatant commanders. "This process will result in an approved requirement and a DA-signed acquisition decision memorandum (ADM) that validates the rationale for using the MTA pathway and identifies the full funding required" (OUSD[A&S], 2019b, p. 8). The objective is to produce a prototype that can be "demonstrated in an operational environment" and provide an operational military utility within five years of developing an approved requirement (OUSD[A&S], 2019b, p. 3). Figure 6 provides a rough estimate of how this effort will be scheduled.

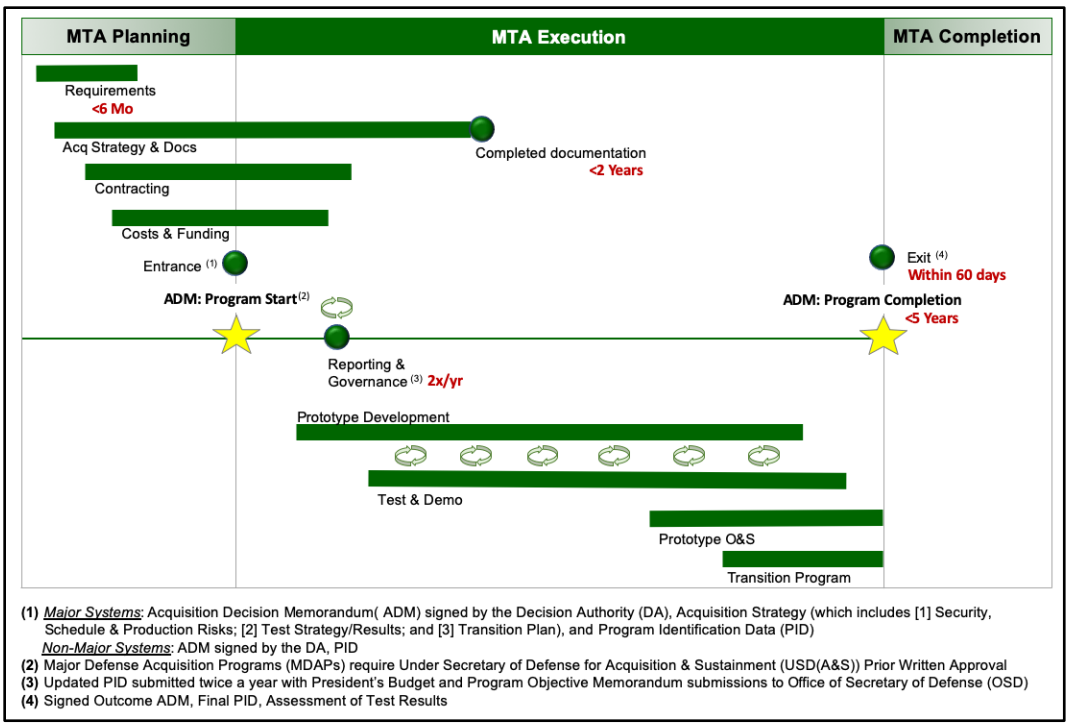

Figure 6. MTA—Rapid Prototyping Path Description. Source: DAU (n.d.).

2. Rapid Fielding

The purpose of rapid fielding is to provide for the use of "proven technologies to field production quantities of new upgraded systems with minimal development required" (OUSD[A&S], 2019b, p. 3). Unlike rapid prototyping, these efforts must begin production within six months of the MTA start date and complete fielding within five years from program start date (OUSD[A&S], 2019b, p. 3). A similar performance-based process to rapid prototyping is employed for consideration when applied rapid fielding. While the other aspect of the MTA pathway focuses on new technologies, this process focuses on existing products (i.e., commercial of the shelf [COTS]) to meet needs communicated by the user community, requirements owner, Joint Chiefs of Staff, and the combatant commanders (OUSD[A&S], 2019b, p. 8). Like rapid prototyping, Figure 7 provides a rough estimate of the schedule of this effort.

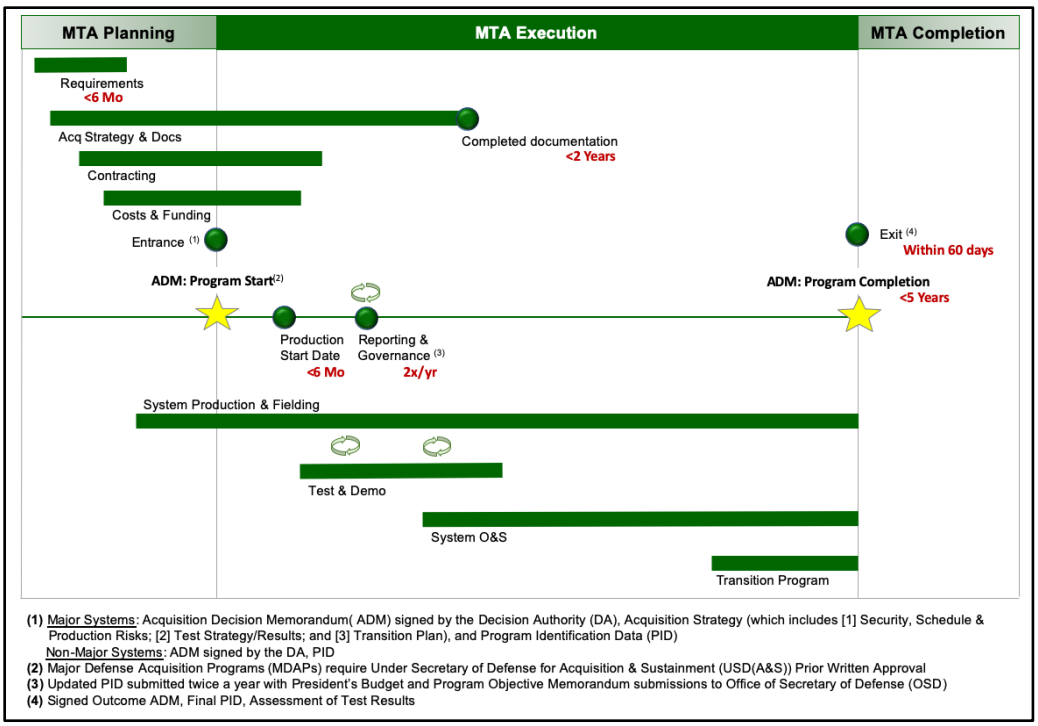

Figure 7. MTA—Rapid Feilding Path Description. Source: DAU (n.d.).

D. PREVIOUS RESEARCH

This CAP continues Kaitlyn Bub's prior research from June 2023, *Analysis of Rapid Prototyping within the DOD* (Bub, 2023). Her CAP factored in the immovable time constraint for rapid acquisition and then analyzed rapid prototyping data to determine the risks and barriers to rapid prototyping projects. In addition, Bub's CAP reviewed a set of projects, concluding that 59% (17 out of 29) of rapid prototyping projects met the five-year schedule objective (Bub, 2023, p. 35). Bub's 2023 report also accounts that the remaining projects (or 41%) that did not comply with the proposed timeline, could encounter a variety of risks, including schedule and funding risks (p. 35).

In contrast, this CAP will address some of Bub's proposed future research areas.

1. What is the probability that an MTA program will transition to a follow-on effort (Bub, 2023, p. 38)?

- This will be addressed by quantitative and statistical analysis from DAVE. The analysis will show (1) how many programs have transitioned into a POR or residual capability since the inception of MTA and (2) a statistical model of how likely a program would transition to a follow-on effort.

2. While schedule is the highest priority of a rapid acquisition effort, what are the effects on cost and performance? If performance is decreased to

meet the schedule, does the program still meet warfighter needs (Bub, 2023, p. 38)?

- These questions are considered in application to the problem statement of this CAP. With schedule being the driver for rapid prototyping, the analysis will show how effective the MTA pathway is for delivering capabilities to the warfighter. This will be evaluated from a qualitative analysis stance where the researcher reviews documentation to weigh the performance of programs as they were delivered to the warfighter. The researchers will also use cost and performance as an evaluation metric against failed MTA rapid prototyping efforts in DAVE.

III. LITERATURE REVIEW

The MTA authority was established in the fiscal year 2016. Considering its recent inception compared to other acquisition processes, the research for this CAP was limited to the studies, reports, and articles released about the subject matter since its introduction in the FY16 NDAA. Nevertheless, available information sheds light on the MTA as an innovative method to acquire and deliver mature technologies faster. This chapter explores the themes, methodologies, findings, connections, and gaps identified throughout the research.

A. RESEARCH THEMES

1. Section 804 of Fiscal Year 2016 National Defense Authorization Act

Section 804 provided the DOD with the authority to establish new guidance for a "middle-tier of acquisition programs" that shall develop, demonstrate, and deliver capable systems to the warfighter between a two- to five-year timeline (NDAA, 2015). The enactment changed the idea of "advanced" acquisition by introducing the MTA to facilitate the rapid prototyping and fielding of innovative and proven technologies to meet emergent mission needs. The new pathway could transform the DOD's competitive edge and technological readiness in many ways.

Section 804 also gave DOD components the responsibility to manage and delegate MTA efforts as they deem appropriate to meet program objectives (NDAA, 2015). This approach would allow organizations to tailor processes, budgets, and practices to fit program requirements, streamline development efforts, and expedite the acquisition of a capability that, under traditional methods, would take more than five years to develop and more than 10 years to field in an operational environment (NDAA, 2015).

2. Middle Tier of Acquisition—A Focus on Speed

The rapid acquisition approach aims to improve the DOD's ability and speed to deliver capabilities to the warfighter. In an era where technology and weapon systems continue advancing at a fast pace, and global threats and adversaries become more real

and technologically dominant, there is a vital need to innovate, not only in the capabilities development area but also in the way those same capabilities are acquired, developed, and fielded. As the former Undersecretary of Defense of Acquisition and Sustainment, Frank Kendall, stated in his memo for the Better Buying Power 3.0 Directive of April 2015:

> the technological superiority of the United States is now being challenged by potential adversaries in ways not seen since the Cold War. Efficiency and productivity are always important, but the military capability we provide our Warfighters is paramount….We must turn our attention increasingly to our ability to innovate, achieve technical excellence, and field dominant military capabilities. (Kendall, 2015, p. 1)

As an innovative approach to acquisition, the MTA pathway facilitates the rapid acquisition and delivery of capabilities at the "speed of relevance" by executing the following:

1. Use of innovative technologies to rapidly develop fieldable prototypes to demonstrate new capabilities and meet emerging military needs. The objective of this effort is to field a prototype meeting defined requirements that can be demonstrated in an operational environment and provide for a residual operational capability within 5 years of the MTA program start date.
2. Use of proven technologies to field production quantities of new or upgraded systems with minimal development required. The objective of an acquisition program under this path will be to begin production within 6 months and complete fielding within 5 years of the MTA program start date (OUSD[A&S], 2019b, p. 3).

Research suggests that rapid acquisition is best achieved through a focus on speed. The MTA pathway is a streamlined approach that removes much of the bureaucracy required for a conventional acquisition process. "MTA programs are exempted from using the JCIDS requirement process and from having to comply with MDAP statutory requirements" (DAU, 2020). MTA allows program executive officials and PMs to customize a process that can, in theory, yield desired results for their program requirements. This approach presents an advantage in accelerating capability development. As stated in article "Middle-tier acquisition authority features flexible prototype and fielding options," published in 2019 in the Army AL&T Magazine and posted in the United States Army website,

> Middle-tier acquisition begins with a blank slate and allows the program, as decision authority, to build an acquisition process appropriate to the capability's maturity and mission needs. This enables programs to field capabilities in two to five years or sooner, versus the seven to 12 years often associated with the traditional acquisition process (Burbey et al., 2019, para. 8).

The MTA authority offers DOD components the opportunity to tailor acquisition strategies according to the unique features and needs of the program, facilitating the deployment of advanced technologies to the warfighters within the required timeframe of five years.

In their research paper about middle tier acquisitions and innovation published in May 2022, Dr. Amir Etemadi, a researcher and assistant professor of engineering, and Dr. John Kamp, a former defense acquisition researcher and professor of engineering at The George Washington University, provide a simplified example of a program schedule plan for a rapid prototyping effort, shown in Figure 8. The example shows four scheduled events, or milestones if you will—program approval or start (St), development start (Milestone B), capability design review (CDR), and delivery (or initial operational capability [IOC]; Etemadi & Kamp, 2022, p. 117–118). In their research, the authors add that the program schedule plan has "three intervals or phases—the time between approval and development start (St.B), the time from development start to design review (B.CDR), and the time from design review to delivery" (Etemadi & Kamp, 2022, p. 118).

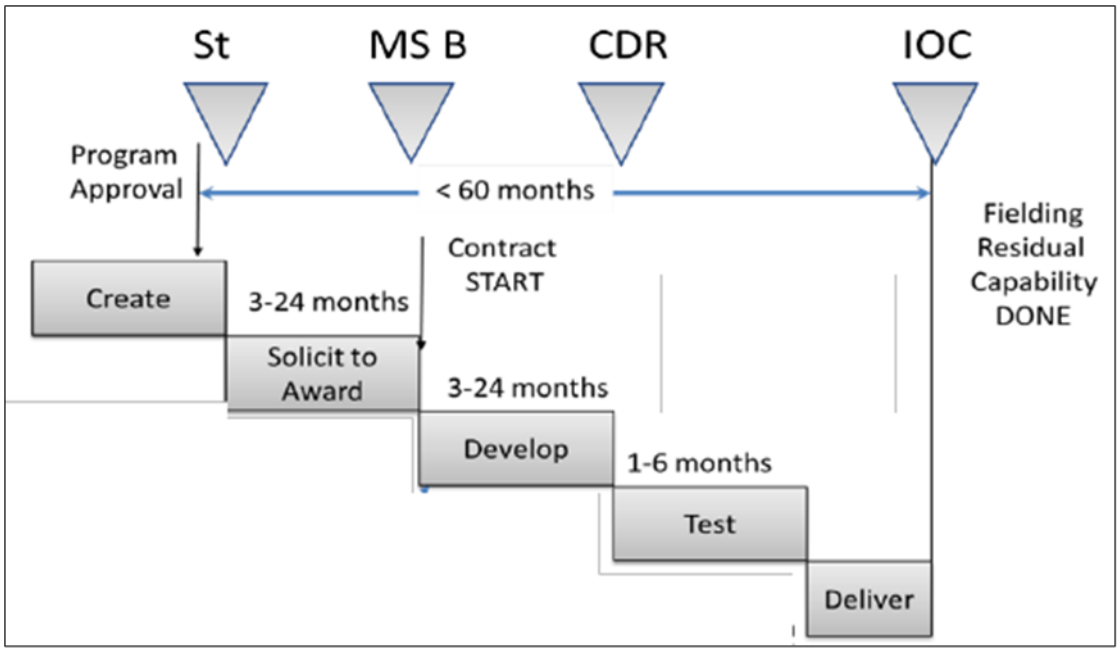

Figure 8. Middle Tier Acquisition Rapid Prototyping Schedule Model. Source: Etemadi and Kamp (2022).

Etemadi and Kamp's research suggests that interval duration and whether the program requirements will be accomplished within the required five years is contingent on the program initiation process, early requirements definition, technical readiness level at MS B, and performance demonstration (Etemadi & Kamp, 2022, p. 118). As per the very nature of the MTA authority, meeting requirements within the schedule plan will also depend on how PMs and decision authorities tailor processes to fit program requirements to deliver a successful outcome.

