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ACQUISITION RESEARCH PROGRAM
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Change in Acquisitions Mentality in Regard to Engineer Kits within the Marine Corps

June 2023

Capt Ryan D. Christmas, USMC

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

Department of Defense Management

Naval Postgraduate School

Prepared for the Naval Postgraduate School, Monterey, CA 93943

ACQUISITION RESEARCH PROGRAM
DEPARTMENT OF DEFENSE MANAGEMENT
NAVAL POSTGRADUATE SCHOOL

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ABSTRACT

Currently, the Marine Corps buys kits the same way that they buy other items, with one large buy or a few smaller buys. These buys are triggered from needs requests sent by the operating forces due to obsolescence of gear or a new requirement. This, in my opinion, leaves too much room for Marines to make do with what they have, leaving little room for improvement of tools and equipment that keeps pace with industry standards. In my capstone, I consider whether an evolutionary acquisitions approach would be beneficial to the performance and lifetime cost currently associated with engineer kits, which include carpenter, pioneer, and lineman's tool kits; some explosive ordnance disposal kits and maintenance kits; Airfield Damage Repair kits; and Multi-Terrain Loader kits. By setting up incremental evaluations of the kits based on time rather than needs request, Program Manager Engineer Systems can better evaluate whether the Marine Corps equipment is keeping up with industry and the mission and create a forcing function for new equipment acquisition without having to replace all the other parts of the tool kit.

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ABOUT THE AUTHOR

Capt Ryan Christmas is a Engineer Officer in the United States Marine Corps. He was commissioned through the NROTC program at Louisiana State University, where he received two Bachelors of Arts in Political Science and Disaster Science and Management. He is married to his wife Victoria Christmas and they have a daughter Mackenzie. He is currently serving as a Project Officer at Marine Corps Systems Command.

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LIST OF ACRONYMS AND ABBREVIATIONS

AAF	Adaptive Acquisitions Framework
AAP	Abbreviated Acquisition Program
ADRK	Airfield Damage Repair Kit
CD&I	Capabilities Development and Integration Branch.
CDD	Combat Development Directorate
COTS	Commercial Off the Shelf
DA	Decision Authorities
DAS	Defense Acquisition System
DoD	Department of Defense
ECP	Engineering Change Proposal
JCIDS	Joint Capabilities Integration & Development Systems
LCES	Logistic Combat Element Systems
MAG	MARCORSYSCOM Acquisition Guidebook
MAGTF	Marine Air Ground Task Force
MCSC	Marine Corps System Command
MDA	Milestone Decision Authority
MI	Modification Instruction
O&M	Funding Operations and Maintenance Funding
PfM	Portfolio Manager
PLT	Platoon
PM	Program Manager
PMC funding	Procurement Funding
PMES	Program Management Engineer Systems
POM	Program Objective Memorandum
PPBE	Planning, Programming, Budgeting, & Execution

PQDR	Product Quality Deficiency Report
PQDR	Product Quality Deficiency Report
SL-3	Stock Level 3
TM	Technical Manual
USMC	United States Marine Corps

DEFINITIONS

Airfield Construction: "Construction of an airbase is a complex general engineering construction project performed by a combination of Marine Wing Support Squadron (MWSS), Engineer Support Battalion (ESB), and Naval Construction Force (NCF) engineers. However, careful planning and a strict focus on essentials can result in a facility that will support air operations soon after construction begins. Subsequent improvements can be made during use. If construction is guided by an ultimate plan, phased completion of each structure can be designed to serve both expedient operation and the final design of the facility." (Marine Corps Combat Development Command, 2016)

Bulk Liquid Support: "All operations rely heavily on the supply of fuel and water. Bulk-fuel Marines and utility Marines in the ESB are responsible for planning and executing bulk liquid operations for the MAGTF beyond the element's organic capabilities. The ESB is responsible for the transfer of Class III (bulk fuel) from amphibious and/or commercial sources, and acts as the main source of fuel storage for the MAGTF. The ESB provides fuel to the ACE, GCE, and CSSE. The ESB also provides the MAGTF with potable water production and storage as well as laundry and shower support when the requirement exceeds the organic capabilities of the elements of the MAGTF." (Marine Corps Combat Development Command, 2016)

Counter-Mobility: "Counter-Mobility is the physical shaping of the battlespace to alter the scheme of maneuver of the enemy. Counter-Mobility operations block, fix, turn, or disrupt the enemy giving the MAGTF commander opportunities to exploit enemy vulnerabilities or react effectively to enemy actions." (Marine Corps Combat Development Command, 2016)

Electrical Support: "Mobile electric power (MEP) support, especially to the MAGTF command element and the command elements of subordinate units, becomes increasingly more important when the MAGTF is unable to rely on local electrical utilities for its power needs." (Marine Corps Combat Development Command, 2016)

Engineer Platoon: "Each platoon consists of (1) platoon commander, (1) platoon sergeant, (1) platoon guide, and (3) nine-man squads." (The Basic School, 2017)

Engineer Reconnaissance: "Engineer reconnaissance collects data that provides engineers within a MAGTF information on terrain, hydro graphics, meteorological, and infrastructure (e.g., built-up areas, transportation networks, utilities, existing natural or manmade obstacles) necessary to support the commanders with their planning for ongoing or future operations. Engineer reconnaissance is vital to successful MAGTF operations." (Marine Corps Combat Development Command, 2016)

Evolutionary Acquisitions: "In this process (Spiral Development), a desired capability is identified, but the end-state requirements are not known at program initiation. Those requirements are refined through demonstration and risk management; there is continuous user feedback; and each increment provides the user with the best possible capability. The requirements for future increments depend on feedback from users and technology maturation." (Lowell, Lowell, & Younossi, 2006)

Heavy Equipment Support: Heavy Equipment Support provides operators and equipment that can perform all tasks involving the use of construction equipment, material handling equipment, and equipment vehicles relating to tasks that engineering units are responsible for during a military operation.

Horizontal Construction: "Horizontal construction is the construction required to shape the terrain to meet the operational requirements of the MAGTF." (Marine Corps Combat Development Command, 2016)

Levels Of Warfare: "Activities in war take place at several interrelated levels which form a hierarchy. These levels are the strategic, Operational, and tactical." (United States Marine Corps, 1997)

Marine Air Ground Task Force: "Task organizations consisting of ground, aviation, combat service support, and command elements. They have no standard structure, but rather are constituted as appropriate for the specific situation. The MAGTF provides a single commander with a combined arms force that can be tailored to the situation faced." (United States Marine Corps, 1997)

Mobility: "Mobility is a quality or capability of military forces that permits them to move in time and space while retaining their ability to fulfill their primary mission. A commander must be able to mass forces quickly at a chosen place and time to accomplish the assigned mission. The commander must be able to achieve superior tempo through a relatively quicker observation, orientation, decision, action (OODA) loop than the enemy. Mobility is critical to achieving this situation and maintaining it for extended periods of time over great distances." (Marine Corps Combat Development Command, 2016)

Rapid Runway Repair: "RRR is one task of the base recovery after attack team (BRAAT). Materials, procedures, and techniques for rapid repair of bomb-damaged airfield runways and taxi ways have been under development for several years. The need for such developments has grown because of the substantial increase in the diversity and lethality of both air-launched and surface-launched weapons capable of inflicting damage on airfield runways and taxi ways." (Marine Corps Combat Development Command, 2016)

Specialized Demolition: "Combat engineers and EOD Marines are capable of executing demolition work of a constructive and destructive nature. Demolition missions requiring the use of formulas or calculated quantities of explosives with specific placement to produce the desired effect are normally performed by engineers.

These tasks include placing hand explosives near heavy weapons, destroying cave systems, facilities; and equipment, and improving mobility in urban terrain and designated or reserve targets. Engineers are assigned those tasks that require greater control in execution, more precision in effect, and are generally larger in scale and more technical in scope." (Marine Corps Combat Development Command, 2016)

Survivability: "Survivability is the ability of personnel, equipment, and facilities to continue to operate within the wide range of conditions faced in a hostile environment. It includes all aspects of protecting personnel, weapons, and supplies. For the MAGTF to survive, it must be able to reduce exposure to threat acquisition, targeting, and engagement. Engineer support tasks such as construction of field fortifications (hardening of command, communication and combat train locations, weapon system firing positions, and infantry fighting positions) are critical to this effort." (Marine Corps Combat Development Command, 2016)

Vertical Construction: "Vertical is the improvement or construction of facilities for use by the MAGTF. These facilities can be used in base camps, command posts, and maintenance facilities. Pre-engineered structures should be considered in the planning of any vertical construction project. These structures provide significant savings to the MAGTF in embarkation space and ease of construction and should be used at every opportunity." (Marine Corps Combat Development Command, 2016)

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I. INTRODUCTION

A. BACKGROUND

Program Manger Engineer Systems' (PMES) current acquisition strategies have relied on past experience and often lack creativity. They focus on a standard way of doing things and copy what has been done in the past. This system works well for a majority of the engineer system programs due to the rinse and repeat aspects of the systems. The standard way of doing things also works well with standard programs that are large one-time buys. These strategies, however, do not take advantage of the improvements to the regulations that govern defense acquisition. The acquisition program baselines within PMES are relatively all the same except for a few programs that have recently taken advantage of a phased acquisition approach.

Within the PMES programs are the Marine Corps engineer kits. Engineer kits are used across teams and complement the Marine Corps engineer missions. The engineer kits are the tools that allow engineers to complete their missions. The kits are not well known throughout the Marine Corps. They are not flashy, and they do not have the same notoriety that other larger equipment items have. Engineer kits are, however, the backbone of the engineer platoons, the go-to for the technician in the field, and the essential piece of gear to get the job done. Within the kits are housed the tools that make engineer ingenuity and adaptability possible.

B. PROBLEM STATEMENT

The Marine Corps engineer kit programs are not keeping pace with commercial industry innovations, equipment upgrades, and inventions. This leaves the warfighter with inferior capabilities. This also presents a supply chain risk as new equipment replaces older equipment in retail, creating a situation where the warfighter is using old, outdated equipment that relies on what is left in inventory for resupply. At times, the programs are lagging behind industry improvements that would increase the capability that United States Marine Corps (USMC) engineer units could offer in support of Marine Corps Operations.

C. PURPOSE

The purpose of this capstone applied project is to analyze whether an evolutionary/adaptive acquisitions approach would be a better acquisition strategy for the procurement of engineer kits moving forward. This research also highlights some of the issues associated with the current strategies and shows how an update to those strategies would benefit the engineering community within the Marine Corps. The goal is to provide a blueprint that can be used to create a strategy for future acquisition of engineer kits. This strategy would allow for updates to be made incrementally and ultimately save the enterprise time and money, with a modern product being continually provided.

D. RESEARCH QUESTIONS

This research will focus on the following questions. The first question will be the primary question that the research is going to answer. The subsequent questions will be the secondary questions that the research will answer. The research questions will focus on whether the standard strategy that is being used should or can be replaced with a method that is more effective.

1. What is the most appropriate acquisition strategy for USMC engineer kits going forward?
2. Does an incremental strategy offer the opportunity for increased capability faster than current strategy?
3. Can the program office sustain and maintain capability released incrementally?
4. Does this strategy leverage commercial off-the-shelf (COTS) products?
5. If an incremental acquisitions approach is appropriate, how would it be implemented?

E. RESEARCH METHODOLOGY

The methodology for this capstone is a qualitative approach relying on an extensive literature review using a case study-based approach of the existing engineer kit program. The research will consist of a review of the source documents from three kits spread throughout PMES. Source documentation will come from Capabilities Development and Integration Branch (CD&I) and PMES. Industry methods of upgrading and improving products will also be included to see if an incremental acquisition approach meets the needs of the USMC. Industry evaluation will focus on the rate of

industry improvement and the historical timeline for when items such as batteries are updated.

The focus of this research is on the Airfield Damage Repair Kit, PLT Pioneer Kit, and the PLT Carpenters Kit. These kits will be used to highlight a strategy that could be applied to the plethora of kits that are held within PMES. The current strategy, utilized by a majority of the teams, is a one-time purchase of the full capability to replace the previously fielded capability. All the items found within the engineer kits are commercial off-the-shelf (COTS), with the exception of a few items within kits relating to demolitions. These one-time purchases are large and replace some items that might not need to be replaced or are timeless such as, for example, a hammer or a hand saw.

These one-time purchases for the entirety of the enterprise tend to create a situation in which the program is not reviewed again until the above criteria are met and/or planned obsolescence allows for the program to be in the queue for a refresh. This refreshment is based on the availability of funds within the funding line that the kit falls under. Kits tend to take the backburner to other larger efforts due to the thought process of "we will get to it when we get to it, but the Marines can make do with what they have now." This thought process leads to the kits being years behind industry standard. This also does not allow for gaps based on a new operating environment to be filled quickly to the enterprise.

F. SUMMARY

This chapter sets the stage for the rest of the capstone research project. Chapter I covers the basic background of the research, how the research will be conducted, and what some of the limitations to the research are. Within this chapter the research questions were also presented. Those questions will create the backbone for the research and be the driving force for the recommendations. Chapter II Background covers the background of defense acquisitions. It covers the pathways that are used within the adaptive acquisition framework. This chapter then covers the basic command structures from Marine Corps Systems Command down to the teams that will be procuring and executing the acquisition of engineer kits. Chapter II also goes into the general purposes for Marine Corps Engineering and how the kits fit into that capability. Chapter III covers

the case history of the engineer kits. It goes through historical documents within the requirements and acquisitions processes. It also lays out some issues that are currently being experienced or were previously experienced within the procurement of the capabilities. Chapter III is also a section for review of industry changes and norms relating to the equipment usually procured as part of the kits. Chapter IV is the breakdown of the case study and a detailed analysis of a possible remedy to the issues outlined in chapter three. Chapter V is the conclusion to the research, the answering of the research questions and the recommended follow-on actions associated with the results of the research.

II. BACKGROUND ENGINEER CAPABILITY

A. OVERVIEW OF DEFENSE BIG A DEFENSE ACQUISITION

1. Big A Acquisitions

Big "A" Acquisition starts with a warfighter requirement for a materiel solution to a capability gap, usually documented in the Joint Capabilities Integration and Development System (JCIDS). (Joint Chiefs of Staff, 2021) "JCIDS is one of three decision support systems that together form the "Big A" acquisition process (note, "little a" acquisition is just the Defense Acquisition System). JCIDS represents the identification of needed capabilities upon which acquisition programs are built." (Defense Aquisition University) Figure 1 outlines what the JCIDS process is and the process for getting a requirement accepted.

This process starts with the identification of a capability gap within the defense department. It then flows to if a requirement exists or does not exist within the defense department that can be used for the procurement of a new capability. If yes, then the team will proceed to using those documents or slightly revising existing documents to meet the warfighters' needs. If a requirement does not exist, then a new requirement will have to be generated. This involves development of the requirements documents, the staffing of those documents through the joint staff, the revision and resubmission to the staff, validating the requirement and then signing of the approved requirement. That approved requirement will then be staffed to the respective services that the requirement applies to.

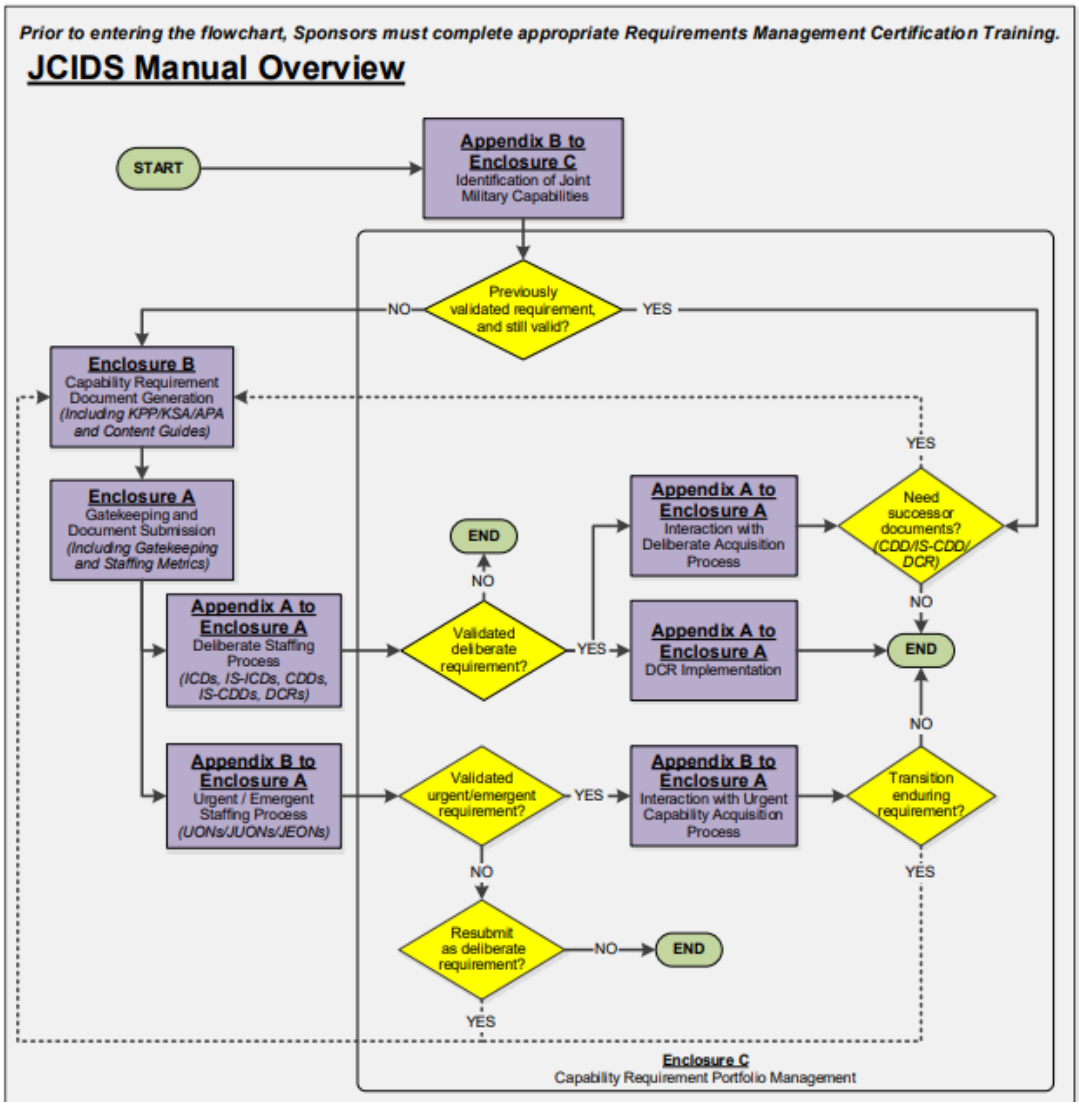

Figure 1. JCIDS Manual Overview. Source: Joint Chiefs of Staff (2021).

The next leg of the three-legged stool is Planning, Programming, Budgeting, and Execution (PPBE).

> The primary Resource Allocation Process (RAP) of DoD. It is one of three major decision support systems for defense acquisition along with Joint Capabilities Integration and Development System (JCIDS) and the Defense Acquisition System. It is a formal, systematic structure for making decisions on policy, strategy, and the development of forces and capabilities to accomplish anticipated missions. PPBE is an annual process which produces the Secretary's Defense Planning Guidance (DPG), five-year approved Program Objectives Memoranda (POMs), and one year Budget Estimate Submissions (BES) for the military departments and defense agencies, and the DoD portion of the President's Budget (PB). (Defense Aquisition University)

Figure 2 outlines the PPBE process. In reality the process is complicated, messy, and does not always go as planned. The key to this process is that it has to occur in order to allow for the allocation and appropriation of funding for acquisition programs.

The PPBE process is the annual process that gets the acquisitions professionals the funds needed to procure the systems that the warfighters need to complete the assigned missions. This process should start in January. The reality is that portions of this chart are either sped up or placed in a holding pattern based on the political climate of the day. This is due to the fact the PPBE process relies heavily on the elected civilian oversight within Congress and the legislative branch of government. Ideally though it starts in December and identifies what will be needed in the coming years. The input is given by the Services up to the DoD and Joint Staff. That is then turned into a budget document that is presented to Congress for approval and appropriation. That document will be revised, reviewed, and questioned over the course of a few months. Once the document is deemed worthy of being passed, the house and the senate vote to approve the budget. This budget is presented to the president who signs it into law. The appropriate money then flows to the acquisitions professionals who use it to buy the capabilities that they stated they needed at the beginning of this process.