In their analysis, Etemadi and Kamp compared MCAP and MTA programs using data gathered from GAO, selected acquisition reports (SARs), Director, Operational Test and Evaluation (DOTE) annual reports, and FPDS.gov. Using interval duration as the primary factor to measure process innovation, Etemadi and Kamp's results showed that "for an MTA to achieve its objective of delivery within 60 months of start, it must have a very fast (less than three month) start (St.B) phase, a development phase of less than two years, leaving the remainder of about three years for delivery" (Etemadi & Kamp., 2022, pp. 121–122). They concluded that, "the middle tier acquisition pathway provides structural incentives for programs to deliver capabilities in a short period of time. They complement existing rapid acquisition processes and highlight the importance of aligning

incentives and objectives" (Etemadi & Kamp, 2022, p. 123). On the other hand, studies from GAO indicate that the "speedy" process can hinder oversight efforts and the Service's ability to obtain valuable insight into program performance and effectiveness. "The policy emphasis is speed. However, such speed should not diminish timely and effective oversight of both the MTA pathway and the MTA programs within it. This oversight ensures that programs are thoughtfully structured to go fast" (GAO, 2023, p. 40).

3. Technology Maturity

Technology maturity defines a technology's development stage or readiness level at a particular moment in the system's development process. When developing major capabilities, best practices recommend programs to assess and demonstrate technology and manufacturing process maturity and test systems in a realistic environment as exit criteria for acquisition development phases. This approach helps identify, understand, and mitigate risk before advancing. It starts with identifying critical technology elements, which are "those technologies that are new or novel, or used in a new or novel way, and are needed for a system to meet its operational performance requirements within defined cost and schedule parameters" (GAO, 2020, p. 57). The more knowledge and awareness decision authorities and program managers attain about the system's technology maturity early and during the acquisition process, the better informed PMs and officials are to make sound decisions that reduce risk and improve the capability from design to deployment.

MTA guidance does not explicitly state a TRL requirement to enter the acquisition pathway. Though, knowledge-based acquisition practices indicate that a TRL 7, which supports the "demonstration of a technology in its form, fit, and function within a realistic environment," is the appropriate technology maturity level to start a program at low risk (GAO, 2020, p. 224).

4. Program Oversight

In February 2018, as directed by Congress, the DOD dissolved the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, creating two new

organizations with undersecretary roles: Acquisition and Sustainment and Research and Engineering (GAO, 2019, p.1). According to DOD officials, "changes in the technology and business landscapes and worldwide threats are the driving forces behind the Defense Department realigning the way it does business to support the warfighter" (Cronk, 2018, para. 1). The DOD also implemented reforms to restructure the Office of the Secretary of Defense (OSD) to concentrate efforts on increasing capability development instead of program oversight (GAO, 2019, p.1). Additionally, program oversight responsibilities for many programs, or MDA, were transferred to the three military departments to streamline acquisition processes, as was the case for MTA programs (GAO, 2019, p. 2). Per DODI 5000.80, MTA policy states that "each DOD Component will develop a streamlined process that results in a succinct requirement document no later than 6 months from the time the operational needs process is initiated. Approval authorities for each capability requirement will be delegated to a level that promotes rapid action" (OUSD[A&S], 2019b, p. 4).

While changes were occurring at the organization level, the department experienced an increase in the number of MTA programs entering its weapon systems acquisition portfolio. By March 2019, the department had started 35 unclassified MTA programs within the Air Force, Navy, and Army (GAO, 2023, p. 2). However, program oversight was and remains a concern due to the apparent lack of clear MTA program information data framework and guidance from the USD(A&S). In 2023, the GAO reported that "the lack of clarity in guidance contributes to misunderstandings about program structure, scope, and technical status and preclude effective oversight of the MTA pathway. [The] DOD depends on reliable data to conduct data-driven oversight. Without reliable data, decision makers lack a clear understanding of the purpose, execution risks, and interdependencies of each MTA program" (GAO, 2023, p. 22).

The GAO's report also suggests that Services are not reporting complete and accurate data in support of the USD(A&S) MTA oversight due to a combination of potential factors: OUSD(A&S) inadequate data framework and reporting guidance, and DOD components not completing the development and documentation of MTA management processes as directed by the DOD (GAO, 2023, p. 17-21). The GAO found that the Air Force, Army, Navy, and United States Special Operations Command

(USSOCOM) developed supplemental policies for the MTA pathway after the DOD released the MTA policy in December 2019. However, reviewing policies and supplemental guidance indicated that the Services followed the DOD's directive. "Discussions with senior acquisition officials from each component corroborated that the development and documentation of these processes remains incomplete" (GAO, 2023, p. 21). This impacts the OUSD(A&S)'s ability to gather complete and accurate information about MTA programs to conduct effective oversight. The GAO stated that "the lack of clear guidance, slow implementation of required processes, and data reliability issues hinder [the] DOD from effectively implementing and conducting oversight of the MTA pathway" (GAO, 2023, p. 17).

5. Data Collection Begins with Program Initiation

A substantial element of conducting program oversight is data collection. In their 2019 paper for the Acquisition Research Program, "Identification and Characterization of Data for Acquisition Category (ACAT) II–IV Programs," RAND's Senior Defense Researcher, Megan McKernan, and Senior Policy Researcher, Jeffrey Drezner, state that "acquisition data lay the foundation for decision-making, management, insight, and oversight of the Department of Defense's (DOD's) acquisition program portfolio" (McKernan & Drezner, 2019, p. 469). According to the authors, data collection begins with the program definition and, as a correlation, with the program start date. "Acquisition program data collection begins with the definition of a program. Until an activity is officially declared a program, many of the information requirements do not apply" (McKernan & Drezner, 2019, p. 479).

MTA guidance requires DOD components to submit program identification data and report program status throughout execution (OUSD[A&S], 2019b, p. 6). Previous interim guidance indicates that executive officials used this information to assess the MTA pathway's use (OUSD[A&S], 2018a, p. 2). However, the definition of program start date has changed as official policy evolved. MTA interim governance, released in October 2018, established that "A six-month and five-year limit for entering production and completing an MTA program will be calculated from the date of the first obligation of funds for a program purpose" (OUSD[A&S], 2018b, pp. 1–2). Fast forward to

December 2019, when the USD(A&S) issued DODI 5000.80, establishing policy and guidance for the MTA pathway, including new definitions. Per DODI 5000.80 and, unless otherwise denoted, the following terms and definitions apply to programs following the issuance.

- **MTA program production start:** The date of funds first obligated to perform production activities.
- **MTA program start date:** The date an ADM is signed by the DA initiating the effort as an MTA rapid prototyping or MTA rapid fielding program, consistent with this issuance.
- **MTA program completion date:** The date of an outcome determination ADM signed by the DA stating that the rapid prototyping program has transitioned to an existing acquisition program, transitioned to a new acquisition program, transitioned to a different acquisition pathway, has residual operational capability sustained in the field, transitioned to rapid fielding, or terminated. For rapid fielding programs, the date of an outcome determination ADM stating that the minimum fielding plan criteria approved by the DA, have been met (OUSD[A&S], 2019b, p. 13).

Pre-existing MTA programs follow the former definition for program start date established under the MTA interim guidance. In accordance with the latest MTA policy and guidance document DODI 5000.80, "MTA programs designated prior to the effective date of this issuance will maintain their MTA program start date of funds first obligated. No later than 60 calendar days after the effective date of this issuance, pre-existing MTA programs will comply with this issuance" (OUSD[A&S], 2019b, p. 12).

6. MTA Authority and Guidance

a. Middle Tier of Acquisition (Rapid Prototyping/Rapid Fielding) Authority and Guidance Memorandum

In April 2018, USD(A&S) Ellen M. Lord approved the release of the *MTA (Rapid Prototyping/Rapid Fielding) Interim Authority and Guidance* memorandum, establishing initial policy and guidance for DOD components to implement the MTA authority as defined under Section 804 of the FY16 NDAA. The temporary guidance would be in effect until September 30, 2019, unless extended at the discretion of the USD (A&S) (OUSD[A&S], 2018a, p. 1).

As part of the implementation guidance, the memo directed DOD components to determine what comprises an approved requirement and allowed them the option to leverage an existing one to enter the acquisition pathway. The USD(A&S) appointed component acquisition executives (CAEs) responsible for managing and delegating the MTA authority and required organizations using Section 804 to develop appropriate procedures to execute program efforts adhering to the policy (OUSD[A&S], 2018a, p. 2).

In support of a DOD collaborative effort to further develop MTA policy and guidance, the memorandum established that CAEs were responsible for capturing and storing program data to be shared with the department. This data would include the program's name, capability gap or problem and its source, capability characteristic or solution, date funds were approved for initiation, sponsor, program result (transition or termination), date and rationale, program budget, and vendor names (OUSD[A&S], 2018a, p. 3). The temporary guidance also required organizations to identify knowledge gaps that must be addressed to use the MTA effectively. Officials would use this information to develop subject-related courses to train personnel through the DAU. The memo also established that organizations exercising the provisional authority were to identify changes needed to improve existing acquisition policy, including the governance instruction for the AAF, DODI 5000.02 (OUSD[A&S], 2018a, p. 3).

b. Middle Tier of Acquisition (Rapid Prototyping/Rapid Fielding) Interim Governance

In October 2018, the OUSD(A&S) adopted an interim governance approach to implementing the MTA authority. The purpose of the interim governance was to "ensure that DOD Components execute MTA programs in a manner that allows the OSD and Congress to have confidence in the appropriateness of the Components' use of this authority" (OUSD[A&S], 2018b, p. 2). As the OUSD(A&S)'s new reform focused on data collection and analysis over individual program oversight, CAEs were required to officially "identify existing MTA programs by submitting an information memorandum to the OUSD(A&S) no later than 30 calendar days after the signing of the memorandum" and submit program identification data via the DAVE database (OUSD[A&S], 2018b, p. 2). For new programs entering the MTA pathway, CAEs were required to "submit an

information memorandum and program identification data at least 30 calendar days before the obligation of funds" (OUSD[A&S], 2018b, p. 2). Although the USD(A&S) had no decision authority over MTA programs, the USD(A&S) retained the authority to determine if any program was not appropriate for the pathway and direct use of traditional acquisition authorities instead, something that remains in effect in current MTA guidance.

Regarding program updates submission, following MTA program identification and initiation, officials were required to submit data updates quarterly. As stated in MTA interim governance policy from October 2018, "After initial program identification, MTA programs will submit updated data quarterly on the first month of each fiscal quarter" (OUSD[A&S], 2018b, p. 2). However, said guidance has changed since then to from submitting program updates every quarter to twice a year. According to DOI 5000.80, "CAEs will submit updated PID via DAVE interfaces with the President's Budget and Program Objective Memorandum submissions to OSD" (OUSD[A&S], 2019b, p. 11).

The subject MTA interim governance established monthly MTA governance meetings to discuss and evaluate the use of the MTA authority based on program data submissions from CAEs (OUSD[A&S], 2018b, p. 2). Expected attendees included "a representative of the Vice Chairman of the Joint Chiefs of Staff (VCJCS), the Under Secretary of Defense for Research and Engineering (USD[R&E]), the USD(A&S), and the Director of Cost Assessment and Program Evaluation (CAPE)" (OUSD[A&S], 2018b, p. 2). Additionally, the interim governance required the above executive officials to conduct quarterly meetings with the CAEs to discuss MTA portfolios (OUSD[A&S], 2018b, p. 2). This portion of the MTA governance would change too. Current MTA governance, as per DODI 5000.80, established an advisory board chaired by the USD(A&S) and comprised of the CAEs, VCJCS, USD(R&E), Direction of CAPE, DOT&E, and others requested by the USD(A&S), "to assess the use of the MTA authority when a request is made by a CAE for a program that exceeds the major defense acquisition program threshold to use the MTA pathway" (OUSD[A&S], 2019b, p. 11). However, new governance does not mention recurring meetings with CAEs to discuss MTA programs performance or the data collected and reported.

c. Middle Tier of Acquisition (Rapid Prototyping/Rapid Fielding) Interim Governance 2

In March 2019, USD(A&S) Ellen M. Lord issued follow-on interim governance, establishing new guidance for rapid fielding efforts. Per governance two, programs were required to develop an affordable sustainment strategy that considers life cycle costs and addresses issues related to logistics support and system interoperability. "As a Concept of Operations is in development, sustainment functions must be considered and addressed in the acquisition strategy or tailored Life Cycle Sustainment Plan" (OUSD[A&S], 2019a, p. 1). Organizations exercising the interim authority were required to include program sustainment considerations as part of the data captured and shared with the department through DAVE to support the eventual development of final MTA guidance. In the memorandum, the USD(A&S) discloses that the reviewed program sustainment data was to be discussed with officials during quarterly meetings to address any concerns directly with CAEs (OUSD[A&S], 2019a, p. 2).

d. DOD Instruction 5000.80: Operation of the Middle Tier of Acquisition

Effective December 30, 2019, the OUSD(A&S) issued DOD Instruction 5000.80, establishing the policy, responsibilities, governance, and procedures for implementing and managing the MTA for rapid prototyping and rapid fielding (OUSD[A&S], 2019b, p. 3). The new instruction applies to the OSD and all DOD components and substitutes the MTA interim guidance released years prior (OUSD[A&S], 2019b, p. 3). The instruction establishes that DOD components are responsible for developing processes to manage and execute MTA efforts (GAO, 2023, p. 21). Figure 9, obtained from the GAO's 2023 report on middle-tier defense acquisitions, presents the processes and documentation requirements directed by the DOD to its components for the implementation of MTA programs as per DODI 5000.80 (GAO, 2023, p. 12). A substantial part of the policy added in the new instruction is that, in addition to the documentation requirements denoted in Figure 9, the USD(A&S) required CAEs to "ensure availability of the program identification data (PID) via DAVE interfaces and submit updated PID via DAVE interfaces with the President's Budget and Program Objective Memorandum submissions

to OSD. CAE must comply with the online PID requirements, consistent with the policy specified in this issuance" (OUSD[A&S], 2019b, p. 11).

Table 2: DOD Directed Processes and Documentation Requirements for Middle Tier of Acquisition (MTA) Programs

Path	Required processes	Resulting documents
Rapid prototyping and rapid fielding MTA	Develop requirements	• Succinct requirements document within 6 months of MTA initiation.
	Implement acquisition and full funding strategies	• Acquisition strategy • Cost estimate
Rapid prototyping MTA	Consider innovative technologies and new capabilities to meet certain needs	• Acquisition decision memorandum at initiation that validates the use of the MTA pathway and identifies full funding required. Process also results in an approved requirement.
	Demonstrate performance and evaluate current operational purposes of proposed products and technologies	• Test strategy or an assessment of test results (included in the acquisition strategy)
	Transition successful prototypes to new or existing acquisition programs	• Transition plan (included in the acquisition strategy) providing a timeline for completion within 2 years of required documentation for transition
Rapid fielding MTA	Consider existing products and proven technologies to meet certain needs	• Acquisition decision memorandum at initiation that includes minimum fielding plan criteria and identifies full funding required. Process also results in an approved requirement.
	Demonstrate performance and evaluate current operational purposes of the proposed products and technologies	• Test strategy or an assessment of test results (included in the acquisition strategy)
	Consider life-cycle costs and address issues of logistics support, training, interoperability, and cooperative opportunities, among other things	• Life-cycle sustainment plan
	Identify and exploit opportunities to reduce total ownership costs	• Life-cycle sustainment plan
	Transition successful programs to operations and sustainment.	• Transition plan (included in the acquisition strategy) providing a timeline for completion within 2 years of required documentation for transition

Source: GAO analysis of Department of Defense (DOD) policy. | GAO-23-105008

Figure 9. DOD Processes and Documentation Requirements for MTA Programs. Source: GAO (2023).