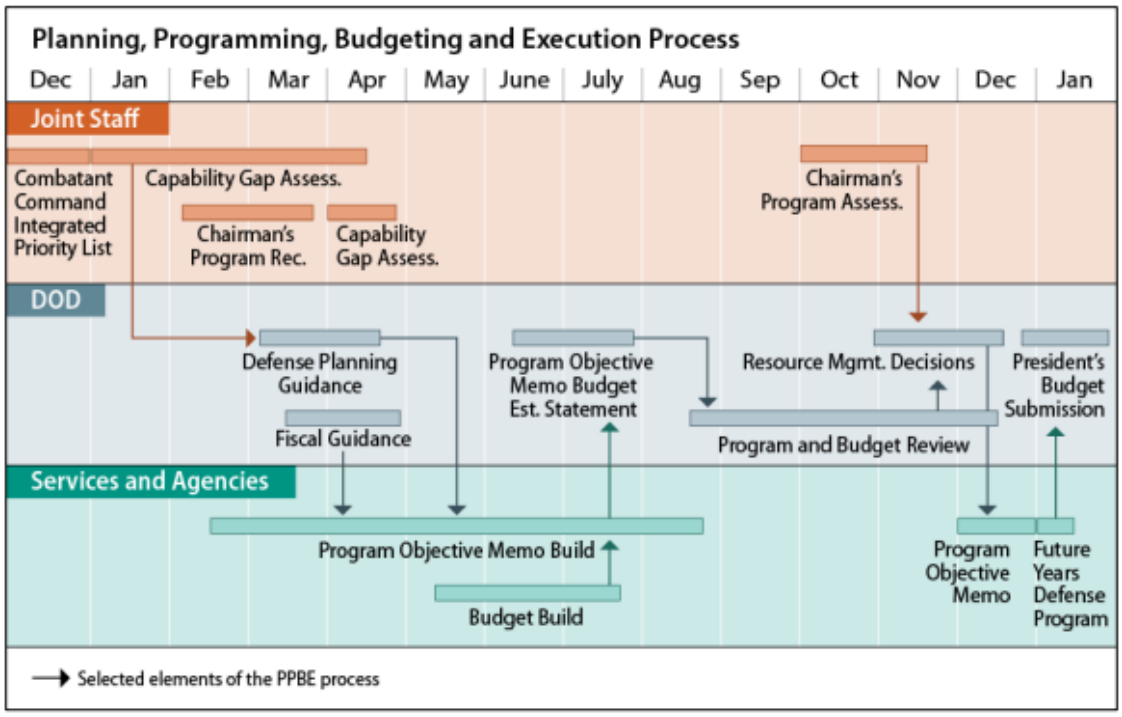

Figure 2. Calendar-Driven Events in the Annual PPBE Process. Source: Congressional Research Service (2022).

The final decision support system is the Defense Acquisitions Management System, usually referred to as little "a." This is where big "A" and little "a" meet. For programs that have approved requirements and appropriate funding, acquisition professionals develop acquisition strategies to design, build, and test systems that are fielded to the warfighters to meet capability gaps. Figure 3, which is difficult to read even on the largest posture, outlines every step within big "A" acquisition for developing and procuring new equipment. It is included to show just how complex the process is and the multiple avenues and approaches that can be taken.

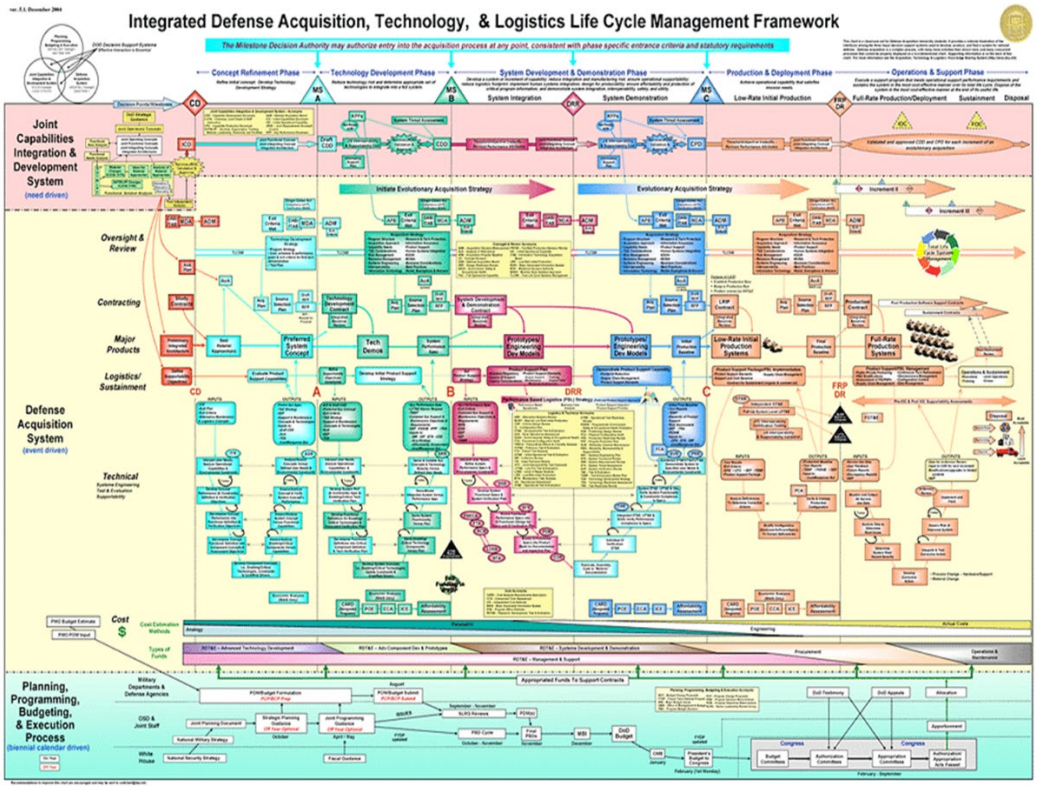

Figure 3. Integrated Defense Acquisition, Technology, & Logistics Life Cycle Management Framework. Source: R. Mortlock, personal communication (May 4, 2023).

Big "A" acquisition is a simple but difficult concept to grasp. The final figure is the proverbial stool that is referred to as big "A" acquisition. Figure 4 is the representation of that stool and is an important visual for understanding big "A" acquisition. What the visual shows is how the defense acquisitions process is held up. A stool is the easiest way to represent this and shows the simplest way to understand big "A." The seat of the stool is the overall goal of defense acquisitions, with each leg being the DoD decision support processes that allow for the goal to be met.

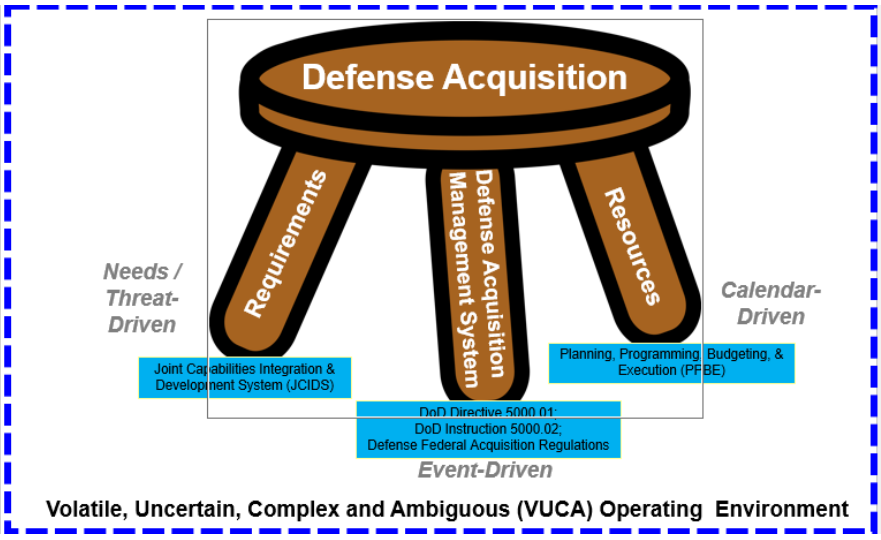

Figure 4. Defense Acquisitions Institution – Big "A" Acquisition Source: R. Mortlock, personal communication (May 4, 2023).

2. Adaptive Acquisition Framework

The Adaptive Acquisition Framework (AAF) is an attempt by the DoD to modernize the little "a" defense acquisition management system. The goal of the Department of Defense Instruction (DoDI) 5000.02 is to give program managers the ability to take advantage of the current speed and innovations that are taking place in industry. AAF gives acquisition professionals the ability to adjust their programs to meet industry standards and industry practices.

> The AAF supports the DAS with the objective of delivering effective, suitable, survivable, sustainable, and affordable solutions to the end user in a timely manner. To achieve those objectives, Milestone Decision Authorities (MDAs), other Decision Authorities (DAs), and Program Managers (PMs) have broad authority to plan and manage their programs consistent with sound business practice. The AAF acquisition pathways provide opportunities for MDAs/DAs and PMs to develop acquisition strategies and employ acquisition processes that match the characteristics of the capability being acquired. (Office of the Under Secretary of Defense for Acquisition and Sustainment, 2022, p. 4)

The DoDI 5000.02 is the baseline that will allow for the use of an incremental approach to the acquisition process that is needed within the Engineer community. Figure 5 displays the six acquisition pathways that can leveraged to develop acquisition strategies The six pathways are Urgent Capability Acquisition, Middle Tier of

Acquisition, Major Capability Acquisition, Software Acquisition, Defense Business Systems, and Acquisition of Services.

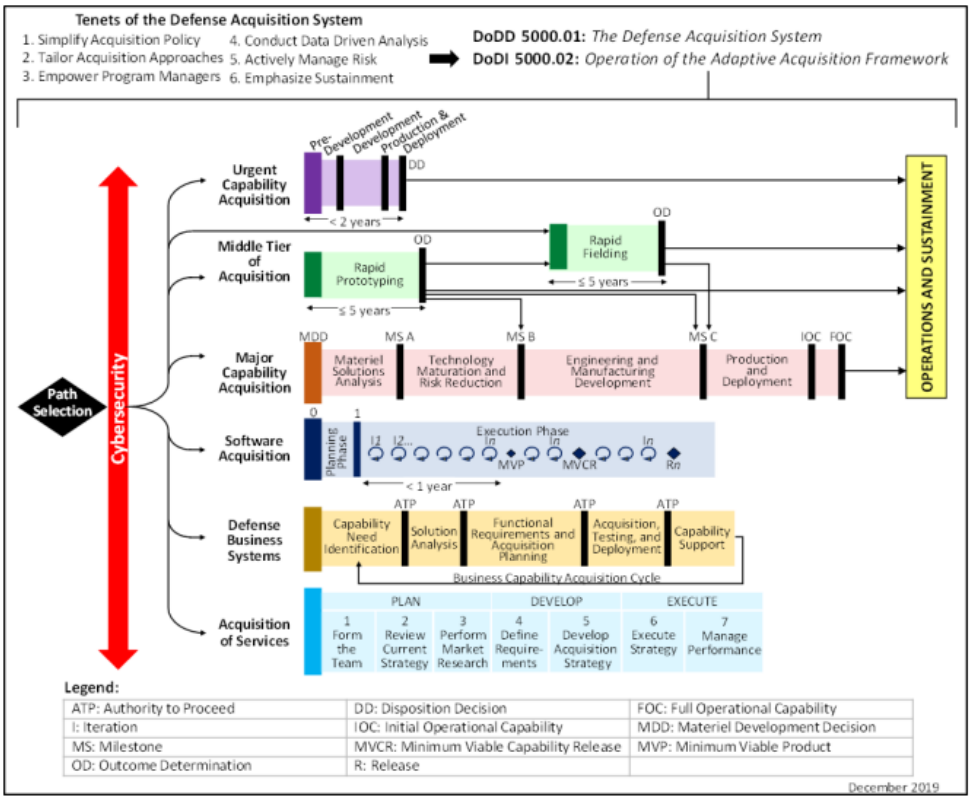

Figure 5. Adaptive Acquisition Framework Pathway. Source: Office of the Under Secretary of Defense for Acquistion and Sustainment (2022).

3. Urgent Capability Acquisition

Urgent Capability Acquisition defined in the DoDI 5000.02 as:

To field capabilities to fulfill urgent existing and/or emerging operational needs or quick reactions in less than 2 years. The DoD's highest priority is to provide warfighters with the capabilities urgently needed to overcome unforeseen threats, achieve mission success, and reduce risk of casualties. Urgent operational needs and other quick reaction capabilities are identified and approved for resolution by designated authorities. The estimated cost of any single solution must not exceed $525 million in research, development, and test and evaluation; or $3.065 billion procurement in Fiscal Year 2020 constant dollars. The acquisition, product support and sustainment processes, reviews, and documents are aggressively streamlined due to operational urgency. The goal is to plan for the capability in a few weeks, with development and production measured in months. The imperative is to quickly deliver useful capability

to the warfighter in a timely fashion. (Office of the Under Secretary of Defense for Acquisition and Sustainment, 2022)

This pathway was one of the pathways used in the initial acquisition of some of the kits. Those kits are not being used as examples for this case study, but it is important that this pathway has been used previously for the procurement of kits within the engineering field. Figure 6 shows in detail what a 2 or less year procurement process looks like and how condensed the processes are to reach a fully fielded operational capability (FOC).

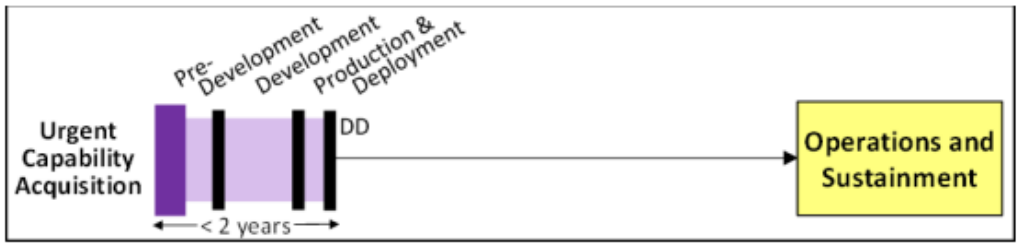

Figure 6. Urgent Capability Acquisition Pathway. Source: Office of the Under Secretary of Defense for Acquisition and Sustainment (2022).

4. Middle Tier of Acquisitions

Middle Tier of Acquisitions defined in the DoDI 5000.02 as:

To rapidly develop fieldable prototypes within an acquisition program to demonstrate new capabilities and/or rapidly field production quantities of systems with proven technologies that require minimal development. The MTA pathway includes rapid prototyping and rapid fielding activities. The objective of rapid prototyping is to field a prototype meeting defined requirements that can be demonstrated in an operational environment and provide residual operational capability within 5 years of the MTA program start date. The objective of rapid fielding is to begin production within six months and complete fielding within five years of the MTA program's start date. These activities will not be subject to the Joint Capabilities Integration and Development System, or the procedures outlined in DoDD 5000.01, except to the extent specifically provided in the guidance. PMs will "tailor-in" reviews, assessments, and relevant documentation that results in an acquisition strategy customized to the unique characteristics and risks of their program. PMs will ensure operational, technical, and security risks are identified and reduced so that fielded systems are capable, effective, and resilient. PMs will comply with statutory requirements unless waived in accordance with a relevant provision. (Office of the Under Secretary of Defense for Acquisition and Sustainment, 2022)

Figure 7 illustrates the MTA pathway. The MTA pathway is characterized by rapid prototyping and then rapid fielding of the equipment. This pathway gets the capability to FOC within five years.

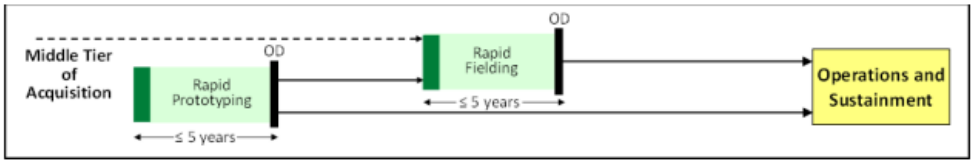

Figure 7. Middle Tier Acquisition Pathway. Source: Office of the Under Secretary of Defense for Acquisition and Sustainment (2022).

5. Major Capability Acquisition

Major Capability Acquisition defined in the DoDI 5000.02 as:

> To acquire and modernize military unique programs that provide enduring capability. These acquisitions typically follow a structured analyze, design, develop, integrate, test, evaluate, produce, and support approach. This process is designed to support major defense acquisition programs, major systems, and other complex acquisitions. Acquisition and product support processes, reviews, and documentation will be tailored based on the program size, complexity, risk, urgency, and other factors. Software-intensive components may be acquired via the software acquisition pathway, with the outputs and dependencies integrated with the overall major capability pathway. (Office of the Under Secretary of Defense for Acquisition and Sustainment, 2022)

Figure 8 illustrates the major capability acquisition pathway. This is the pathway that is most commonly used to procure engineer kits. It is the pathway that is currently being used for the modernization of the pioneer and carpenters' kits and was the pathway that was just used for the modernization of the ADR kit. For a majority of the engineer kits the programs enter the process at Milestone C. While Figure 8 looks linear in nature, at the materiel development decision review, the program milestone decision authority, and the acquisition professionals, primarily the program manager, can choose to enter at any of the milestones based on the items being procured, availability of funding, urgency of need, and the technological maturity of those items and manufacturing capability/ capacity. Due to the majority of the tools that make up the engineer kits being COTS, entry at Milestone C is the most common within PMES. Figure 8 outlines what this

pathway looks like linearly. One key point to note is that the acquisition professionals can choose to enter at any of the appropriate milestones.

Figure 8. Major Capability Acquisition Pathway. Source: Office of the Under Secretary of Defense for Acquisition and Sustainment (2022).

6. Software Acquisition

Software Acquisition defined in the DoDI 5000.02 as:

> To facilitate rapid and iterative delivery of software capability (e.g., software-intensive systems and/or software-intensive components or sub-systems) to the user. This pathway integrates modern software development practices such as Agile Software Development, Development, Security, and Operations (DevSecOps), and Lean Practices. Small cross-functional teams that include operational users, developmental and operational testers, software developers, and cybersecurity experts leverage enterprise services to deliver software rapidly and iteratively to meet the highest priority user needs. These mission-focused, government-industry teams leverage automated tools for iterative development, builds, integration, testing, production, certification, and deployment of capabilities to the operational environment. (Office of the Under Secretary of Defense for Acquisition and Sustainment, 2022)

Figure 9 illustrates the software-intensive pathway. This pathway is used sometimes within the engineer field when a technology has software components to the equipment. Some examples would be the laser leveling system that uses tremble technology for drafting and surveying, ENFIRE system which is an engineer reconnaissance platform, and a few small business initiatives within the program office to name a few. While this pathway is not the main acquisitions pathway used, its tenets are incorporated in these programs. As technology matures and evolves this pathway will most likely need to be incorporated in greater detail into the procurement of engineer kits. Figure 9 shows how this pathway works and looks in a linear fashion.

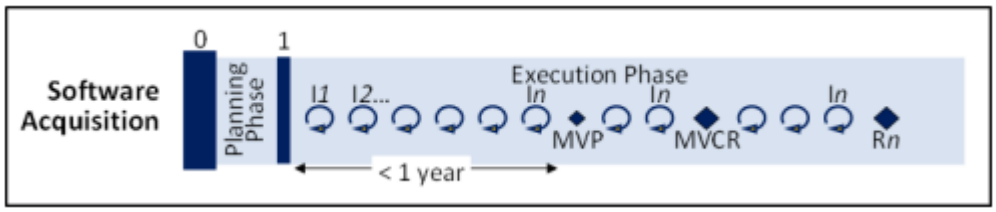

Figure 9. Figure 9 Software Acquisition Pathway. Source: Office of the Under Secretary of Defense for Acquisition and Sustainment (2022).

7. Defense Business Systems

Defense Business Systems does not apply to engineer kits but is important to defined in the context of understanding the pathways outlined in DoDI 5000.02. Figure 10 illustrates the DBS pathway.