The review of MTA interim policy and DOD Instruction 5000.80 showed changes to parts of the guidance. Aside from establishing more definitive procedures and implementation guidance, DODI 5000.80 expanded on the roles and responsibilities involved with the identification, authorization, implementation, and support of the MTA pathway (DAU, n.d.). Per OUSD(A&S)'s DODI 5000.80 (2019b), the OUSD(A&S) "establishes policy and guidance for the MTA pathway" in consultation with other executive officials (p. 5). This role will also "determine when a program is not appropriate for the MTA pathway" and, if so, "direct use of an alternate acquisition pathway," something that has remained consistent since the interim guidance was in effect earlier in 2018 (OUSD[A&S], 2019b, p. 5).

According to DODI 5000.80 (2019b), heads of MTA programs in DOD and OSD Components oversee their programs through their CAEs and PMs. The instruction specifies that "CAEs will serve as the DA for programs approved for the MTA pathway, unless delegated by the CAEs" (OUSD[A&S], 2019b, p. 6). Additionally, CAEs will

implement the procedures set in the guidance, and designate a PM for each MTA effort (OUSD[A&S], 2019b, p. 6). According to OUSD(A&S)'s MTA policy and guidance (2019b), the PM is responsible to "develop acquisition strategies, execute approved program plans, field capabilities, and report program status" (p.6). Additionally, DODI 5000.80 gives PMs the responsibility to "tailor-in reviews, assessments, and relevant documentation that results in an acquisition strategy customized to the unique characteristics and risks of their program" (OUSD[A&S], 2019b, p. 6). Furthermore, the instruction states that the PM is responsible to guarantee that "operational, technical, and security risks" are known, addressed, and mitigated to ensure deployed systems are robust, efficient, and reliable in their intended operational field (OUSD[A&S], 2019b, p. 6). To achieve this, the instruction allows PMs to "employ an innovative and disciplined approach and seek appropriate alternatives to any regulatory requirements that increase procedural burden without adding value to the program" (OUSD[A&S], 2019b, p. 6).

The new instruction revised the guidance for program status update submissions. In accordance with implementation guidance as per Section 4 of DODI 5000.80, "CAEs will ensure availability of the program identification data (PID) via DAVE interfaces and submit updated PID via DAVE interfaces with the President's Budget and Program Objective Memorandum submissions to OSD. CAEs must comply with the online PID requirements, consistent with the policy specified in this issuance" (OUSD[A&S], 2019b, p. 11). It is important to note that the updated guidance has changed the frequency of program update submissions from quarterly to biannual, compared to the interim guidelines issued in 2018.

Following the subject instruction published in December 2019, the MTA governance also changed. Current MTA governance, as per DODI 5000.80, established an advisory board chaired by the USD(A&S) and comprised of the CAEs, VCJCS, USD(R&E), Direction of CAPE, DOT&E, and others requested by the USD(A&S), "to assess the use of the MTA authority when a request is made by a CAE for a program that exceeds the major defense acquisition program threshold to use the MTA pathway" (OUSD[A&S], 2019b, p. 11). However, the new governance does not mention regular meetings with CAEs to discuss the MTA program's performance or the data collected and reported, unlike the 2018 MTA interim governance. Under the previous governance,

OSD officials used to conduct monthly meetings to assess the "aggregate use of the MTA authority based on data submissions," and quarterly meetings with CAEs to discuss the MTA portfolio (OUSD[A&S], 2018b, p. 2).

7. DOD Component Guidance

After the introduction of the MTA authority and the release of MTA interim guidance in 2018, each military department (Army, Navy, Air Force, and USSOCOM) issued interim guidance, providing additional information about roles and responsibilities (GAO, 2023, p. 6). By late-December 2019, the DOD had issued DODI 5000.80, *Operation of the MTA*, formally establishing policy, assigning roles and responsibilities, and providing recommended procedures to manage MTA efforts (GAO, 2023, p. 6). In accordance with the GAO, all Services have developed supplemental policies for the MTA pathway. As mentioned in our scope and limitations presented in Chapter I, research was further limited to DAF and USSOCOM as they were the only branches of Service with enough programs to be considered for statistical significance. Therefore, this section will reference the MTA policy and guidance followed by DAF and USSOCOM.

a. The United States Department of Air Force

The following DAF policies are two of the policies that govern the use of the MTA pathway (GAO, 2023, p. 56).

1. Air Force Operation of the Middle Tier of Acquisition (MTA) Supplemental Instruction DODI5000.80_DAFI163-146

- Implements DODI 5000.80, operates the MTA, and provides DAF guidance for middle-tier acquisition. DODI5000.80_DAFI163-146 adds to the responsibilities and procedures for the management of middle-tier acquisition described in DOD policy (Office of the Secretary of the Air Force [SecAF], 2021).

2. Air Force Requirements Development Guidebook—Requirements Activities to Support Middle Tier of Acquisition Pathway

- Describes the department's process for validating "operational capability requirements" to support capability development. It is a "how to" guidebook for stakeholders participating in the Air Force requirements process. Volume 5 depicts the requirements and actions that support the MTA pathway (DAF, 2020).

b. United States Special Operations Command

The following USSOCOM policies govern the use of the MTA pathway (GAO, 2023, p. 57).

1. USSOCOM Acquisition Management System Policy 70–1,

- "Establishes the policy for acquisition management of Special Operations Peculiar (SO-p) equipment, material, supplies, and services in support of USSOCOM's mission" (USSOCOM, 2020a, p. 3).

2. USSOCOM Capabilities Integration and Development System Directive 71-4

- "This directive codifies the SOFCIDS as the process used by USSOCOM to fulfill its Joint Requirements Oversight Council (JROC) authorities to certify/endorse and validate Special Operations-Peculiar (SO-P) capabilities. SOFCIDS is also the process utilized to fulfill authorities to approve Middle Tier of Acquisition (MTA) requirements in accordance with (IAW) Section 804" (USSOCOM, 2020b, p. 3).

Resources did not include a USSOCOM DODI 5000.80 supplement equivalent to that of DAF, DODI5000.80_DAFI163-146. For this reason, it is assumed that USSOCOM defaults to DODI 5000.80 as the DOD-established policy for the operation and management of middle-tier acquisition programs.

8. Defense Acquisition University

Research showed that the university is crucial in sharing information about MTA statutes, policy, and guidance for DOD components. "DAU supports USD(A&S) by disseminating guidance applicable to the MTA pathway. DAU develops education, training, research, and publications to guide acquisition with the goal of improving outcomes" (GAO, 2023, p. 12). DAU is also featured in DODI 5000.80 as an MTA companion guide. The instruction states that "Additional information will be available to expand upon the MTA policy established in this issuance at the Adaptive Acquisition Framework page on the Defense Acquisition University website at: https://www.dau.edu/aaf/" (OUSD[A&S], 2019b, p. 12).

However, a 2023 GAO report found inconsistencies with MTA documentation requirements published on the DAU website. According to GAO findings, after the issuance of DOD's AAF, DAU established online resources—including guidance and other information necessary—to help DOD acquisition authorities understand the requirements

relevant to the acquisition pathway of choosing (GAO, 2023, p. 18). In such efforts, DAU created the AAF Document Identification Tool, which "intended to support acquisition officials in their efforts to identify applicable statutory and regulatory documentation requirements for each of the six pathways within the AAF, including the MTA pathway" (GAO, 2023, p. 18). However, GAO assessment of the tool pertaining to the MTA pathway revealed that "DAU's Document Identification Tool guidance did not consistently reflect the MTA documentation requirements outlined in policy and statute" (GAO, 2023, p. 18). Per GAO findings, DAU's tool declares that MTA policy requires all MTA programs to submit an affordability analysis as part of the entrance requirements (GAO, 2023, pp.18-19). However, the MTA policy does not identify these as a documentation requirement. Furthermore, GAO found that the tool identifies documentation requirements like acquisition strategy for both major and non-major program, when DOD's MTA policy depicted in DODI 5000.80 mandates acquisition strategies only for major system (GAO, 2023, p. 19). Such inconsistencies could compromise process adequacy and overall program effectiveness. DOD components rely on DAU as a source of guidance for MTA programs, making it crucial to distribute accurate and up-to-date information. (GAO, 2023, p. 18). However, Component officials told GAO that "the inconsistent reflection of the documentation requirements in the Document Identification Tool has caused confusion and required further research and clarification" (GAO, 2023, p. 20). Recognizing this issue and the importance of distributing reliable information to support the proper application of the MTA pathway, the OUSD(A&S) initiated efforts to develop and update DAU's online guidance and document identification tools for various pathways (GAO, 23, p. 20). Still, there is a shared understanding that the pathway is dynamic, and so its policy and guidance continue evolving as acquisition officials continue learning from data collection and making data-driven decisions (GAO, 2023, p. 20).

B. GOVERNMENT ACCOUNTABILITY OFFICE REPORTS

The GAO is an independent, non-partisan agency that helps Congress meet its constitutional mandate and adequately use taxpayer dollars. By the direction of Congress, the organization performs yearly assessments on many areas within the federal government to study how public funds are spent, identify gaps or shortfalls, and provide substantiated

recommendations to improve affordability and accountability across the federal government and its agencies. This section summarizes the findings and methodologies of several GAO assessments reporting on the performance of the DOD's major weapon acquisition and middle-tier acquisition programs.

1. 2019 Report

In their 2019 Weapon Systems Annual Assessment, the GAO assessed the cost and schedule performance and application of knowledge-based acquisition practices of a selection of over 50 MDAPs included in the DOD's 2018 portfolio, valued at $1.69 trillion (GAO, 2019, para. 1). For their report, the GAO obtained data from DOD documentation like selected acquisition reports (SAR), databases like the Defense Acquisition Management Information Retrieval (DAMIR), and questionnaire responses from program officials. The assessment came to be at a crucial moment in the DOD acquisition reform history after the dissolvement of the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics and a DOD restructure that "refocuses the OSD principal acquisition function to one focused on increasing the speed of capability development rather than conducting program oversight" (GAO, 2019, p.1). The OSD restructuring led to passing program oversight responsibilities, or program decision authority, to military branches (GAO, 2019, p.1).

The GAO's report revealed that the cost performance of programs was in decline. Despite losing four programs, the MDAP portfolio's total acquisition cost increased $26.6 billion in one year—mainly attributed to procurement costs—and 51%, or $569 billion, since the programs' first complete estimates (GAO, 2019, pp.19–23). "This portfolio has four fewer programs than last year's portfolio but will require more money than any portfolio from the prior six years" (GAO, 2019, p. 12). Although the portfolio's size decreased, the GAO also observed that its average age and schedule delays increased. A contributing factor is that newer DOD programs opt to enter rapid prototyping or rapid fielding pathways, so the MDAP portfolio supports fewer programs than it would in other years. Therefore, its average age and schedule performance lean toward older programs; per the report, at least 20 programs have been in the DOD MDAP portfolio for more than 20 years (GAO, 2019, p. 16).

According to the GAO (2019), another trend causing performance decay was the inconsistent implementation of knowledge-based acquisition practices (GAO, 2019, p. 2). GAO observations showed that various MDAPs failed to conduct preliminary design reviews and demonstrate technology maturity before starting the development phase. Furthermore, many programs declared operational capability without performing Initial Operational Test and Evaluation (IOT&E), and only one program ensured that its manufacturing processes met statistical control requirements during engineering and manufacturing development ahead of starting the production phase (GAO, 2019, pp. 47–54) In their report, the GAO stresses the importance of using knowledge-based management and decision-making processes to reduce risk and increase the likelihood of positive outcomes associated with program cost and schedule performance. Also, these are essential to ensure the DOD delivers on-time, affordable, and quality capabilities to the warfighter.

The GAO's work determined that program officials should obtain high levels of knowledge before making critical decisions through the acquisition process. As shown in the report, "major DOD acquisition programs that completed one or more of three specific practices had significantly lower cost and schedule growth than those that did not" (GAO, 2019, para. 6). These three practices were:

1. Demonstrate that all critical technologies were very close to final form, fit, and function within a relevant environment before starting development.
2. Complete of a preliminary design review prior to starting development, and
3. Release of at least 90% of design drawings by critical design review (GAO, 2019, para. 6).

2. 2020 Report

In response to an FY19 NDAA provision, the GAO surveyed a combined portfolio of 121 of the most expensive DOD weapons and IT acquisition programs valued at $1.8 trillion. The level of investment warranted more profound oversight as programs adapted to changes in DOD acquisition policy. The 2020 Defense Acquisition Annual Assessment expanded efforts to include insights on rapid prototyping, rapid fielding programs, and MTA programs, which totaled an investment of $19.5 billion of the combined portfolio. For their

report, the GAO obtained data from interviews with DOD officials and questionnaire responses gathered from program executive offices.

The GAO's task came at another crucial moment in the history of the DOD acquisition reform. In January 2020, the department released new guidance to improve the speed of the acquisition process. The decision came after Congress enacted several reforms in previous years to help refocus acquisition oversight and deliver operational capabilities faster (GAO, 2020, para. 2). The new guidance would support six acquisition pathways forming the AAF, which, per the DODI 5000.02, has the purpose of providing "opportunities for MDAs/DAs and PMs to develop acquisition strategies and employ acquisition process that matches the characteristics of the capability being acquired" (OUSD[A&S], 2022b, p. 4). The GAO focused on program characteristics, as well as cost and schedule measures.

a. GAO Findings on Programs' Cost Characteristics

For their 2020 report, GAO assessed 13 MTA programs declared in the DOD's 2019 acquisition portfolio as of June 2019 (GAO, 2020, p. 54). Twelve programs underwent rapid prototyping efforts, and one was authorized to enter both rapid prototyping and rapid fielding pathways. As per the GAO, all 13 MTA programs were "unbaselined programs," meaning they did not have baseline cost information included in a SAR or Acquisition Program Baseline (APB) before entering the pathway (GAO, 2020, p. 20).

- Acquisition Notes define a SAR as a "standard, comprehensive, summary of an MDAP (Acquisition Category [ACAT] I) required for periodic submission to Congress by the Secretary of Defense. […] It is mandated in accordance with Title 10 United States Code (U.S.C.) 4351, and includes the total program cost, schedule, performance and program unit cost, unit cost breach information, full life cycle cost analysis of the program and all its increments" (AcqNotes, 2021, para. 1–2).
- The APB is the responsibility of the program manager to develop and submit before the start of all ACAT programs. The baseline represents a plan that "states the threshold and objective values for the cost, schedule, and performance requirements for a program" (AcqNotes, 2023, para. 1).

Military departments identified that all 13 programs had cost estimates close to or equal to the MDAP cost threshold. Per GAO, the collective investment of the 13 MTA

programs was valued at $19.5 billion, from the least expensive program, estimated at $292 million, to the most expensive program estimated at $8.4 billion (GAO, 2020, p. 54).

Rapid prototyping and fielding are required to complete efforts and deliver functional capabilities to the warfighter within five years of the start date unless the defense acquisition executive (DAE) approves a waiver. This distinctive trait makes the MTA an attractive acquisition approach. However, the timeline constraint and the lack of an official cost baseline affect actual cost projections, especially since most programs are not always clear about their follow-on plan after current MTA efforts are complete—whether it is transitioning to an existing or new POR, transitioning to a rapid fielding MTA effort, or terminate the program. "Due to the time-limited nature of MTA programs, MTA program cost and schedule estimates often do not reflect [the] DOD's full planned level of investment in acquiring the capability being prototyped or fielded. By DOD guidance, the MTA program estimates reflect only the current MTA effort" (GAO, 2020, p. 56).