> To acquire information systems that support DoD business operations. This pathway: (a) Applies to defense business capabilities and their supporting business systems, including those with "as-a-service" solutions to include: 1. Financial and financial data feeder. 2. Contracting. 3. Logistics. 4. Planning and budgeting 5. Installations management. 6. Human resources management. 7. Training and readiness systems. (b) May also be used to acquire non-developmental, software intensive programs that are not business systems. This pathway assesses the business environment and identifies existing commercial or government solutions that could be adopted to satisfy DoD needs. The DoD reviews its business processes and revises them to align more closely with commercial or government information technology best practices. Customization of a selected information technology solution is minimal. The DoD reduces risk and maximizes benefits by using commercial-off-the-shelf software that has been successfully demonstrated in the commercial marketplace. (Office of the Under Secretary of Defense for Acquisition and Sustainment, 2022)

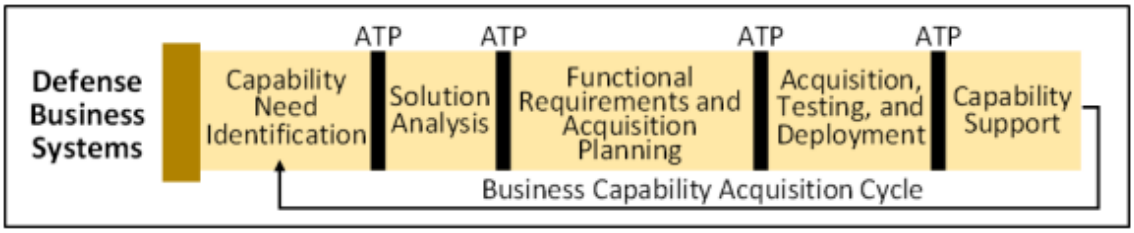

Figure 10. Defense Business Services Pathway. Source: Office of the Under Secretary of Defense for Acquisition and Sustainment (2022).

8. Acquisition of Services

Acquisition of Services does not apply to engineer kits but is important to defined in the context of understanding the pathways outlined in DoDI 5000.02. Figure 11 displays the services acquisition pathway.

> To acquire services from the private sector including knowledge-based, construction, electronics and communications, equipment, facilities, product support, logistics, medical, research and development, and transportation services. This pathway is intended to identify the required services, research the potential contractors, contract for the services, and manage performance. The seven steps of the pathway are grouped into three phases: Plan, Develop, and Execute. (Office of the Under Secretary of Defense for Acquisition and Sustainment, 2022)

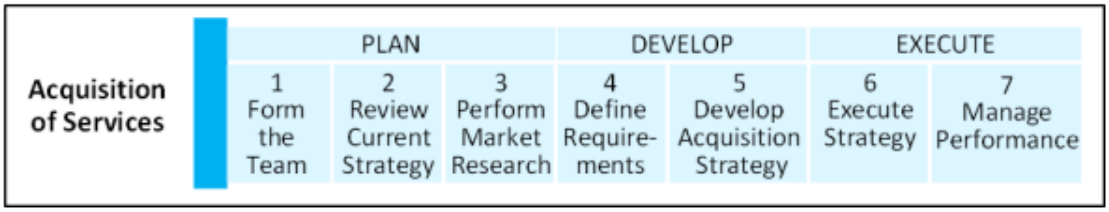

Figure 11. Acquisition of Services Pathway. Source: Office of the Under Secretary of Defense for Acquisition and Sustainment (2022).

B. INCREMENTAL DEVELOPMENT APPROACH

This is an approach to allow the warfighter to get a product before that product meets all the requirements because some development time is required to reach full technical maturity. Each of the increments currently functions as its own program and produces an upgrade or modernized product at completion of that increment. It is commonly used when the time to get a fully capable program would leave the Services gapped of a capability for two long. The overall program would be increments coupled together and set to produce fully operational capability at the completion of the final increment. These increments can happen congruently and be in different milestones. One example of this would be increment 3 is at fielding, while increment 4 has just entered milestone B. Figure 12 outlines what this process looks like. Figure 12 shows what a single procurement looks like to get a single capability and what an incremental development to a single capability looks like during the same time. In the lower half of the figure the warfighter will receive multiple iterations of the capability. While not the

full capability it allows for the gap to be filled imperfectly during the time that is being taken to develop the fully operational capability. The end result is the same in both instances, but the incremental development approach fills the capability gap in the meantime.

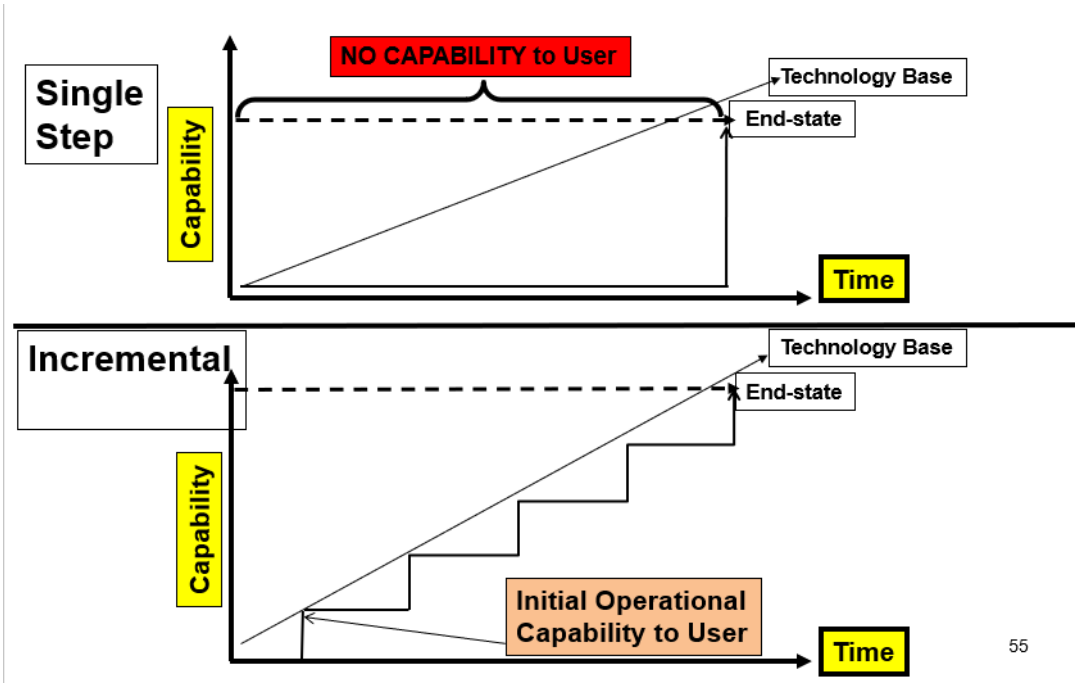

Figure 12. Single Step vs. Incremental Development (R. Mortlock, personal communication, May 4, 2023)

C. MARINE CORPS SYSTEM COMMAND

It is important to show how PMES fits within the greater Marine Corps Systems Command (MCSC). MCSC is the primary acquisition and life-cycle management organization within the USMC. Figures 13 through 15 outline the command structure and personnel within MCSC (Figure 13), LCES (Figure 14), and PMES (Figure 15). PMES is the structure that holds the programs relating to engineering equipment within the Marine Corps. It is important to note that for Abbreviated Acquisition Programs (AAP) that are within PMES the Portfolio Manager (PfM) is the milestone decision authority (MDA). The PfM directly reports to the Marine Corps Systems Commanding General.

Figure 13 is the breakdown of the overall command structure within Marine Corps Systems Command. The Command is made up of the Command Deck, different deputies, general staff sections, the portfolios within the command, and the program

managers within the portfolios. The terms are spelled out for each of the boxes within their own box.

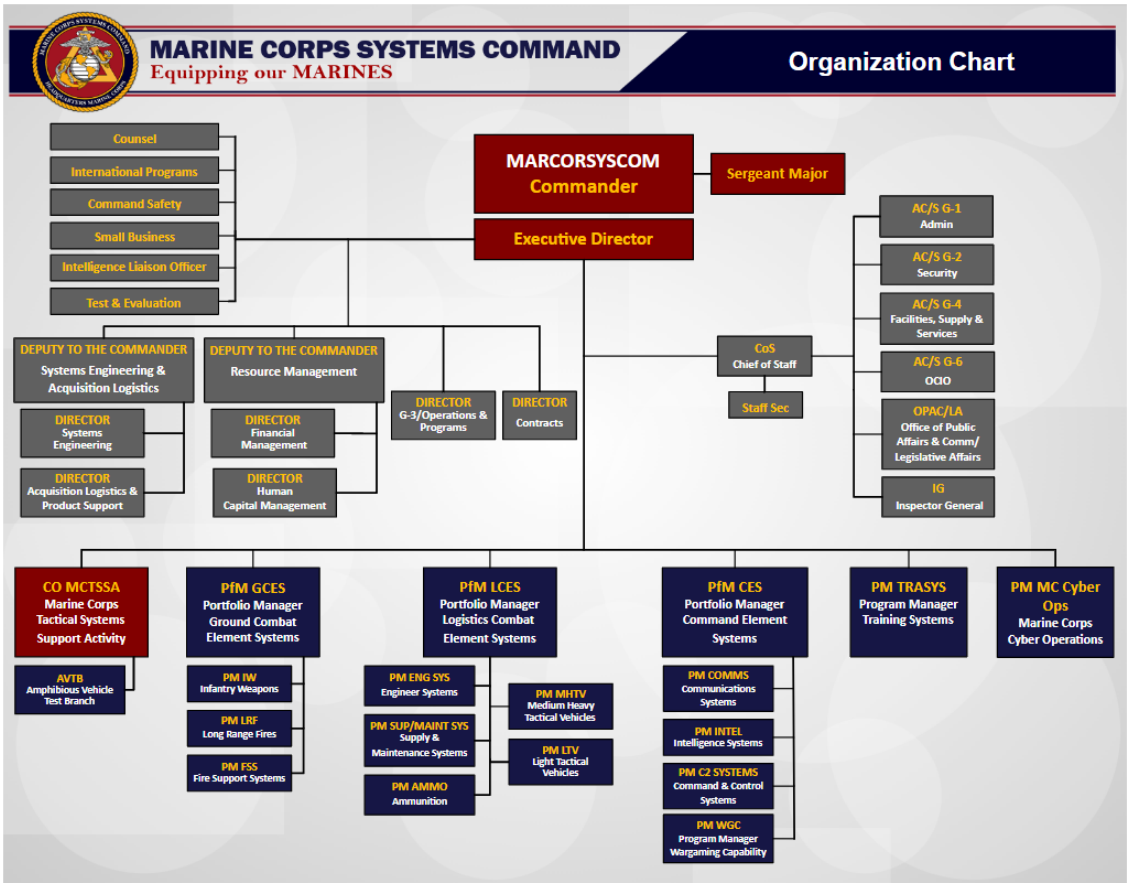

Figure 13. Organizational Chart for Marine Corps Systems Command. Source: Marine Corps Systems Command (2023).