In accordance with DODI 5000.80, before a potential program enters the MTA pathway, the program is categorized as either a major or non-major system. Each category has dollar threshold definitions, as shown in Table 2. Something to note in this section is that MTA programs are not part of the definition of an MDAP, as established in Section 847 of the FY17 NDAA, which states that "the term 'major defense acquisition program' does not include an acquisition program or project that is carried out using the rapid fielding or rapid prototyping acquisition pathway under Section 804" (NDAA, 2016). However, officials use the MDAP cost threshold as a measure to compare MTA programs' cost estimates. Any MTA program that is projected to require a total expenditure exceeding the MDAP's dollar threshold as shown in Table 2, "requires a written decision from the USD(A&S), after consultation with the advisory board approving use of the MTA pathway, or direction to use an alternative strategy, before obligation of funds to a performing activity" (OUSD[A&S], 2019b, p. 11).

Table 2. Dollar Threshold Definitions. Source: DAU (2020)

Program Type	Definition	Dollar Threshold
MDAP	Defined by Section 2430 of Title 10, U.S.C.	Dollar value for all increments of the program estimated by the DAE to require an eventual total expenditure for research, development, and test and evaluation of more than $525 million in FY2020 constant dollars or, for procurement, of more than $3.065 billion in FY2020 constant dollars
Major system	Defined by Section 2302d of Title 10, U.S.C.	Dollar value estimated by the DOD component head to require an eventual total expenditure for research, development, and test and evaluation of more than $200 million in FY2020 constant dollars or for procurement of more than $920 million in FY2020 constant dollars
Non-major system	Does not meet dollar value thresholds for major systems or above	Dollar value estimated by the DOD component head to require an eventual total expenditure for research, development, and test and evaluation equal to or below $200 million in FY2020 constant dollars or for procurement equal to or below $920 million in FY2020 constant dollars

b. GAO Findings on Program Schedule Characteristics

DOD interim guidance issued in December 2018 stated that the start date of an MTA program was the date of the first obligation of funds (OUSD[A&S], 2018b, p. 2) One year later, in December 2019, the released final guidance defining the start date of an MTA effort as the date the ADM was signed. Regardless, the policy stated that MTA efforts shall be completed within two to five years after the start of the program. The GAO (2020) analysis of the 13 MTA programs showed that:

- Three programs had an expected length of MTA effort of less than three years.
- Five programs had an expected length of MTA efforts between three and four years.
- Five programs had an expected length of MTA efforts between four and five years.
- The average expected length of the MTA portfolio was 3.8 years from when the DOD obligated funding for the MTA program.
- The minimum expected length for an MTA program in the portfolio was 2.1 years.

- The maximum expected length for an MTA program in the portfolio was five years (GAO, 2020).

The GAO (2020) findings show that the least costly MTA program in the portfolio, estimated at $292.02 million, had an expected length of three years. In turn, the most expensive MTA program in the portfolio, estimated at $8,410.41 million, had an expected length of five years (GAO, 2020, p.55). Considering cost vs. schedule, these two separate MTA efforts, both rapid prototyping, and Air Force programs, have a two-year difference in expected length and a cost estimate difference of $8.1 billion. Such comparison suggests that program schedule is the main driving factor for MTA programs, regardless of program scope and cost.

c. GAO Findings on Program Technology Maturity

The level of maturity a technology has when starting a development program can affect program cost, schedule, and system operational performance. Therefore, data on technology maturity is crucial to mitigate potential programmatic and technical risks. Technology maturity depends on the readiness level of critical technology elements, which comprise critical features of the end capability. The GAO's findings show that out of the 13 MTA programs, eight programs had identified critical technologies and expected to mature throughout the effort, two programs did not have critical technologies, and three programs had yet to identify critical technologies at the program's start but intended to do so through the effort (GAO, 2020, p. 57).

d. GAO Findings on Programs Planned Deliverables and Transition Plans

According to the GAO, all 13 MTA programs aimed to provide residual capability by the required timeline of five years (GAO, 2020, p. 58). Several programs planned to deliver a fieldable prototype to end users, and others planned to use the prototype for testing purposes only (GAO, 2020, p. 59). Nevertheless, the plan to demonstrate residual capabilities in a relevant or operational environment at the completion of the program varied for most programs. Figure 10 shows this variation.

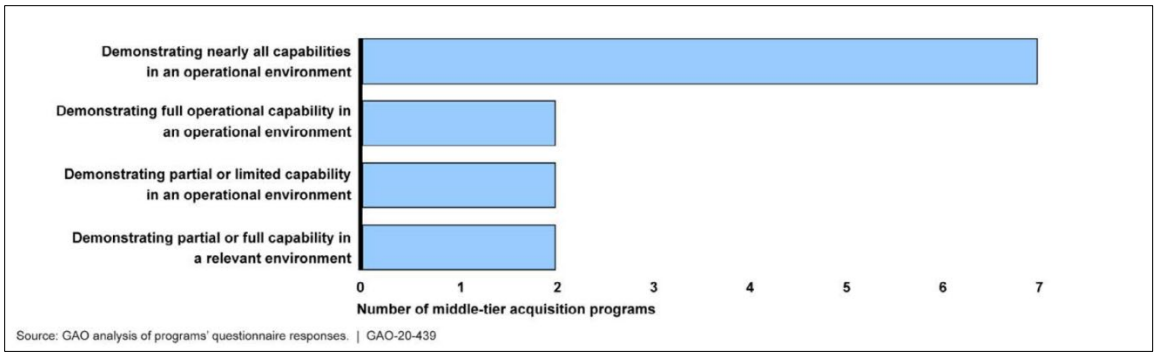

Figure 10. Plan to Demonstrate Residual Capabilities. Source: GAO (2020).

Regarding transition plans, only nine out of 13 programs planned to transition, either to a rapid fielding effort or the MCA pathway (GAO, 2020, p. 60). Figure 11 illustrates the transition plans for the 13 MTA programs reviewed by the GAO.

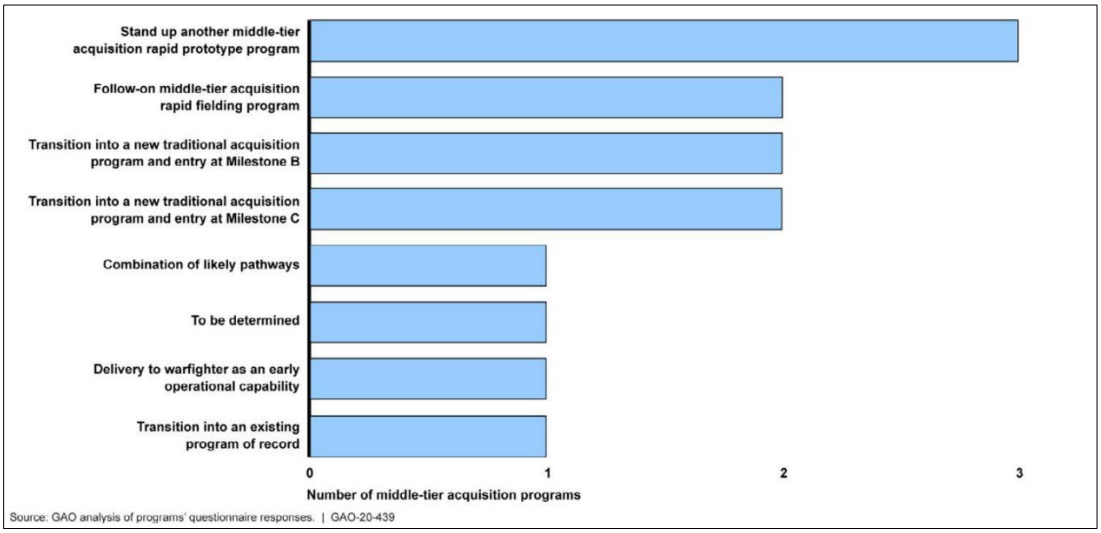

Figure 11. MTA Programs Planned Transition Plans. Source: GAO (2020).

3. 2023 Report

In their 2023 report, GAO reviewed the execution and oversight of 15 active MTA programs, totaling a cost estimate of $12 billion (GAO, 2023, p. 3). The survey included rapid prototyping and rapid fielding efforts within the Air Force, Army, Navy, and USSOCOM. Additionally, the GAO examined MTA policies and guidance against key principles driving effective product development. Said principles involve "attaining sound business cases, applying iterative design approaches, off-ramping capabilities when needed to prioritize schedule, and incorporating feedback from users of initial

capabilities" (GAO, 2023, para.4). Figure 12 illustrates the four leading principles that enable successful product development.

For their report, the GAO 2023 report focused studies on DOD components that had ongoing MTA efforts in March 2021 (GAO, 2023, p. 46). The GAO used the DOD's DAVE database to obtain program information and select the survey of programs to be studied. Program selection was based on specific criteria like acquisition pathway, MTA oversight category, cost, MTA designation date, oversight structure, and decision authority.

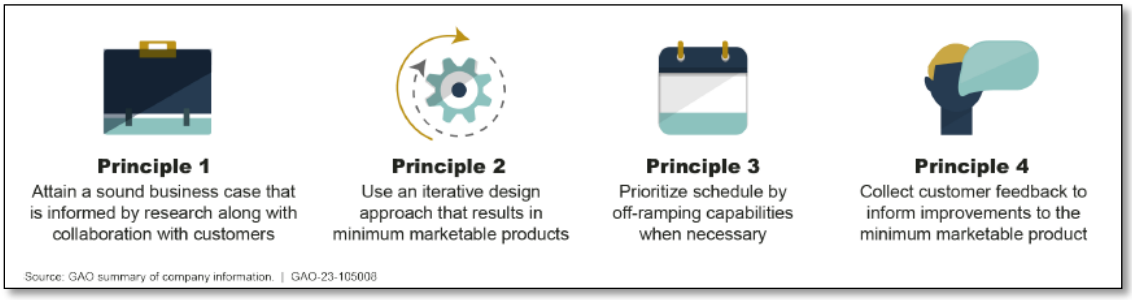

Figure 12. Product Development Leading Principle. Source: GAO (2023).

In this research, our focus is on leading principle 3 and the GAO's observations about its application by DOD components. Principle 3 recommends releasing capabilities as needed to prioritize the program schedule. It aims to assist MTA programs in quickly delivering capabilities to the warfighter while adhering to cost and schedule goals. This principle is further divided into three sub-principles, as detailed on page 35 of the GAO 2023 report, each of which plays a significant role in successfully applying the overarching principle.

- **Sub-principle 1:** Use periodic reviews throughout the product development process to monitor project performance and take action to ensure development stays on course.
- **Sub-principle 2:** Maintain a realistic assessment of product development activities, with a willingness to make difficult decisions about capabilities.
- **Sub-principle 3:** Off-ramp capabilities that present a risk to delivering the product on schedule (GAO, 2023, p. 35).

The GAO found that the components at least partially implemented most of the three sub-principles. The Air Force, Army, and Navy fully implemented sub-principles 1

and 2. However, none of the components fully applied sub-principle 3. According to the GAO, "policies from all four components require proven or objective processes for review to evaluate product development activities and permit higher-level officials to redirect MTA programs or make trade-offs in the event of a problem" (GAO, 2023, p. 35). Interestingly, all components' policies for MTA programs fully implemented sub-principle 2, which asks them to be rational about product development activities and be disposed to make tough decisions regarding capabilities. Thus, components claim to be prepared to be reasonable and face challenging decisions about capabilities. However—according to observations— they do not appear to be ready to drop capabilities when needed for the sake of the schedule.

Based on responses from executive officials, the GAO gathered the key factors that drive policy inconsistency among components' policies when applying sub-principle 3. DAF reported that "they evaluate performance, schedule, cost, and risk trade-offs throughout the life cycle of programs" (GAO, 2023, p. 35). The Army and Navy reported that "the process of off-ramping capability to prioritize schedule can take place in practice" (GAO, 2023, p. 35). The Army also argued that such an event "requires coordination between acquisition officials and the requirements community" (GAO, 2023, p. 35). USSOCOM stated that "determinations to release MTA capability conditionally or incrementally can be made through operational test and evaluation and the fielding determination" (GAO, 2023, p. 35).

C. RAND CORPORATION REPORT

While the AAF is still in its infancy, "the OUSD(A&S), Office of Acquisition Enablers, asked the RAND Corporation's National Defense Research Institute to identify and assess metrics that could provide insight into the health of the AAF" (Arena et al., 2022, p. 40). This report from 2022, titled *Using Metrics to Understand the Performance of the Adaptive Acquisition Framework*, builds on prior RAND research from FYs 2019–2021. The research objective was "to identify metrics for each AAF pathway that can provide insight into whether a given pathway is performing as intended" (Arena et al., 2022, p. 4).

Regarding the MTA pathway, this report states that this pathway far exceeds the maturity of the other pathways in data analytics, governance, and management (Arena et al., 2022, p. 13). However, in contrast, the quality of DAVE may not be verified properly. RAND reports that data some data field appear incomplete when entered in DAVE (Arena et al., 2022, p. 13).

> The following are considered good practices in data governance and management that the MTA stakeholders are following: the DOD is using the Acquisition Visibility Steering Group/Acquisition Visibility Working Group to make decisions on governance and management; A list of all MTA programs is available in DAVE's authoritative program list; MTA core program identification data are maintained in DAVE via structured format; MTA data standards are defined in the Acquisition Visibility Data Framework (AVDF); MTA program data are being integrated into component-level programmatic information systems; and planning is being done for the electronic transmission to OSD. (Arena et al., 2022, p. 14)

RAND identified three challenges to address when implanting metrics for the MTA pathway. The first challenge is that RAND and the GAO have noted "inconsistent reporting of MTA cost data to OSD, Congress, and the GAO, meaning that the data need additional governance and management to improve their quality" (Arena et al., 2022, p. 14). The second challenge highlights difficulty in standardizing the data requirement when the pathway contains a wide variety of programs. These programs range from prototypes, and residual fielding capabilities of major and non-major systems (Arena et al., 2022, p. 14). The last challenge involves the dilemma of having to sacrifice performance to meet the MTA scheduled timeline.

Table 3 provides an "initial list of five metrics that help to determine pathway health along with the intent of the metric, whether a related AVDF data element is available, and whether there is a gap in data availability" (Arena et al., 2022, p. 14). The first three metrics are related to the project management triangle (cost, schedule, and performance), and the remaining two metrics signify which resources are stable and the potential outcomes of the pathway (Arena et al., 2022, p. 15).

Table 3. Suggested MTA Metrics: Indicators for Pathway Health. Adapted from Arena et al. (2022).

Metric	Intent of Metric	ACDF Element Available	Data Gap Notes
Average percentage cost growth (quantity adjusted, if applicable)	Indicates whether the capability in this pathway experiences a particular amount of cost growth	Cost estimates are captured in the AVDF via AV0539, Acquisition Document Type, in the Acquisition Information Repository (AIR). The specific document type is Data Element number 1696 (DEn1696), Cost Estimate	Cost estimates are not captured directly in the MTA data in DAVE
Difference between MTA start date and expected operational demonstration date	Indicates schedule slippage of efforts in this pathway	Schedule information is captured in AVDF through MTA Program Start Date (AV0072) and MTA–Operational Demonstration Date (AV0760)	Schedule information is also captured in the MTA data in DAVE
Beginning Technology Readiness Level 5 or greater	Notes TRL level when entering MTA execution phase (i.e., appropriateness of pathway)	Technology Readiness is captured in AVDF as Demonstrated Technology Readiness Level (AV0061)	TRL is also captured in the MTA data in DAVE
Percentage change in initial and current budget (year-over-year)	Ensures resources are stable, so budget changes do not negatively affect schedule	Budget information is captured in AVDF using Budget Estimate—Account Annual Amount (AV0731)	Budget information is also captured in the MTA data in DAVE
Number of rapid prototypes fielded, transitioned, or terminated	Tracks pathway outcomes	Outcome type is in the AVDF using MTA—Outcome Type (AV0784)	The outcome type is also captured in the MTA data in DAVE

D. GAPS IN LITERATURE

One area of interest that can be further explored is the risk associated with the fact that "no limitation on dollar threshold currently exists" for the MTA pathway (DAU, 2020). When studying program management, students learn about the relationship and balance between three parameters: cost, schedule, and performance. There is no perfect program, as there is no perfect balance. To manage a program is to learn how to make complex decisions based on trade-offs. The three parameters help measure the performance of a program following a set of predefined objectives, requirements, and thresholds. For the case of the MTA, the schedule serves as a primary indicator of successful or non-successful outcomes. However, what happens when there is no limitation on cost? Affordability remains essential to effective program management, especially defense acquisition programs.

While the number of MTA programs continues to increase, the literature also shows that many of these programs exceed MDAP cost thresholds; still, the pathway has no cost restrictions. The "DOD does not identify a dollar limit for programs using the MTA pathway and MTA programs have increasingly taken root across the military departments, including as complex, expensive programs that DOD identifies as critical to meeting its mission" (GAO, 2023, p. 2). Through our research, we intend to learn whether exceeding cost estimates has presented obstacles to completing current MTA efforts or the program's follow-on plan to transition to another acquisition effort.

E. THEORETICAL FRAMEWORK REVISITED

The MTA pathway is named "middle-tier" because it is meant to fill Defense capability gaps between the urgent and major capability acquisition pathways. Though the transition plan is not equal for every major system MTA program, the literature suggests that many MTA efforts transition to a new or existing major capability acquisition program. That said, residual capabilities can transition to either the TMRR phase, EMD phase or low-rate initial production of an MCAP, depending on the type of MTA effort. Considering this possibility, the research highlights the importance of obtaining sufficient and adequate knowledge early and continuously throughout the

program life cycle to support knowledge-based decision milestones and improve the prospect of achieving the program's desired results. Per the GAO, "Our body of work has shown that attaining high levels of knowledge before programs make significant commitments during product development drives positive acquisition outcomes" (GAO, 2019b, p. 7). Figure 13 describes the GAO-identified knowledge points and best practices knowledge-based acquisition model obtained from GAO report.

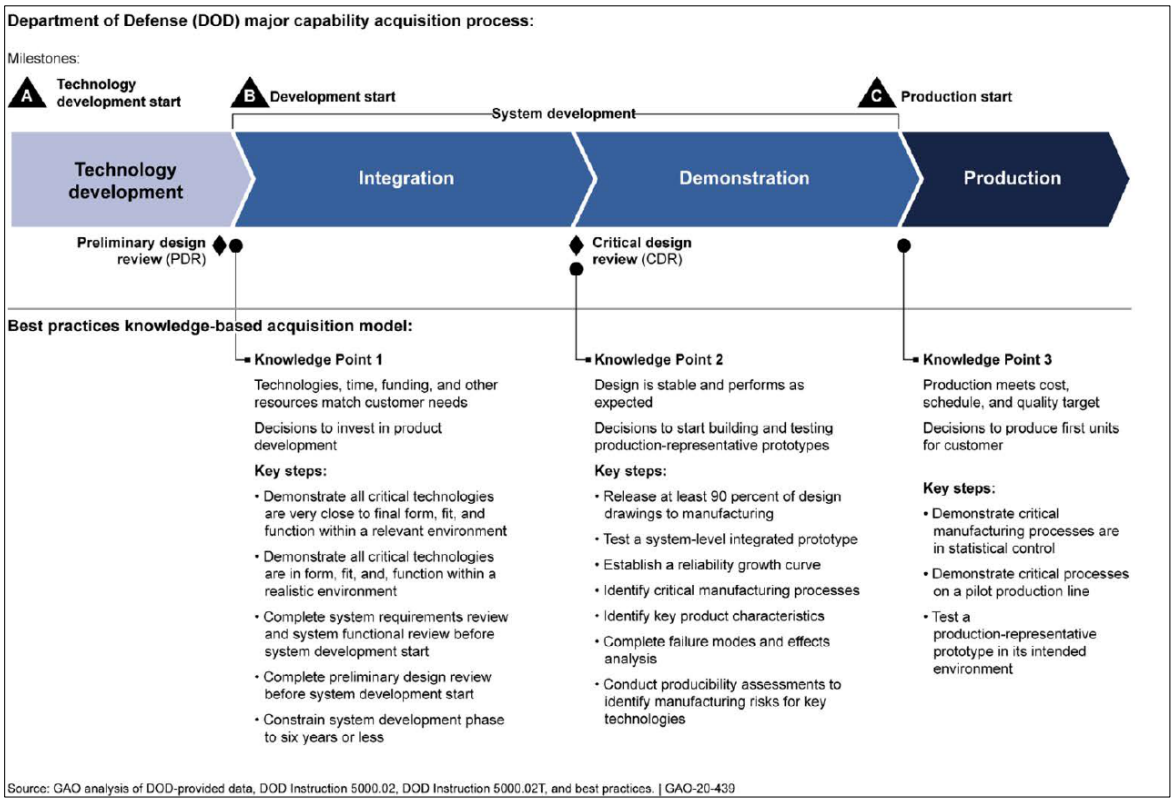

Figure 13. DOD Defense Acquisition Process and GAO-identified Knowledge Points. Source: GAO (2020).

The MTA pathway is an unprecedented acquisition approach adopted by the DOD and its components to develop and deploy advanced capabilities more quickly. A desirable trait of the MTA pathway is its flexibility in tailoring program requirements to fit the unique needs and characteristics of the acquired capability, thus making it an attractive alternative to pursuing rapid acquisition and fielding. As such, the promise of the MTA pathway represents a radical and innovative shift from traditional acquisition practices, an appealing effect that has contributed to its rising popularity across the different components. However, the literature suggests that acquisition professionals,

executives, and decision authorities have experienced challenges with the MTA authority and continue learning to implement policy and guidance most effectively. Likewise, DOD components continue learning to capture and report data optimally to improve program oversight and performance. According to the sources, data collection and program oversight play a significant role in assessing program performance and added value. While the potential of the MTA pathway promises an improved strategic approach to sustain DOD's technological and military advantage, reduce acquisition costs, and create new opportunities for growth in the defense industry, its effectiveness remains in question. The following chapter dives into the research to present the data collected and the analyses conducted to answer the research questions centered on the MTA's effectiveness.

IV. ANALYSIS

This CAP analyzes available rapid prototyping data from DAVE and other sources to assess the effectiveness of the MTA pathway. "A non-disclosure agreement (NDA) is in place for accessing information in DAVE, thus limiting information accessible for public consumption and research" (Bub, 2023, p. 25). All analyses involving DAVE will be structured in accordance with the NDA. The initial intent to prove effectiveness was to conduct a statistical analysis of the data from DAVE to determine the likelihood of a project transitioning to a program of record—this portion of the analysis aimed to quantify the strength of evidence against a null hypothesis. DAVE provides a sample size of 81 completed MTA projects, including rapid prototyping and rapid fielding. Given this large size, analysis was limited to rapid prototyping with 55 completed projects. This allowed the analysis to narrow its field of view while being statistically relevant. With each branch having variations to its own MTA process, the analysis will also delve into the success rate of each branch to determine if these policy changes provide any statistical significance to the successful use of the MTA pathway. While all programs under review for this analysis are considered complete, the analysis will also delve into the level of oversight in which these programs were completed.

Further analysis was primarily grounded in the program information obtained from DAVE and GAO reports. For this part, we incorporated GAO assessments of individual MTA rapid prototyping efforts, documented in three reports from 2020 to 2022. Leveraging both sources, we aimed to identify the current acquisition status of each program in DAVE, the MTA program start timeline, and the expected program length provided by GAO. By comparing this data, we aimed to assess if the programs in question adhered to the projected timeline and the 5-year time limit mandated by the MTA pathway policy. Our analysis also included observations about the programs' transition plan, as identified by GAO, and we sought to link any correlation between having a defined transition plan and the successful transition or restructuring of an MTA program. Moreover, we examined the knowledge points obtained before the transition for

the programs planning to transition to the MCAP pathway, a practice endorsed by GAO to facilitate knowledge-based decisions throughout the program's life cycle.

A. DEFENSE ACQUISITION VISIBILITY ENVIRONMENT

The "DAVE is the authoritative source for acquisition documents and program identification data (PID) for declared MTA programs" (OUSD[A&S], 2023, p. 6). DAVE replaced the previous reporting system, DAMIR. It serves as the central reporting resource for all DOD related acquisition data. "Before an MTA Submission can be initialized, the program must first be available within the DAVE application" (OUSD[A&S], 2023, p. 10). According to DAVE's website (dave.acq.osd.mil),

> DAVE provides the Department timely access to accurate, authoritative, and reliable data to support insight, analysis, and decision-making. It provides easily accessible front-end applications, data repositories, capabilities, and a well-defined and managed data framework to offer perspective and context for acquiring data. DAVE supports the DOD acquisition community and partners. DAVE provides an integrated foundation for the DOD acquisition community, delivering improved security, performance, reusability, interoperability, scalability, and maintainability of Acquisition data. (OUSD[A&S], n.d.)

With the DAVE NDA in place, analysis had to be presented in a way that did not violate that agreement. Table 4 displays the data elements that CAEs and/or designated PMs shall input into DAVE to register and update MTA program data regarding Middle-Tier Rapid Prototyping (MTRP) and Middle-Tier Rapid Fielding (MTRF). Per DAVE MTA Reference Guide last revised in November 2023, "This guide is intended to provide users at the Program Management Office (PMO), Program Executive Office (PEO) or Component Acquisition Executive (CAE) level with step-by-step instruction on how to initiate, review and approve a new PID submission" (OUSD[A&S], 2023, p. 6). There is an important caveat that needs to be mentioned, the Air Force and Space Force program offices create MTA submission using Program Management Resource Tool (PMRT), not DAVE (OUSD[A&S], 2023, p. 10). However, information changed within PMRT will not be reflected in DAVE until the next calendar day.

Table 4. DAVE Program Identification Data Example. Source: (OUSD[A&S], 2023, p. 9).

Program Identification Data		
Data Element	Major System	Non-Major System
Program Information		
Full Name*	X	X
Short Name*	X	X
Acquisition Structure	X	X
DOD Lead Component*	X	X
Program Executive Office (PEO)*	X	X
Acquisition Type	X	X
Acquisition Status	X	X
Decision Authority*	X	X
MTA Program Manager's Reporting Point of Contact (POC)*	X	X
Mission and Description	X	X
Joint Capability Area(s)	X	X
Antecedent System (if any)	X	X
Effective Date		
Program Status Effective Date	X	X
Capability Requirements		
Requirements Document title	X	X
Capability Requirements Document Type	X	X
Validation Authority	X	X
Date Approved	X	X
Technology		
Supporting Technology(ies), each with the following data: Full Name Short Name Type Description Demonstrated Technology Readiness Level (TRL) Expected TRL at Completion Demonstrated Manufacturing Readiness Level (TRL) Expected MRL at Completion	X	
System Integration Complexity	X	X
System Demonstration Scope	MTRP	MTRP
Schedule		
MTA Designation (Program Start)	X	X
Funds First Obligated	X	X
Initial Production	MTRF	MTRF

Program Identification Data		
Data Element	Major System	Non-Major System
Operational Demonstration Complete	X	X
Program Complete	X	X
Budget (TY&M)		
Budget Position	X	X
Budget year	X	X
First Year of Funding	X	X
Final Year of Funding	X	X
Total Development Quantity	X	X
Total Procurement Quantity	X	X
Funding Sources		
Supporting Budget Line(s), each with the following data: Appropriation Category Department Cost Account Budget Activity (BA) Line Item Program Element (PE) Project	X	X
Performing Activities and Contracts		
For each Government Entity: Supported Phase CAGE Code CAGE Code Legal Name	X	X
For each Commercial Entity (Contract): Support Phase Contact Strategy	X	X
For each Awarded Contract/Agreement: CAGE Code CAGE Legal Name Award Date Contract Type Technical Data Rights Contract Number Contracting Office	X	X
Sustainment		
Field Sustainment Responsibility	MTRF	MTRF
Depot Sustainment Responsibility	MTRF	MTRF
Supply Chain Responsibility	MTRF	MTRF
Unit Expected Service Life (Years)	MTRF	MTRF
Outcome		

Program Identification Data		
Data Element	Major System	Non-Major System
MTA Outcome Decision Memorandum Date (if any)	X	X
Actual or Projected Outcome	X	X
Reason for Outcome (if Actual)	X	X
If Transitioned, Identify Program	X	X
Outcome Notes (if Other)	X	X

*Fields must be defined for the program before initiating an MTA (OUSD[A&S], 2023, p. 12).

This database has been adapted for this CAP as "DAVE users without data entry access may only view approved MTA submissions and access a database export of MTA data" (OUSD[A&S], 2023, p. 6). The research established its foundation by filtering the data into MTRP and MTRF programs. While the information gathered from DAVE proved helpful to an extent, lack of specific data elements prevented a proper investigation into the effectiveness of the MTA pathway. The data fields that were of use for analysis were:

- Full Name
- Short Name
- Acquisition Status
- Lead Component
- AAF Pathway
- Acquisition Type
- Created At Date/Time
- Updated At Date/Time

Analysis for this CAP focuses on completed programs to eliminate the variables subject to change. In addition, reporting for these programs is considered finished, and all necessary information should be provided for the remainder of this CAP.

B. PROBABILITY OF SUCCESS

The MTA pathway is considered successful when programs are given the acquisition status of Transitioned/Restructured. By the assumed definition (see Chapter I, Section D, this means that a program either moved to an existing acquisition program, transitioned to a new program, moved to a different acquisition pathway, transition to a rapid fielding MTA effort, or had partial success due to a schedule slip of greater than five years. However, with the MTA pathway still being relatively new, a challenge is to determine whether there is enough information in DAVE to be statistically relevant. As

of 09 Jan 2024, there are 201 MTA programs in DAVE: 134 MTRP projects within DAVE with 75 holding an active acquisition status and 74 MTRF projects within DAVE with 48 holding an active status (OUSD[A&S], n.d.). The active projects are still in development, and this CAP focuses on completed projects for analytical purposes. From this data, 81 MTA projects are considered complete: 55 (67.9%) are MTRP, and 26 (32.1%) are MTRF. The scope of analysis was further limited to focus on MTRP as there were not enough MTRF projects to determine a significant impact. Of those 55 MTRPs, the following probability was determined within the respected MTA time frame:

- MTRP Terminated = 9/55 = 16.36%
- MTRP Transitioned/Restructured = 46/55 = 83.64%

The next step of this analysis was to determine if there was a bias within these results by applying hypothesis testing with binomial distribution. This is achieved using the P value defined by the Department of Community Medicine at Ahmadu Bello University as the "probability under the assumption of no effect or difference (null hypothesis)" (Dahiru, 2008). "P stands for probability and measures the likelihood that any observed difference groups are due to chance" (Dahiru, 2008). The basis of hypothesis testing is to accept and reject one hypothesis. As seen in Table 5, "adopting this practice exposes one to two types of errors: a type I/alpha error (i.e., the two therapies differ when they are the same, also known as a false-positive result), or type II/ beta error (i.e., concluding that they are the same when in fact they differ, also known as a false-negative result)" (Dahiru, 2008).

Table 5. Errors Associated with Results of the Experiment. Source: Dahiru (2008).