Figure 14 is the detailed organizational chart for the Logistics Combat Element Systems portfolio. The acyronms are not spelled out within this chart. APFM represents the assistant portfolio Manager for their respective fields of expertise. DPFM represents the deputy to the portfolio manager. The next section that relates directly to the Program Manger Enginer Systems is the term APM, APM represents the assistant program manager for their respective fields and will be convered in more detail in Figure 15.

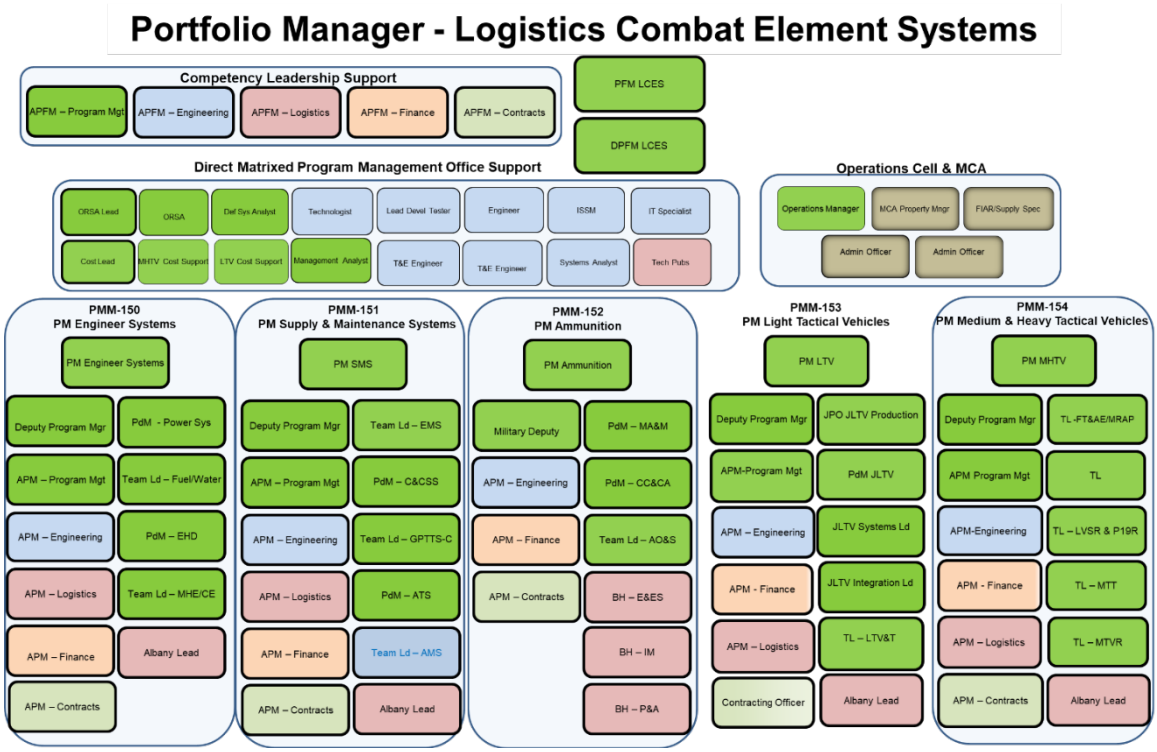

Figure 14. Organizational Chart for Logistics Combat Element Systems
Source: Logistics Combat Element Systems (2023).

Figure 15 is the figure that details the organizational structure for Program Management Engineer Systems. This chart shows the structure for the program manager that owns the engineer kits. APM is a term that represents assistant program manager in their specific field of expertise. The PdM is the product manager for the specific section of equipment. Engineer Kits is found within every PdM. Above each PdM is what the section is called. There are four sections within PMES. Those sections are Power Systems, Fuel & Water systems, Explosive Hazard Defeat (EHD), and Material Handling & Construction (MHE/CE). The Airfield damage Repair Kit is housed within MHE/CE and the other two kits within this research paper are housed within EHD.

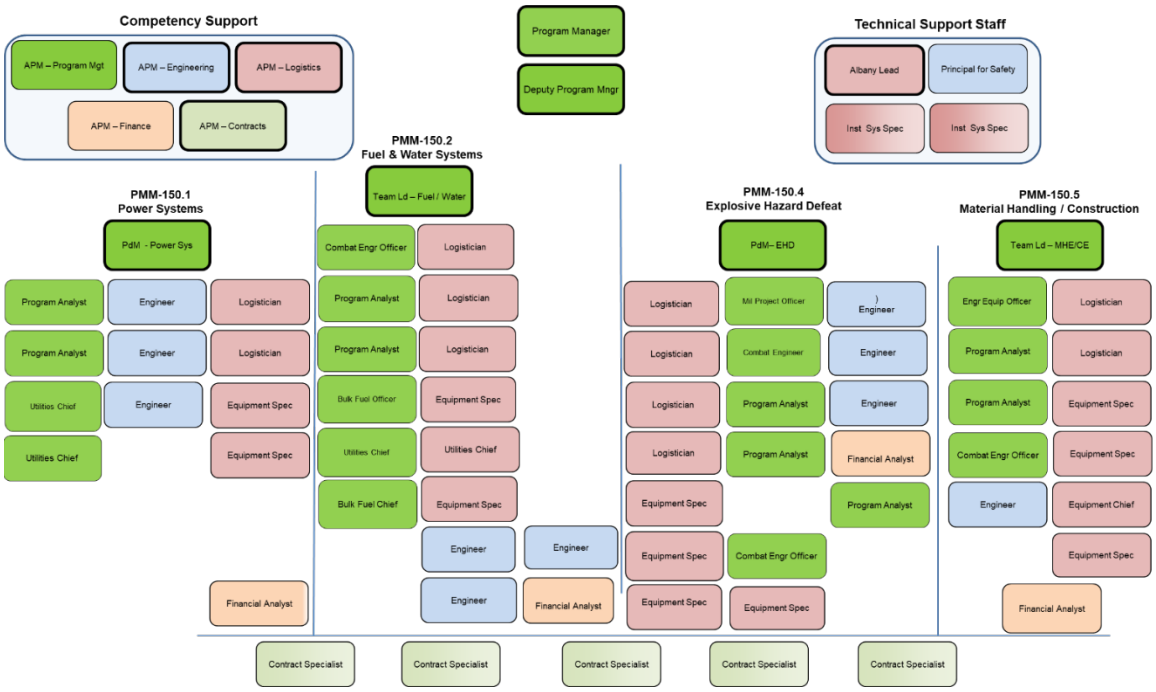

Figure 15. Organizational Chart for Program Management Engineer Systems
Source: Program Manager Engineer Systems (2023).

D. ENGINEER CAPABILITY

1. Introduction

The Marine Corps is organized into multiple levels of Marine Air Ground Tasks Forces or MAGTFs. Marine Corps Engineering can be found at all levels of warfare and at a majority of operational units throughout the Marine Corps. Engineers within the Marine Corps need to have a good understanding of all mission sets within a MAGTF and be able to support a wide variety of missions at any given time or place. Engineering operations can be divided into subtasks that are then divided even further based on the unit that is being supported by an engineering element. The primary missions of Marine Corps Engineering include Survivability, Mobility, Counter-Mobility, Vertical and Horizontal Construction, Airfield construction, Engineer Reconnaissance, Specialized Demolition, Rapid Runway Repair, Electrical Support, Bulk Liquid Support, and Heavy Equipment Support. USMC Engineering is a support function and rarely takes on the role as the main effort. For this reason, engineers have to be flexible and innovative in their planning. Equipment sets are both the force multiplier and limiting factor when it comes to supporting operations. Engineer Marines' capabilities are usually defined by their

equipment rather than their personnel. (Marine Corps Combat Development Command, 2016)

Engineers tend to have interesting and unique command structures. These structures are both formal and informal based on what the situation calls for. The best way to describe the operational structure of Marine Corps engineers is to adapt units that can support the main effort. Most engineer units are custom built based on what the unit they are supporting needs. A good example is the Combat Logistics Battalion Engineer Platoon. This platoon is modeled after an Engineer Support Battalion but on a much smaller scale. It provides all the general engineer functions to the Marine Expeditionary Unit, and it also tends to break up into smaller detachments depending on the needs of the supported units. Of course, there is a standard breakdown of forces within a Combat Engineer Battalion, Engineer Support Battalion, or Pioneer Battalion. Outside of the occasional full battalion deployments these engineer units pull from within to create units to match needs, and rarely deploy as a full force. Those units then attach as direct or general support to the mission.

2. Purpose for Use of Kits

Engineer kits are the primary tools that allow an engineering unit within the Marine Corps to complete assigned missions, as stated in the introduction. The engineer kits provide well-packaged tool sets that can be custom-designed and tailored to the mission at hand. Most of the kits within PMES are scalable and nested in the way the Marine Corps warfighting doctrine of a MAGTF is scalable. The majority of the tools within engineering tool sets are commercial off the shelf items or (COTS) and do not have any military modifications. For a majority of kits, they are packaged in COTS containers ranging from a small pelican case to 20ft International Organization for Standardization (ISO) Container. The kits to be focused on in this research are the Carpenter Kit, Pioneer Kit, and ADR Kit. These three kits are the most prevalent throughout the engineering units across the Marine Corps and provide the largest and most diverse array of tools that are used across the engineering community to conduct engineering operations.

The Carpenter Kit is primarily used for all construction projects ranging but not limited to survivability to vertical construction. It is one of the primary kits used by the 13XX Military Occupational Specialty to complete missions in areas where heavy equipment cannot reach or does not have the capability to support. Figure 16 displays the boxes as they currently are configured for the squad carpenter kit. It is how Marines lay it out during inspection and gives a rough overview of some of the items found within the carpenter's kit.

> The Carpenter Tool Kit consists of carpentry hand tools, materials and battery powered tools used to perform basic woodworking and wood construction operations at the company level. The kit is comprised of one Carpenter Platoon assembly, sub-kit, and three Carpenter Squad sub-kits per total Carpenter Kit. It is stowed and transported in five ruggedized cases. Some tools require 120/240VAC, 50/60Hz. Refer to SL-3 1144KIT1A for complete inventory. Man portable. (Marine Corps Systems Command, 2011)

Figure 16. Photos of Carpenter Kit.
Source: Marine Corps Systems Command (2011).

The Pioneer Kit is for all missions related to pioneer operations such as mobility and counter-mobility, but not limited to these missions. This kit is also key for when

heavy equipment cannot be brought into a specific area. The expeditionary nature of the kits is a key parameter for their utilization. Many times, heavy equipment cannot be brought in during the initial phase of an operation. Figure 17 displays the platoon pioneer kit as it would be presented during an inspection. This gives a rough idea of what items make up the pioneer kit and the types of missions that can be accomplished using this kit.

> The Pioneer Platoon Kit consists of hand tools and materials used for clearing land, building emplacements, fortifications, and other construction missions. It is stowed and transported in 3-ruggedized cases. (Marine Corps Systems Command, 2011)

Figure 7 does not include the two gas powered chain saws that come with the kit. These items are not pictured in the technical manual.

Figure 17. Photos of Pioneer Kit.
Source: Marine Corps Systems Command (2011).

The ADR Kit is used in all aspects of airfield operations and can be used on other missions outside of airfield operations based on the wide array of tools found within the kit. Also pictured in Figure 18 is the Portable Concrete Mixer, it is not technically a part of the kit but was procured at the same time. It has its own program of record but was procured to be in support of concrete requirements within the ADR Kit. Figure 18 displays the ADR Kit. This is an illustration of what is contained in each of the containers. One container consists of the tools and equipment that are needed during the repair of an airfield. They are arranged and packed so that the hundreds of items can be easily found and stored during and after use. One of the containers consists of a compact tracked loader. That loader is a CAT 279D. The associated tools with that machinery are also stored in the container. 3 of the containers hold the most simplistic materials to repair a runway. Many times, the materials cannot be easily sourced and need to be

produced on site. Those containers hold the materials needed to produce the repair solutions. The final item illustrated is the portable concrete mixer (PCM). This is a separate item from the ADR kit but is expected to be used in tandem with it. The PCM is able to rapidly produce the solutions needed to repair large damage to runways and uses the materials found in the ADR kit to do so.

> The ADR Kit consists of an assemblage of Commercial Off-The-Shelf (COTS) items in five (5) International Standards Organization (ISO) containers and a standalone Portable Concrete Mixer (PCM). (Marine Corps Systems Command, 2017)

Figure 18. Airfield Damage Repair Kit System Illustration. Source: Marine Corps Systems Command (2017).

The tools within the engineer kits can be grouped into three subsections: Tools that are timeless (i.e., saws, hammer, screwdrivers), tools that are designed for military only, tools that experience obsolescence with industry (i.e., battery powered tools and chargers). These subsets will be used as the basis for analysis of the current kits and the future improvements that can be made. The tools within the kits that would fall into subset 3 or the items that would be looked at for modifications are those that have batteries, the batteries themselves, the chargers, and potential industry items that could be added. These items tend to cost the market value or less depending on the quantity that are being procured. They are added to GSA schedules regularly and do not require modifications to be added to the kits. One such improvement would be a battery powered nail gun. Currently, the battery powered nail gun is not in the tool kit but is available commercially. The cost associated with each modernization would be based on market value of the equipment to be procured and if the item would cause a repackaging of the

kit. Some upgrades such as a drill replacement would not change the current packaging. While the procurement of something like an asphalt zipper would cause some upgrades to the container it would be stored in.

E. SUMMARY

Chapter II lays the foundation for what big "A" acquisitions are, what acquisitions strategies can be leveraged, how does Program Manger Engineer Systems fit within Marine Corps Systems Command, and how the engineer kits fit within the Marine Corps Engineering Capability. It provides the foundational understanding of the frameworks that the options and recommendations will be held to and evaluated by. Chapter III will break down what the current situation is for the engineer kits and what the acquisitions history of the engineer kits is.

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III. PROGRAM CASE HISTORY

A. INTRODUCTION

The current issue that plagues engineer systems is a lack of creativity in the acquisition approaches being used. This makes sense since the majority of the equipment is considered abbreviated acquisition programs (AAP), is fast-moving, and needs to be executed quickly. The easiest way to move quickly is to follow the path of least resistance on a well-worn path. The issue that this causes with the engineer kits is that at the time that they need to be reviewed and improved through the standard process, the power-driven equipment is well behind the industry curve and the manual tools have not changed much at all. (DeWalt, 2022) This creates a situation where the program office is replacing all the equipment in the kits. Only the items that have been improved by industry need to be updated. The program office ends up spending money on equipment that does not need to be changed instead of spending appropriations on adding new innovations. Those innovations are not added at times due to lack of funding associated with replacing the entire kit.

Another issue that is occurring is the aging requirements documents associated with the engineer kits. The requirements documents tend to be reused as capability requirement changes (CRC). This is due to an overall lack of manpower within the Marine Corps doctrine and future planning, but the same number of requirement billets. It is a classic underpaid, overworked, and undermanned situation with requirement needs being continually generated by the Combat Development Division (CDD). This creates another "closest alligator to the boat" mentality, and the engineer kits tend to slip through the cracks. This will be an issue moving forward as things change, but also creates an opportunity to use the adaptive acquisition framework and FAR part 12 for COTS contracting approaches due to the relatively stable nature of the requirements and the ambiguous nature of the language used within the documents.

The final challenge that the engineer kits face is that modernizing them is a time-consuming action for all personnel involved. The kits consist of numerous parts, pieces, and items. The logistician's process to inventory, populate, and assign national stock

numbers (NSN) is time-consuming, and for small teams with lots of other requirements, these items can take up too much bandwidth and leave other areas vulnerable. For that reason, as well as the cost change-out all those parts, engineer kits tend to be placed on the backburner until the last minute. This hinders the modernization process and does not allow for the innovations to be taken advantage of early and often.

B. REQUIREMENT AND PROGRAM OFFICE DOCUMENTS

1. Pioneer Kit / Carpenters Kit

The requirements documents approval and revalidation process for the family of construction tool kits is slow. The original requirement for the kits originated in the 1950s and was not updated until 2005 (Combat Development and Integration Branch, 2005). This document is also the same document that the Marine Corps is using to derive two separate kits from pioneer and carpenter; while the kits have some similarities, the uses of the kits are different and distinct.

> The current Family of Engineer Construction Tool Kits came into the Marine Corps inventory between 1950 and 1989 and has been the mainstay of Engineers for the past 50 years. However, the current inventory of took kits is outdated, very awkward, heavy to carry, and all are past their planned service life. (Combat Development and Integration Branch, 2005)

That trajectory for late modernizations and extended life cycles has remained the same. The kits were then fielded in 2011 and 2013. This timeline shows how much time and money was wasted from 2005 to 2013 attempting to build kits from the ground up with modifications to the system occurring in 2009 (Command, MCSC Aquisition Policy Letter 02–09, Modification to Systems of 26 May 09, 2009). From 2009 on, the carpenter's kit and pioneer kit have remained relatively the same. During this time though, industry has changed dramatically, especially in the case of the carpenter's kit. Today, the Marine Corps Systems Command is planning to update the acquisition strategy for engineering kits. The goal is to modernize the kits with the latest technology but follow the same process that has only allowed the pioneer kit to be updated every 15 years or so. That timeline for modernization is behind the common timelines for

modernization that is found within the industries that supply the equipment used within the kits.

The program documents and the statement of need are also outdated. In the time frame of the development of the document, the Marine Corps was conducting major land operations in two landlocked countries. While it is true that the first insertion into Afghanistan was the furthest amphibious assault conducted in history (Holterman, 2002), the majority of the war was a major land and occupying operation. Today, the Marine Corps has shifted its focus back to the littorals, and the documents associated with requirements should reflect the ability to implement updates and modifications as obsolescence and innovations come from industry. The documents should also be two separate requirements or a more detailed family of style requirements that analyzes the gaps that exist in the current engineering field. While it is faster to use the past requirement documents to get the job done and get something to the Marines, forward thinking needs to be applied even to the AAPs. The dollar value may not be insanely high, but the tactical impact is significant. These kits are the only ones that can be hand-carried into a contested or combative location.

2. Airfield Damage Repair Kit

The Airfield Damage Repair Kit program and requirements documents were written between 2016 and 2019 and are much more in-depth than the construction kits documentation. Capabilities Development and Integration Branch (CD&I) updated the requirements and developed a requirement to match the changing landscape of airfield operations. The ADR Kit requirements memorandum is thorough and looks to the future development of the aviation platforms to build its capability. It has a 10-year life expectancy to be reevaluated in 2027 (Combat Development and Integration Branch, 2016). This is a good expectation for adjustments to the system and a step in the right direction in regard to building incremental systems that match the innovations of the industry (Combat Development and Integration Branch, 2016). The goal would be that modernization or changes to the system to be 1 to 2 years behind when the industry tends to make jumps. The acquisitions baseline outlines that the previous version of the ADR kit was 15 years old at the development of the new requirement. This places the ADR

modernization outside of the range in which industry is innovating standards, technologies, and development of new materials. This is, however, in line with the development of new aircraft needs for expeditionary runways, that is, the F-35 joint strike fighter (Marine Corps Systems Command, 2017). The ADR Kit was fully operationally capable in 2020 (Portfolio manager Logistics Combat Element Systems, 2019). This gives it 7 years before it has to be completely reevaluated. With the shift to Force Design 2030, the ADR kit will most likely be required to become lighter or more modular, costing a hefty upfront fee for the next modernization (Congressional Research Service, 2022) The latest modernization cost the Marine Corps upwards of $45 million to field (Portfolio manager Logistics Combat Element Systems, 2019)

Overall, the requirements presented in the program documents for the ADR kit are thorough and more concise than those outlined in the construction kits, but the plans still rely on the outdated acquisition strategy for modernization for kits that consist of a wide variety of tools and equipment. (Marine Corps Systems Command, 2017). The pace is also behind industry when it comes to the development of new technologies. The single acquisition management plan (SAMP) seems to be working toward an incremental or adaptive approach but falls short of creating the trigger mechanisms to make that a reality. It does highlight though that the adoption of the incremental approach would not be a massive innovation or a shock to the PMES bureaucratic system (Marine Corps Systems Command, 2017).

C. INDUSTRY TRENDS

Industry is the driving factor for the innovation of a majority of engineer kits and is highlighted in this capstone through the examination of the carpenter, pioneer, and ADR kits. This is due to the large reliance of these kits on COTS items. This makes it important to follow industry trends and modernization cycles to avoid materiel shortfalls and early obsolescence. Batteries illustrate this point. Battery technology is fast-paced and evolving quickly. Batteries are also key components in all the kits and offer the greatest opportunities to modernize as the technology of battery-powered equipment improves. The other portion of batteries to pay attention to is the changing laws in the United States. Many states have adopted new laws in regard to small motors, and those

laws will impact manufacturers and the acquisitions of COTS equipment moving forward (Willon, 2021)

The pioneer and construction kits are currently undergoing modernization. The batteries for those kits are currently not being manufactured. This creates the threat to the fleet that batteries are not able to be sourced for the equipment. The kits use 36v batteries, and DeWalt currently only carries 20v and 60v batteries (Marine Corps Systems Command, 2011) The flexvolt came out in 2016 and has replaced all the batteries in the inventory (Ronix Tools, 2020). The Marine Corps is well behind industry innovations when it comes to power tools and battery updates.