Results of Experiment	Null Hypothesis True	Null Hypothesis False
Reject Null Hypothesis	Type I Error Rate (α)	Power = 1-β
Accept Null Hypothesis	Correct Decision	Type II Error Rate (β)

Hypothesis testing for this portion of the analysis was conducted using RStudio. This is an integrated development environment for the programming language R, primarily used for statistical computing and graphics. Assuming that each system has an equal probability of being transitioned/restructured or terminated, the null hypothesis for this test is that the true probability of success is equal to 0.5. This would give the analysis

a confidence level of 95% or an alpha (α) of .05. The alternative hypothesis is that the true probability of success does not equal 0.5. This would assume that there is a bias favoring one outcome over the other and that the likelihood of both outcomes is not equal. After performing the hypothesis test, there is a p-value of 0.0000004336, less than 0.05. Therefore, the analysis rejects the null hypothesis, and there is enough evidence to conclude that the probability of the system being transitioned/restructured is not equal to 0.5, indicating a bias. The 95% confidence interval is 0.712 to 0.922, which means that if another random sample of 55 systems were taken, we are 95% confident that the probability of a system being transitioned/restructured would fall between 71.2% (39/55) and 92.2% (50/55).

Even though the MTRP has had considerable success, additional variables needed to be created to add weight to these results. DAVE provided branch of Service information regarding the "DOD Lead Component." Six DOD organizations employed the MTRP pathway: Air Force, Army, Defense Counterintelligence and Security Agency (DCSA), Navy, Space Force, and USSOCOM. This portion of the analysis aims to determine if the branch of service influenced the success of MTRP programs, as certain Services have adapted their policies for MTA evaluation. See Figure 14 for the breakdown of the MTRPs by branch and "Acquisition Status."

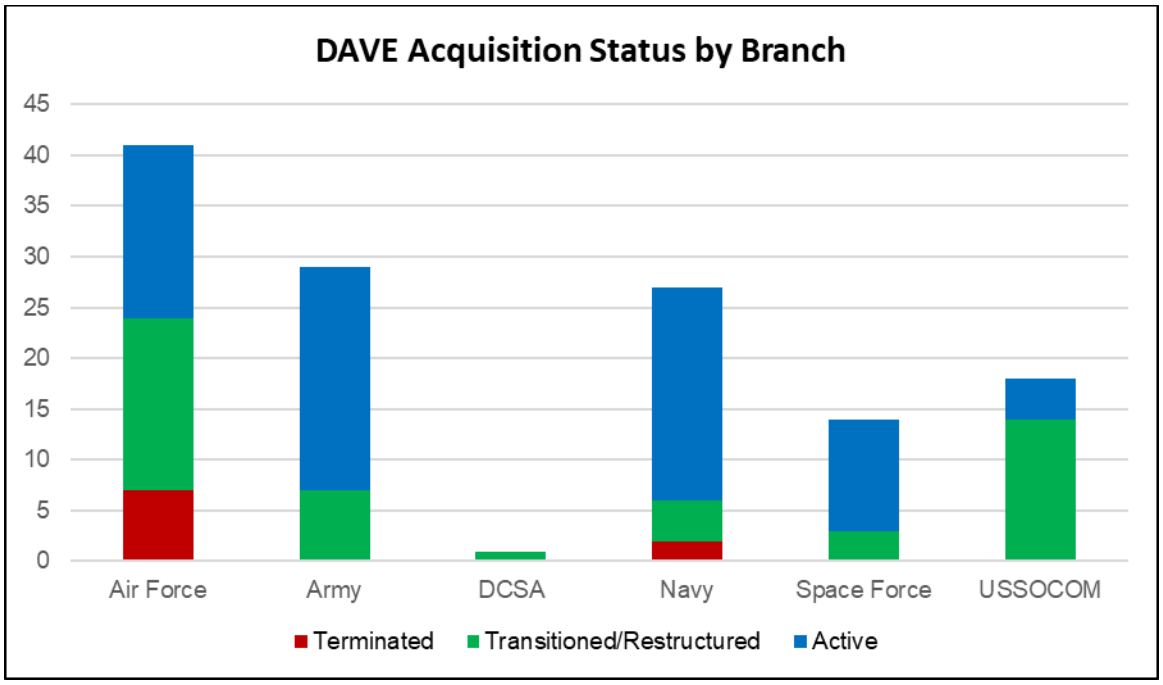

Figure 14. DAVE Acquisition Status by Branch. Adapted from OUSD[A&S] (n.d.).

Following this breakdown, there needed to be more programs to consider testing statistical significance for any of the branches of Service besides the Air Force and USSOCOM. Of 24 systems from the Air Force prototyped, 17 were transitioned or restructured. From this sample, the probability that a system is transitioned or restructured is 70.83%. However, from our previous test, our probability of a system being transitioned/restructured was 83.64%. For this hypothesis test, the null hypothesis is that the true probability of success equals 0.8364. The alternative hypothesis is that the true probability of success is not equal to 0.8364. Our confidence level is 95% or alpha = 0.05. After performing the hypothesis test, the p-value of 0.0979 was more significant than 0.05. Therefore, we fail to reject the null hypothesis and conclude that there is no evidence of a statistically significant difference between the prevalence of a system being transitioned/restructured in the current sample compared with the previous sample, given the sample size. The 95% confidence interval is 0.489 to 0.874, which means that if another random sample of 24 systems from the Air Force were taken, we are 95% confident that the probability of a system being transitioned/restructured would fall between 48.9% (11/24) and 87.4% (21/24).

Of 14 prototyped systems from USSOCOM, 14 were transitioned or restructured. From this sample, the probability that a system is transitioned or restructured is 100%. However, from our first test, our probability of a system being transitioned/restructured was 83.64%. For this hypothesis test, the null hypothesis is that the true probability of success equals 0.8364. The alternative hypothesis is that the true probability of success is not equal to 0.8364. Our confidence level is 95% or alpha = 0.05. After performing the hypothesis test, we got a p-value of 0.1465, more significant than 0.05. Therefore, we fail to reject the null hypothesis and conclude that there is no evidence of a statistically significant difference between the prevalence of a system being transitioned/restructured in the current sample compared with the first sample, given the sample size. The 95% confidence interval is 0.768 to 1.000, which means that if another random sample of 14 systems from USSOCOM were taken, we are 95% confident that the probability of a system being transitioned/restructured would fall between 76.8% (10/14) and 100% (14/14).

In summary, the only statistical significance from the data was the probability that an MTRP effort would be either a success or failure. Given the confidence intervals, more programs must be completed to thoroughly determine statistical significance by branch of Service. This was a limitation to the analysis as the MTA pathway is still relatively new. However, more rigorous analysis could have been implemented if more reliable data fields had been found. For example, there was an "MDAP/ACT I Equivalent" field that was yes/no, yet the "Acquisition Category" field was blank. This comparison alone would have provided more depth to the statistical significance of specific MTRP programs. Another inconsistency that would have been useful is the notes for why a program was transitioned/restructured or terminated. This field could have investigated the correlation between programs as a form of root cause analysis. Once these inconsistencies have been addressed, further statistical significance can be assessed for future evaluation.

C. DAVE DATA ANALYSIS

The research conducted by the team involved an analysis of MTA program data, with a central focus on the information reported via DAVE. For the analysis herein, we

used DAVE information from early-April 2024 to reflect current program status. We also utilized MTA program information researched and assessed by GAO from their reports from 2020–2022, and MTA policy and guidance outlined in DODI 5000.80, issued in December 2019. GAO reports and DAVE served as key sources for this part of the study. During the analysis, the researchers examined key factors such as program acquisition status, duration, transition plans, and other relevant information. The analysis aimed to identify any trends, factors, or inconsistencies within the data that could influence the success, partial success, non-success criteria of the MTA pathway as preciously defined in Chapter I.

To facilitate the analysis and establish a basis for comparison, the researchers used the MTA programs listed in the GAO report from June 2020 titled *Defense Acquisitions Annual Assessment: Drive to Deliver Capabilities Faster Increases Importance of Program Knowledge and Consistent Data for Oversight.* In their report, GAO summarized the characteristics of 121 DOD weapon systems and Information Technology (IT) programs, including thirteen MTA programs (GAO, 2020). Per GAO, the organization selected 13 unclassified MTA programs to review that the military departments identified "as at or above the equivalent threshold cost for designation as an MDAP—$523.6 million for RDT&E or $3.1 billion in procurement (fiscal year 2020 dollars)—and that already had funds obligated or were expected to have funds obligated within 30 days of July 2019" (GAO, 2020, p. 227). The organization evaluated five Army MTA programs and eight Air Force MTA programs using PID forms submitted by Services to the OSD in the third and fourth quarters of fiscal year 2020 (GAO, 2020, p. 227). In addition, GAO also conducted interviews, gathered responses from supplemental questionnaires, and collected additional information from each program to validate program acquisition data. At the time of their analysis, their assessment focused on current MTA efforts, not the programs' future plans (GAO, 2020, pp. 227–228). For this research paper, the analysis was narrowed down to MTA rapid prototyping efforts led by the DAF, which is the lead component of most DOD MTA portfolio programs, in accordance with our findings from DAVE.

GAO assessed further MTA programs using similar selection criteria in two subsequent reports from June 2021 and June 2022, titled *"Weapon Systems Annual*

Assessment: Updated Program Oversight Approach Needed" and *"Weapon Systems Annual Assessment: Challenges to Fielding Capabilities Faster Persist,"* respectively. Both reports included additional and updated information about the thirteen programs initially referenced in the previous assessment. We used the data from GAO to compare against the data obtained from DAVE to identify any discrepancies or inconsistencies that could affect the success or failure of the programs based on the research assumptions, scope, and limitations defined in Chapter 1. Table 6 lists the MTA programs obtained from the GAO report (2020) and used for this section of Chapter IV.

Table 6. GAO list of MTA rapid prototyping programs led by DAF. Source: GAO (2020, p. 55).

Air Force MTA Programs Identified by GAO	
Full Name	**Type of Technology**
Air-Launched Rapid Response Weapon	Hypersonic missile
B-52 Commercial Engine Replacement Program Rapid Virtual Prototype	Aircraft engine
F-22 Capability Pipeline	Aircraft hardware and software upgrades
Hypersonic Conventional Strike Weapon	Hypersonic missile
Next Generation OPIR Space Rapid Prototype	Missile warning satellite system
Protected Tactical Enterprise Service- Release 1	Communications support
Protected Tactical SATCOM	Communications support
Unified Platform Prototype	Software platform

After searching the selected programs in DAVE and analyzing the data, we discovered that both MTA programs, *Protected Tactical Enterprise Service- Release 1* and *Protected Tactical SATCOM*, have the United States Space Force (USSF) as the lead component in the database. This finding highlights an inconsistency between GAO program information and DAVE program data. As both programs are listed under USSF in DAVE, we considered them Space Force MTA programs in the sample data used to analyze the probability of success in the previous section. Therefore, we excluded both from the data analysis conducted herein. Table 7 displays the Air Force MTA programs analyzed in this section. The table includes DAVE program identification data such as full name, short name, and acquisition status. Additionally, we included the "Created At" and "Updated At" dates obtained from DAVE. It is important to mention that most of the information presented in this section was obtained from GAO reports.

Table 7. DAVE PID for Air Force MTA Programs. Adapted from DAVE (n.d.)

DAVE information on Air Force MTA programs observed				
Full Name	**Short Name**	**Acquisition Status**	**DAVE Program Created At**	**DAVE Program Updated At**
Air-Launched Rapid Response Weapon	ARRW	Active	7/29/2019	9/15/2023
B-52 Commercial Engine Replacement Program Rapid Virtual Prototype	B-52 CERP RVP	Transitioned/ Restructured	8/14/2019	2/8/2024
F-22 Capability Pipeline	F-22 Capability Pipeline	Transitioned/ Restructured	7/29/2019	11/18/2022
Hypersonic Conventional Strike Weapon	HCSW	Terminated	7/29/2019	11/18/2022
Next Generation OPIR Space Rapid Prototype	Next Generation OPIR Space Rapid Prototype	Transitioned/ Restructured	8/21/2018	3/27/2024
Unified Platform Prototype	UPP	Transitioned/ Restructured	7/31/2019	7/24/2023

1. Observations on MTA Program Length

This section provides an analysis of the MTA program length using DAVE program data and GAO reports. The aim of this analysis was to identify the expected program duration of the programs listed in Table 7, any changes in the projected duration, and their current acquisition status. Further, we used the sources to analyze whether the programs met the 5-year timeline required for the MTA pathway based on their acquisition status and the MTA program initiation information. Table 8 contains timeline information obtained from GAO-20-439, GAO-21-222, and GAO-22-105230 reports. We revised the expected program length of the MTA program based on any changes reported on the MTA completion timeframe.

Table 8. GAO MTA program timelines and projected completed dates. Adapted from GAO (2020, 2021, 2022)

GAO MTA program timelines and projected completion dates						
Short Name	**MTA initiation**	**MTA funds obligated**	**MTA completion**	**5-year mark since MTA funds obligation**	**Expected program length of MTA programs (in years)**	**Revised Expected program length of MTA programs (in years)**
ARRW	May-18	Aug-18	Aug-23	Aug-23	4.1	5.0
B-52 CERP RVP	Sep-18	Dec-18	Dec-23	Dec-23	2.3	5.0
F-22 Capability Pipeline	Oct-18	Oct-18	Sep-21	Oct-23	2.9	2.9
HCSW	May-18	May-18	Mar-22	May-23	3.8	3.8
Next Generation OPIR Space Rapid Prototype	Jun-18	Oct-18	Oct-23	Oct-23	5	5.0
UPP	Aug-18	Oct-18	Oct-23	Oct-23	5	5.0

According to the analysis, all six (6) Air Force rapid prototyping MTA efforts began before the release of DODI 5000.80 in December 2019, which currently governs the Operation of the Middle-Tier of Acquisition. As a result, these programs followed the previous DOD interim guidance issued in December 2018, which defined the start date of an MTA program as "the date of the first obligation of funds for a program purpose" (OUSD[A&S], 2018b, p. 2). The expected duration and 5-year mark for MTA efforts were determined based on the timeframe when MTA funds were obligated. Another finding is that DAVE does not provide the initiation, completion, transition, restructure, or termination date, as applicable, which is essential data to assess program schedule performance. Regarding timelines, the information obtained from DAVE only provides the program "Created At" date and time, and the "Updated At" date and time. For the analysis, we interpreted the "Updated At" date as the last date the program in question

had been updated in the defense acquisition database. We used this information to evaluate Exit program requirements per DODI 5000.80, which state that,

> No later than 60 calendar days after the MTA program completion date, CAEs will submit the following documentation via DAVE interfaces: (a) Outcome determination ADM signed by the DA, (b) an assessment of test results, (c) Final PID capturing updated entries, to include the outcome, sustainment, and final budget of the MTA program (OUSD, 2019b, p. 11).

However, our analysis showed that the lack of schedule information for specific events hinders the verification of MTA pathway effectiveness in regard to program duration and Exit requirements. The following information provides a summary of the observations for each MTA program listed in Table 8.

a. Air-Launched Rapid Response Weapon

The Air Force started the MTA program as a rapid prototyping acquisition effort in May 2018 with the objective to complete it by September 2022 (GAO, 2020, p. 185). However, due to schedule delays, the expected completion timeline shifted from September 2022 to August 2023, as shown in GAO reports. The schedule shift extended the expected duration from 4.1 years to 5 years. As of April 2024, DAVE data shows the program acquisition status as active. Considering the program funds were obligated in August 2018, the MTA effort would reach the 5-year mark since the obligation of funds in August 2023. Therefore, following MTA pathway policy, observations indicate that the program surpassed the required 5-year limit for effort completion. According to GAO,

> Air Force's ARRW programs have experienced developmental challenges and schedule delays that now threaten the 5-year timelines. These programs lacked key business case elements at initiation—including approved acquisition strategies and formal technology and schedule risk assessments—that could have helped decision makers assess the programs' likelihood of meeting MTA schedule objectives (GAO, 2022, p. 41).

Based on this observation, if the program transitions or restructures after the 5-year time limit, the program would be considered "partially successful" as per the definition in Chapter I, given that it partially met criteria as it experienced a schedule slip greater than five years.

Furthermore, it is worth noting that DAVE's latest program status update was in September 2023. Given the program's active status as an MTA effort, there are two possible scenarios to consider. First, the program was not able to deliver the required capability within the MTA pathway time limit and received a DAE waiver to continue the MTA effort. Second, it's also possible that the acquisition status has changed, but the PID has not been updated since September 2023, indicating a potential gap in the reported data.

b. B-52 Commercial Engine Replacement Program Rapid Virtual Prototype

Per GAO, the program consisted of two virtual rapid prototyping efforts. "Virtual system prototype development is occurring incrementally, with the initial capability delivered in September 2021 (Spiral 1 Increment 1) and full capability expected in July 2022 (Spiral 1 Increment 2)" (GAO, 2022, p. 107). According to the GAO reports, the MTA program was expected to be completed by December 2023. (GAO, 2021, 2021). As of April 2024, DAVE data shows that the program transitioned/restructured, although the database did not specify when the transition occurred. Following the assumptions provided for acquisition status of "transitioned/restructured" in Table 1, the subject MTA effort is considered successful.

DAVE data also shows the program status was last updated in early February 2024, approximately two months after the MTA completion/5-year mark since the obligation of MTA funds (program start). This observation indicates that the program completed the MTA effort within the projected completion timeline and the acquisition pathway time limit per policy. Furthermore, DODI 5000.80 requires CAEs to submit status update documentation via DAVE by 60 days after the MTA program completion date (OUSD, 2019b, p. 11). Although the completion date is not shown in DAVE, the timelines indicate that the program was updated within the 60-day requirement.

c. F-22 Capability Pipeline

As per the GAO-22-105230 report (2022), the *F-22 Capability Pipeline* program was restructured in April 2021. This involved dividing the subject MTA effort into two separate MTA efforts. One was dedicated to rapid prototyping, and the other focused on

rapid fielding (GAO, 2022, p. 115). By April 2024, DAVE data shows the program's acquisition status as transitioned/restructured, indicating the program was successful as per the assumptions defined in Table 1. Observations also indicate that the MTA effort was completed within the expected timeline; by the time GAO published their report in June 2022, the subject MTA effort had already been restructured. However, the GAO and DAVE data need to be clarified; whether the program was restructured by the projected date or after is still in question. DAVE does not specify the transition/restructure date, only the "updated at date" in November 2022, over one year after the MTA projected completion date. With this in mind, observations also indicate that the CAE did not meet the 60-day requirement to enter program outcome update after completion, as per DODI 5000.80.

d. Hypersonic Conventional Strike Weapon

The program initiated a rapid prototyping effort in May 2018 to be completed by March 2022 (GAO, 2020, p. 191). However, "in February 2020, the Air Force indicated its plans to cancel *HCSW* and keep a second hypersonic weapon prototyping effort due to budget pressures" (GAO, 2020, p. 191). As of April 2024, DAVE lists the program acquisition status as terminated. The MTA effort is considered unsuccessful based on Table 1 assumptions for "terminated" acquisition status. Additionally, DAVE data shows that the program status was last updated in January 2022, indicating that it was terminated before the expected MTA completion date of March 2022.

e. Next Generation OPIR Space Rapid Prototype

The MTA program began as a rapid prototyping effort in October 2018, with a completion target set for October 2023, which was also the 5-year mark since the obligation of MTA funds (GAO, 2020, p. 193). As of April 2024, the DAVE data indicates that the program acquisition status has been transitioned/restructured. Based on the assumptions defined in Table 1, the program is considered successful. However, it should be noted that DAVE data does not provide a specific date for the program's transition or restructuring, only the "updated at" date for the subject program in late March 2024, about six months after the projected MTA effort completion timeline. Per

our analysis, whether the program was transitioned/restructured by the projected timeframe or after is necessary to assess program schedule performance effectively. Another notable observation regarding the program status update date is that if the program ended by the October 2023 target date but was updated in DAVE in March 2024, then the program exceeded the required timeframe of 60 days after MTA program completion to submit the final PID capturing program outcome determination via DAVE (OUSD, 2019b, p. 11).

f. Unified Platform Prototype

The MTA program was launched in October 2018 as a rapid prototyping effort. It was expected to be completed by October 2023, marking a five-year timeline since the obligation of MTA funds. As of April 2024, the DAVE report indicates that the program has been transitioned or restructured, meeting the successful criteria in Table 1. Per GAO, the program transitioned to the software acquisition pathway in August 2020 (GAO, 2021, p. 68). However, it is worth noting that, as per DAVE, the program was updated in late July 2024. This observation indicates that the "updated at" does not align with the exit guidance established in DODI 5000.80, which requires CAEs to submit program outcome updates via DAVE within 60 days after MTA program completion (OUSD, 2019b, p. 11).

Based on our observations, all Air Force MTA programs that underwent transition or restructuring, as reflected in DAVE, were successful according to our assumptions in our research methodology. Moreover, the analysis indicates that DAVE needs to provide more information to verify whether these programs transitioned or restructured before or by the expected MTA completion timeline. As we went through the data, we observed that DAVE, as a primary source to collect MTA-PID for program performance oversight and assessment based on PID status submission, is only partially reliable. Per the analysis, a significant trend was that the information gathered from the database needs to specify substantial data elements, like schedule information and program notes, contributing to a more thorough analysis of program duration. Additionally, we observed that, although we interpreted the Updated At date as the latest PID status update

submission in DAVE, the database must also clarify that. Table 9 records the score given to the six Air Force MTA programs reviewed based on our methodology.

Table 9. Score of MTA programs

MTA Programs score following the assumptions defined in Chapter I		
Short Name	**Score**	**Rationale**
ARRW	Partial success	The program remains active but plans to transition. However, based on the GAO data reviewed, the program surpassed the MTA 5-year mark since the program's start timeline.
B-52 CERP RVP	Successful	The program transitioned/restructured per DAVE data.
F-22 Capability Pipeline	Successful	The program transitioned/restructured per DAVE data.
HCSW	Unsuccessful	The program terminated per DAVE data.
Next Generation OPIR Space Rapid Prototype	Successful	The program transitioned/restructured per DAVE data.
UPP	Successful	The program transitioned/restructured per DAVE data.

2. Observations on MTA Programs Transition Plan

Programs categorized as major systems must develop and submit a transition plan to enter the MTA pathway (OUSD[A&S], 2019b, p. 10). DODI 5000.80 states that the transition plan shall be included in the acquisition strategy and shall comprise "a timeline for completion within two years of all necessary documentation required for transition, as determined by the DA, after the MTA start" (OUSD[A&S], 2019b, p. 10).

For rapid prototyping efforts, DOD components must develop a plan to transition "successful prototypes to new or existing acquisition programs for production, fielding, operations, and sustainment under the rapid fielding pathway or other acquisition pathway" (OUSD[A&S], 2019b, p. 8). Similarly, for rapid fielding efforts, DOD

components must develop a plan to transition successful programs to operations and sustainment (OUSD[A&S], 2019b, p. 9). A transition plan can help programs identify and understand the best acquisition practices and knowledge needed before transitioning to a predetermined acquisition pathway, increasing the chances of successful outcomes.

For this section, we utilized GAO reports to determine whether the Air Force MTA programs listed in Table 7 had established a transition plan upon entering the MTA pathway and if it changed over time. Additionally, we checked whether the programs that were deemed successful in the previous section had a defined transition plan and if it changed during program execution. Table 10 presents the transition plans identified in GAO reports (2021, 2022) for each Air Force MTA program listed in Table 8.

Table 10. MTA programs transition plan. Adapted from GAO (2020, 2021, 2022)

Short Name	MTA Program Transition Plan
ARRW	The program planned to transition to either a new rapid prototyping effort or MCAP pathway at the production milestone (GAO, 2021, p. 111).
	The program changed plans to transition to a new rapid fielding effort (GAO, 2022, p. 105).
B-52 CERP RVP	The program planned to transition to a follow-on rapid prototyping effort (GAO, 2021, p. 113).
	The program changed plans to transition to the MCAP pathway with entry at the development phase (GAO, 2022, p. 107).
F-22 Capability Pipeline	The program had yet to determine a transition pathway by the time of GAO's assessment in January 2021 (GAO, 2021, p. 119).
	The program restructured into two separate MTA efforts in April 2021. system development or production (GAO, 2022, p. 115).
HCSW	The program planned to transition to a follow-on rapid prototyping effort. However, the program was canceled in early-2020 stating "budget pressures" (GAO, 2021, p. 191).
Next Generation OPIR Space Rapid Prototype	The program planned to transition to the MCAP pathway with entry at system development (GAO, 2021, 2022).
UPP	By the time of GAO report from June 2020, the lead component was "evaluating what type of acquisition pathway to pursue at the end of its rapid prototyping effort" (GAO, 2020, p. 199).

As per the DAVE MTA-PID reference guide from November 2023, authorized users with access to a declared MTA program can submit program status through DAVE. Entry data includes the approval date of the transition plan submitted to the OUSD(A&S) AIR (OUSD[A&S], 2023, p. 49). However, the data obtained from DAVE needs more information about the transition plan.

We analyzed GAO reports and DAVE to identify a relationship between the determination of a transition plan and the acquisition status. Our analysis showed that there is no substantial correlation between the two. For example, the *UPP* program transitioned to another acquisition pathway even though, according to the GAO assessment in 2020, the program had yet to determine a transition plan entering MTA. A similar situation can be seen with the *F-22 Capability Pipeline* program. Officials were assessing which acquisition pathway to follow after completing the MTA effort; but the program ended up restructuring in April 2021 (GAO, 2021, p. 119). The *HCSW* program "planned to transition to a follow-on rapid prototyping effort," according to GAO (2021), but ended up canceling the effort in early 2020 due to budget concerns (p. 191). *AARW* planned to transition to a new rapid prototyping effort or MDAP pathway at Milestone C (GAO, 2021, p. 111). The program later changed plans to transition to a new rapid fielding effort (GAO, 2022, p. 105). However, based on recent DAVE data, the program's acquisition status remains active.

As shown in Table 7, four out of six programs transitioned/restructured. However, their transition strategies varied. Both *B-52 CERP RVP* and *Next Generation OPIR Space Rapid Prototype* had a determined transition plan, as shown in Table 9. However, *B-52's* plan changed, but *Next Gen's* did not, yet they both transitioned/restructured. The other programs, *UPP* and *F-22 Capability Pipeline* have yet to determine a transition plan for entering the MTA, as shown in Table 10. Still, *UPP* eventually transitioned, and *F-22* restructured. Therefore, observations suggest that a defined transition plan at the entrance of the MTA pathway does not particularly impact a program's transition outcome and potential success.

3. Observations on MTA Programs Knowledge Points Before Transition

MTA programs planning to transition to a follow-on rapid fielding effort or major capability acquisition program are better positioned for successful outcomes when attaining high levels of knowledge before significant milestones. According to GAO's findings, "a knowledge deficit at the end of the current MTA effort poses cost and schedule risks after the program transitions to a follow-on effort" (GAO, 2022, p. 35). Figure 15 illustrates the knowledge points depicted on the MCAP and MTA pathways identified by GAO using DODI 5000.80, DODI 5000.85, and leading acquisition practices. In practice, an MTA program's plan to attain certain knowledge points would depend on the program's transition plan (GAO, 2022, p. 35). Per GAO, "if an MTA program planned to transition to the major capability acquisition pathway at system development, we assessed the extent to which the program planned to demonstrate knowledge that informs the decision to invest in product development by the end of the current MTA effort" (GAO, 2022, p. 35). Figure 13 in Chapter III, Section E breaks down key activities for programs to perform to attain knowledge points and apply leading acquisition practices when planning to transition to the MCAP pathway.

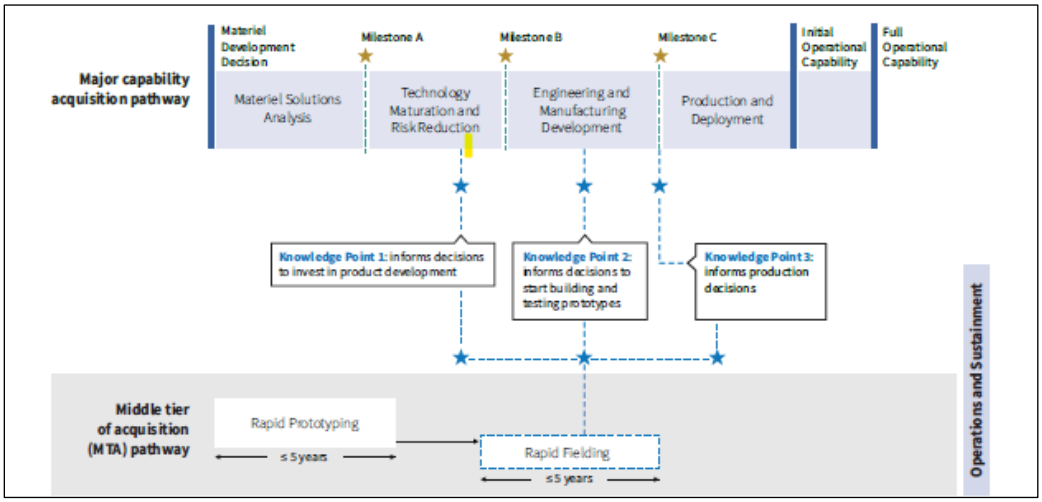

Figure 15. GAO-Identified Knowledge Points depicted on the MCAP and MTA Pathways. Source: GAO (2022, p. 35).

For this section, we utilized GAO reports to determine whether the MTA programs listed in Table 7, those which planned to transition to the MCA pathway and transitioned/restructured per DAVE, attained recommended knowledge in preparation for

the transition. As seen in GAO, the assessment of knowledge points attained did not apply to programs planning to transition to a new MTA rapid prototyping effort, another acquisition pathway under the AAF, or programs without a transition plan. Table 11 shows the knowledge attained or planned for MTA programs based on their transition plan. The table was adapted from GAO reports.

Table 11. Planned Knowledge by MTA Transition. Adapted from GAO (2020, 2021, 2022)

Planned Knowledge by MTA Transition													
Reporting Year		**2020/2021**						**2022**					
Short Name		**AAWR**	**B-52 CERP RVP**	**F-22 Capability Pipeline**	**HCSW**	**Next Generation OPIR Space Rapid Prototype**	**UPP**	**AAWR**	**B-52 CERP RVP**	**F-22 Capability Pipeline**	**HCSW**	**Next Generation OPIR Space Rapid Prototype**	**UPP**
Transition Plan		Either to a new MTA rapid fielding effort or to the MCAP for production	Transition to a follow-on MTA rapid prototyping effort	Has yet to determine a transition pathway	Transition to a follow-on rapid prototyping effort	Transition to the MCAP pathway with entry at system development	Has yet to determine a transition pathway	Transition to a new MTA rapid fielding effort	Transition to the MCAP pathway at system development	Program restrcutured in April 2021	Program cancelled in early-2020	Transition to the MCAP pathway with entry at system development	Transitioned to the software acquisition pathway in August 2020
Resources and requirements match													
Knowledge Point 1	Demonstrate all critical technologies are very close to final form, fit, and function within a relevant environment	KP	NA	NA	NA	KP	NA	KA	NA	NA	NA	KP	NA
	Demonstrate all critical technologies in form, fit, and function within a realistic environment	KP	NA	NA	NA	NA	NA	INA	NA	NA	NA	NA	NA
	Complete system-level preliminary design review	KA	NA	NA	NA	KA	NA	KA	KP	NA	NA	KA	NA
Design Review													
Knowledge Point 2	Release at least 90 percent of design drawings	KA	NA	NA	NA	NA	NA	KA	NA	NA	NA	NA	NA
	Test a system-level integrated prototype	KP	NA	NA	NA	NA	NA	KP	NA	NA	NA	NA	NA
Production Start													
Knowledge Point 3	Demonstrate critical processes on a pilot production line	KP	NA	NA	NA	NA	NA	INA	NA	NA	NA	NA	NA
	Demonstrate Manufacturing Readiness Level of at least 9 or critical processes are in statistical control	KNP	NA	NA	NA	NA	NA	KNP	NA	NA	NA	NA	NA
	Test a production-representative prototype in its intended environment	KP	NA	NA	NA	NA	NA	INA	NA	NA	NA	NA	NA

KA: Knowledge Attained; KP: Knowledge Planned; KNP: Knowledge Not Planned; NA: Not Applicable; INA: Information Not Available

Based on observations from the GAO report from 2021, the MTA program *Next Generation OPIR Space Rapid Prototype*, which planned to transition to the MCA pathway with entrance at system development and was determined to have transitioned/ restructured per DAVE, needed to obtain Knowledge Point 1 to facilitate entrance to MCA pathway system development, Milestone B (GAO, 2021, p. 39). According to the information presented in Table 11, the program completed system-level preliminary design and planned to demonstrate that "all critical technologies are very close to final form, fit, and function within a relevant environment" (GAO, 2021, p. 39). Further review showed that the transition plan remained unchanged from 2021 to 2022. It is also worth mentioning that, per the assessment, "critical technologies were not assessed in a realistic environment because "satellite technologies demonstrated in a relevant environment are considered fully mature" (GAO, 2022, p. 121). Although DAVE reflects an updated acquisition status of transitioned/restructured, it does not mention if the program transitioned to the MCA pathway. Nonetheless, from our observation of the GAO data, the program planned to obtain the knowledge recommended before transitioning to the MCA pathway at system development based on system characteristics and transition plan (GAO, 2022, p. 38).

Based on observations from the GAO report from 2022, MTA program *B-52 CERP RVP*, which planned to transition to the MCA pathway with entrance at system development and was determined to have transitioned/restructured per DAVE, needed to obtain Knowledge Point 1 to set its position to transition to MCA at system development, Milestone B (GAO, 2022, p. 38). According to Table 10, the program planned to complete a system-level preliminary design review before the transition. However, per GAO, demonstrating all critical technologies within a relevant and realistic environment did not apply (GAO, 2022, p. 107). The organization did not assess said key steps because "the program stated that the system does not have any such technologies" (GAO, 2022, p. 107). It is worth mentioning that the subject program changed the transition plan from 2021 to 2022. *B-52 CERP RVP* originally planned to transition to a follow-on MTA rapid prototyping effort, which assessment for planned knowledge by MTA transition did not apply (GAO, 2021, p. 113). Although DAVE reflects an updated acquisition status of transitioned/restructured, it does not mention if the program transitioned to the MCA

pathway. Nonetheless, from our observations of the GAO report, the program planned to obtain the knowledge recommended before transitioning to the MCA pathway at system development based on system characteristics and transition plan (GAO, 2022, p. 38).

D. SUMMARY

The collected analysis of this CAP covers MTA data availability, probability of success, contributing factors to success, and program transitions. This analysis was pulled primarily from user data accessible through DAVE, GAO reports, and other publicly available references. Specific details from some of the analyses were limited due to the restriction of the NDA from the DAVE website. In addition to the limitation of details that could be mentioned because of the NDA, analysts also discovered a lack of consistency within the accessible data that limited the scope of analysis. However, statistical analysis was still able to prove the statistical significance of an MTRP being a success through hypothesis testing. This showed a high probability that a new set of projects being transitioned/restructured would fall between 71.2% (39/55) and 92.2% (50/55). That same hypothesis testing was conducted to evaluate if two branches of Service had any statistical significance to the success of an MTRP. Due to the limited number of systems by Service, the findings concluded that there was no statistical significance.

Programs that transitioned/restructured as per their acquisition status in DAVE are considered successful. That said, if DAVE had provided more details about the program schedule, we could have confirmed when the program completed the effort, and determined program length and whether programs were fully or partially successful. Moreover, having reviewed the MTA program transition plan data for the programs that transitioned/restructured, we determined that there was no correlation significantly impacting the "successful" outcome of the program. However, we gather that having a defined transition plan before MTA completion is significantly valuable to know and understand the knowledge programs should attain before transition, particularly those programs that want to move to either a follow-on or new rapid fielding effort or MCA pathway, whether at the development or production phase. Although the DAVE data obtained did not provide information about MTA program transition plans either, as analyzed in the previous section, two programs that transitioned/restructured and planned

to move to MCAP with entry at system development obtained the necessary information apt for their respective system requirements and characteristics to facilitate the transition. According to GAO, "MTA programs that do not plan to achieve recommended knowledge before transitioning to another MTA effort or acquisition pathway may carry unnecessary risks into their follow-on efforts" (GAO, 2021, p. 40).

V. CONCLUSION, LESSONS LEARNED, AND RECOMMENDATIONS

A. CONCLUSION

The initial intent of this research was to determine the effectiveness of the MTA rapid prototyping pathway. The analysis answered the following three primary research questions:

(1) Of the MTA efforts, what percentage have done rapid prototyping, and what percentage were rapid fielding?

From the 201 MTA programs in DAVE: 134 (67%) rapid prototyping projects with 75 holding an active acquisition status and 74 (33%) rapid fielding projects with 48 holding an active status.

(2) Of the rapid prototyping efforts, what percentage was completed within five years?

Given the lack of program schedule information in DAVE, analysts could not answer this question for this capstone. Still, to expand our analysis and knowledge on program duration, we leveraged GAO assessment of six unclassified, rapid prototype MTA efforts led by the Air Force classified as major systems. The GAO reports provided the MTA program start, expected completion, and the 5-year since the start timeline. By using this information and the program acquisition status obtained from DAVE, we attempted to examine whether the programs that transitioned/restructured met the 5-year mark. Unfortunately, as we have noticed in Chapter IV, Section C.1, the analysis indicated that DAVE data was insufficient to assess whether the program completed efforts within the five-year time limit required by MTA policy.

(3) Of the rapid prototyping efforts, what percentage transitioned to a POR?

Of the 55 completed MTA rapid prototyping efforts, 46 (83.64%) were Transitioned/Restructured. It is unclear whether all those 46 were restructured as a POR or were simply transitioned into a follow-on effort.

Analysis of the primary research questions proved that there is a statistical significance that an MTA rapid prototyping effort will likely be considered a success (i.e., transition to a follow-on effort or transition into a program of record). While the initial research questions provide a broad scope of pass/fail within the MTA pathway, additional research questions were developed to conduct a more rigorous study. This next portion of the analysis answered the following three secondary research questions:

(4) Which branch had the most success with MTAs?

This is a loaded question in hindsight. Out of the six branches of service, four had a 100% success rate. Three of those four branches had under ten completed programs: Army-7, Space Force-3, and DCSA-1. However, USSOCOM could be considered the most successful branch as it maintained its 100% success rate with 14 completed programs.

(5) Which branch had the most failures with MTAs?

The service branch with the most failures with MTAs was the Air Force, with seven program terminations. Even with those seven terminations, the Air Force maintains the highest number of completed successful rapid prototyping efforts, at 17 programs. When factoring in the programs that are still active, the Air Force leads the other branches of service in rapid prototyping efforts, at 41 programs.

(6) Which branches are considered statistically significant following the DAVE data?

Only two branches had enough completed programs to be considered for statistical significance. These branches were the Air Force and USSOCOM, with 24 and 14 programs, respectively. However, based on hypothesis testing with a binomial distribution, there was not enough evidence to support that either branch has successfully leveraged rapid prototyping.

These research questions were particularly ambitious as DAVE was presented as the primary reporting endeavor for all MTA programs. The DA will approve MTA programs documentation within their purview… CAEs will ensure documentation is available and updated as required via DAVE (OUSD[A&S], 2019b, p. 10). While

instructions from DODI 5000.80 *Operation of Middle Tier Acquisition* state that all PIDs must be updated through DAVE, other tools have been accommodated to fit this need, contributing to the inconsistencies found during research and analysis. DAVE is meant to be the authoritative database, yet updates can be made through tools like AIR or PMRT. There has been a significant effort to deliver all reporting requirements through DAVE; however, as researchers, we feel the integrity of that database and administrative discipline to maintain it is lacking.

B. LESSONS LEARNED

While the MTA pathway is still relatively new, ways to evaluate and quantify results are still being developed. We believe that within a few more years there will be enough data to fully evaluate the capabilities of the MTA rapid prototyping pathway. However, oversight improvements must be made in order to establish a higher standard of data availability and data validity.

The literature portrayed DAVE as an all-encompassing tool when viewing, updating, or starting MTA efforts. Contrary to the leading documentation, the investigation of DAVE has shown that it does not have a clear direction of what it is meant to be. Results from this investigation have rendered DAVE as merely a product support analytical tool that is part of a database that aids the defense acquisition workforce in identifying the best product support solutions to optimize system readiness and life cycle cost. One of the primary issues found when using DAVE was the inconsistencies with the level of details between certain programs. This prevented an in-depth trends analysis from taking place as it would have provided additional details for comparison. An example of this can be seen in the "System Type" field. Some programs would have one or two words describing the program while others would be blank. This field would have had a wider range of diversity, but consistency would have still provided a use level of comparison. Another example that was previously mentioned was the lack of what the actual "Acquisition Category." Given the limited options available for this field, an additional hypothesis test could have been conducted to prove statistical significance. Even though there is no mention of other tools in *DODI 5000.80*, these inconsistencies could stem from DAVE not being the primary reporting resource for

every branch of service. The other tools supported by DAVE are PMRT and AIR. However, there is no definitive acknowledgement within the DAVE data if and when those have been updated by these tools.

In an ideal world, DAVE would be the center of reference class forecasting (RCF) for defense acquisition as it is meant to be the primary reporting hub. Being the giant program database it is, DAVE would be able to filter programs down by class or similar nature. "Use data from that class–about cost, time, benefits, or whatever else you want to forecast–as your anchor. Then adjust up or down, if necessary, to reflect how your specific project differs from the mean in the class" (Flyvberg, 2024, p. 107). DAVE can be so much more than a data storage tool. It has the potential to be molded into an analytical tool for predicting the future. The systems are in place, but we need to enforce some discipline to maintain them.

The effectiveness of the MTA pathway is not influenced by the schedule element as the only potential constraint. There are other factors that impact the pathway and its ability to deliver. Some of these other factors include transition plans, knowledge points, TRLs, and acquisition categories. As the analysis states, utilizing DAVE did not provide the scale of information required to fully answer the effectiveness of the MTA rapid prototyping pathway. Another lesson learned would be to create a smaller scope and do a deeper analytical dive into that specific area of interest. This would allow for the usage of DAVE as a base to narrow down the research and the incorporation of other analytical tools thereafter. From this point, researchers would have better control over external variables, begin to focus on ones that bring validity to the research at hand, and draw upon a conclusion to the field with impunity.

C. RECOMMENDATIONS

With this CAP, there was an element of rushing to commit. In a way, we are somewhat guilty of the planning fallacy "WYSIATI" (What You See Is All There Is). This means there is "an assumption that whatever information we have on hand is all the information available to make the decision" (Flyvbjerg & Gardner, 2024, p. 29). DAVE seemed to be the end of the road regarding MTA reporting, and we were made to believe that all the necessary information we required would be within that database. Even when

problems started to present themselves, we were committed to the point that DAVE would provide alternate solutions to complete the analysis and answer the question of effectiveness. Passed a point, we also fell for the "sunk cost fallacy" and continued pushing forward, investing more time and resources into the research with the expectation that DAVE would deliver more. Needless to say, we have found out differently. Going forward, a better approach to answering the question of MTA effectiveness would be to perform a case study between two completed MTA rapid prototyping efforts, one that transitioned/restructured and another that was terminated. We recommend selecting programs from the Air Force portfolio as the Service branch has the most failures and the highest number of completed successful rapid prototyping efforts per the previous analysis. Narrow the selection down to programs of similar nature to eliminate irrelevant variables and focus on best practices. To maximize the research, we recommend including interviews, questionnaires, and other investigative efforts to those perspective program offices to facilitate enough valuable information to assess the selected programs appropriately.

D. RECOMMENDED AREAS FOR FUTURE RESEARCH

The MTA pathway holds great potential to revolutionize how the DOD acquires and delivers weapon systems. Its focus on speed and invitation to transform acquisition practices for the benefit of warfighters breaks traditional methods and sparks much interest across the DOD components. However, its effectiveness requires further study. As we have learned, the effectiveness of the MTA pathway is swayed by more than just the number of programs that successfully transition or restructure. Factors like policy, guidance, program oversight, technology maturity, data reporting and collection, knowledge attained before important milestones, and the established schedule time limit for completion of effort are essential in evaluating the MTA pathway's effectiveness in meeting its purpose. Despite this, the MTA pathway, as a relatively new approach to acquisition, presents an opportunity to shift the paradigm and change how processes are planned and executed and how capabilities are developed and fielded. Furthermore, it strengthens DAS to create "a culture of performance that yields a decisive and sustained U.S. military advantage" (OUSD[A&S], 2019b, p. 3). Therefore, to expand the DOD's

knowledge of the MTA pathway and its effectiveness within the AAF, here are some areas of interest for potential future research.

1. Analyze data reporting and collection methods to identify any patterns or trends that may affect the oversight and performance of the MTA pathway.
2. Determine the number of MTA programs in execution that exceeded the five-year timeline after the program start date with a DAE waiver. Identify the key program characteristics that contributed to the schedule slip.
3. Determine the number of MTA programs that are classified as ACAT I equivalent. How many programs have transitioned to a new or follow-on MTA effort or POR under a different acquisition pathway? What is the probability that an ACAT I equivalent MTA program transitions to a POR compared to other programs classified as major and non-major systems?
4. Examine how cost performance affects the effectiveness of the MTA pathway. Determine the number of programs that have exceeded their initial cost estimates. Analyze the impact of exceeding cost estimates on MTA programs' plan to complete efforts within the mandated 5-year timeline and/or transition to a follow-on effort.
5. Examine the extent to which MTA programs identify and assess the TRL of critical technologies before entering the MTA pathway. Analyze the impact such data has on program performance and outcome.
6. Investigate the possibilities of utilizing artificial intelligence to aid DAVE in quantifying its reporting requirements. Researchers may be able to leverage large language models to investigate varies gaps within DAVE and provide levels of reporting for every system. This insight should highlight issues with compliance and should issue warnings to stakeholders to ensure higher quality when navigating DAVE.
7. Investigate other acquisition databases to highlight areas of improvement for DAVE. Use RCF to find a database similar to the anchor for comparison, then adjust some of the best practices to optimize DAVE as an acquisition tool. Once optimized, apply RCF within DAVE to quantify programs of a similar nature to evaluate a standard process to estimate time to completion.

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