For how fast the industry moves it is easy to highlight with a Google ®search that the market is flooded with newer, more advanced, and overall, more effective equipment every day. Looking at when the big companies seem to adopt new technology is 3 to 5 years which is in line with when the batteries from the previous upgrade will be going bad. (Koehler, 2021) (Ronix Tools, 2020)

The final aspect of industry concerns is associated with the laws that are beginning to take effect on the use, distribution, and sale of small engine gas-powered tools (Willon, 2021). These laws that have been adopted or considered in more than just California will influence the construction industry as a whole. Part of that will be the Marine Corps engineer equipment sets and the availability of parts and replacement items. The change in laws will also cause manufacturers, for which the military is a small customer, to adapt to the changing landscape to continue to sell equipment (Brooks, 2021). One of the items that will be most affected is the chainsaws within the pioneer kits. Currently the electric chainsaws on the market do not provide enough power to accomplish the mission requirements, but moving forward, the gas-powered chainsaw will need to be phased out due to the most likely lack of manufacturing associated with industry trends.

D. SUMMARY

The Marine Corps Kits documents and acquisition plans are currently antiquated and need to be revised to meet DoD requirement standards. The required documents do

offer the opportunity in the way that they are written to adopt a better acquisition strategy moving forward. The documents provide a historical framework for what the kits have been in the past and why they were built the way that they are. Industry and regulations are going to cause a major jump in technology and operating systems within the construction and tools industry. The Marine Corps needs to set themselves up for success and to be able to match this future change to the COTS equipment that the engineer kits tend to rely on.

IV. CASE STUDY ANALYSIS

A. STAKEHOLDERS

The stakeholders for these programs are relatively small in comparison to larger programs. The key stakeholders in regard to the engineer kits are the warfighters, specifically the engineer Marines who use the kits daily. These Marines tend to be junior Marines with a junior officer leading them. The second group of stakeholders within the warfighter community is the engineer organizations that task out the missions that get completed with the kits and the warfighting organizations that are supported.

The other key stakeholders are the program office, CD&I, and CDD who all have a role in the development and procurement of the engineer kits. They do a considerable amount of work to get the engineers the equipment that they need to accomplish the mission. Industry does not tend to be a stakeholder with regards to the kits because of the limited procurement and dollar value associated with each individual item. The quantity is no different than other purchasers and with the equipment being 98% COTS industry does not have to adjust or spend money trying to meet the warfighters needs as it does in other programs.

Figure 19 shows how these stakeholders will most likely react to a proposal for a different acquisitions approach to the engineer kits as a whole. The junior Marines and junior officers would be the most receptive to receiving updated equipment at a faster timely. This is because they will be impacted the most by an enhanced capability. This group has limited impact in the decision making due to being less well connected and not involved directly in the process of procurement. The engineer warfighting organizations and support organizations would be receptive to this improved capability and have more impact on the decision to improve the procurement process. CD&I and CDD would be directly related to whether the requirements documents can remain as they are currently or if the documents would have to be rewritten. For that reason, they are high impact due to approval authority on if the acquisition plan meets the requirements set forth in the requirements documents. The last of the major stakeholders is the program office itself. This would be directly related to the program manager and if they would be willing to put

in the work on the front in, which will save time down the road. The difficulty with convincing the program office to adopt a new system is that inertia within middle management would be a real issue. Things tend to be done as they have always been done.

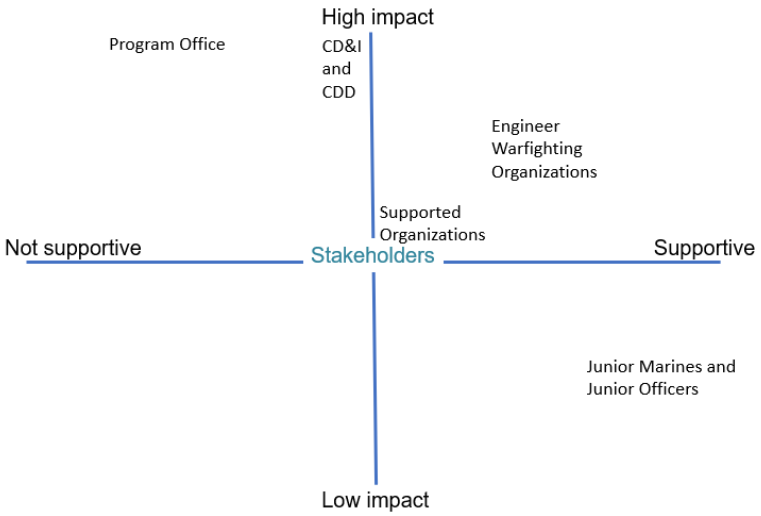

Figure 19. Stakeholder Map

B. PROBLEM AND ROOT CAUSE

The first aspect of the primary issue is that the engineer kits are complex and tend to be pushed to the backburner when it comes to development and modernization. This is due to the price tag, time and effort, and research associated with modernization of kits that have in some cases thousands of components. It takes a considerable amount of time and effort to review the hundreds of components within a single engineer kit. Those items then need to procure, other items within the industry need to be reviewed, and the logistics section must add each new and old item to the provisioning documents and database within the Marine Corps. Overall the engineer kits represent a painstakingly intense process of review, deliberation, and man hours to produce a single product. The second aspect is that the engineer kits tend to be overlooked by the individuals' running programs. This is because often they are not seen as big-ticket items. This is because they do not show up on reports such as the Marine Corps Automated Readiness Evaluation System (MARES) that get highlighted at higher echelons of oversight. MARES is the system in which commanders can review readiness of equipment at all levels of their

command. The readiness of equipment is usually limited to specific equipment that is deemed essential to the operation and a majority of the time tends to have an engine or motor of some kind. These items tend to need regular maintenance and that is the reason they are tracked in detail. The MARES reportable programs tend to get the money and time to modernize faster.

The root cause of these issues of this is that acquisition and requirement professionals are the same as anyone else. They will tend to fix the problem that is giving them the biggest headache first. The second issue that they fix is the one that will give them the fastest win in the books and make them look good for their boss. The engineer kits represent neither of these conditions. This coupled with the amount of work that goes into modernizing an engineer kit tends to make acquisitions professionals shy away from those programs. The programs are then not reviewed or modernized until the fleet causes a big enough commotion about the equipment. This usually occurs when one of the key items such as a specific battery are no longer able to be procured due to complete obsolescence in the market.

C. DEFINE OPTIONS

(1) Option 1

The strategy adopted within the APBs and SAMPs should be two-fold: first phase would be to use Major Capability Acquisitions pathway that is currently the primary pathway, and the second phase would be incremental review and modernization based on needs of the warfighter as well as modernization and obsolescence of technology. Later capability upgrades will be continual and incremental leveraging the middle tier and urgent capability acquisition pathways. Urgent and middle tier can be used because the equipment being procured is all mature and requires less testing due to the equipment being COTS. The strategy would start over at phase one if and when major changes to the requirements documents occur. The strategy would be that the 2023 Pioneer Kit modernization is fully fielded with the first review of the components in 2026. In 2026, if any components are found to be lacking or need upgrades due to a change in industry standard, a dollar value will be assessed. If that value is above a threshold, an urgent capability acquisition is initiated, and procurement, Marine Corps (PMC) funding will be

used. If the changes, adjustments, or upgrades do not meet the threshold dollar value outlined in the APB, an engineering change proposal and a modification instruction will be produced to adjust the kits. The changes to the components will be procured using operations & maintenance (O&M) or procurement dollars, whichever is available. During PPBE the program office will budget for O&M due to the stable nature of the funding year over year. However, being able to use either funding provides flexibility or makes for a more productive way to support the warfighter in the event funding becomes available at the end of the year.

The incremental upgrades themselves will be on a 5-year timeline. That timeline would begin at year 3 since the last fielding of improvements. This strategy would be considered a push strategy from PMES to the fleet. The fleet Marine force would be solicited for revisions or additions to the kit, this would most likely be a quick turnaround due to Marines constantly wanting to add or adjust the kits currently. The PM would push the revision request down to the fleet and then gather the information submitted back for review. This would crowdsource the overall review of the kits and take some work off of the acquisitions team during the analysis of the review process. The expectation is that the commanders would push the review to platoons and squads, allowing the Marines on the ground to provide input. This is a good way to get warfighter feedback and learn what the actual needs of the junior Marines are in regard to their kits. When the revisions came in, the program manager and team would decide on the additions and whether the recommendations from the warfighter warrant an engineering change proposal and modification instruction or a new procurement for the kits. This gives the program office 2 years to procure and field the updates to the kit. This would occur until the capability that the kits filled was no longer a required capability for the Marine Corps engineer community. This would also allow for the kits to be modernized incrementally and without a large acquisition.

This system would also allow for modernization through sustainment to be planned for and appropriated in a more streamlined manner. O&M funding, once in the system, is rarely taken out. This would create a source of funding that would allow for modernizations to occur on a regular basis. This system would also allow for the addition of single items without the review of all the items. One example would be the addition of

an asphalt zipper to the ADR Kit. Which has been brought up during conversations throughout the Marine Wing Support Squadrons, when the program office visits. Currently there are limited opportunities for the field to request additions and then to see those additions added. This acquisition strategy would allow a pathway for those additions and ultimately a better capability for the warfighter. The engineer kits would take on a continuous review and improvement with the understanding that the items in the kits are a small piece of the overall capability that should be adjusted as warfighter needs change and evolve.

This acquisition strategy would also be less time-consuming than the traditional single-step upgrade acquisition strategy. That is because only a few items would be in review for modernization. Due to the COTS items being at a technology and manufacturing readiness levels of 9, the time it takes to make the adjustments would be minimum, especially if the dollar value did not exceed the threshold to require a new procurement to meet the need. It would push the decision authority to the Program Manager of Engineer Systems. Eliminating bureaucratic processes tends to slow down modernization. The main point would be that the modernization review would be on the calendar and a part of the battle rhythm and not something that could be pushed to the side until the last hour. This would also provide a vehicle for warfighter buy-in and direction. It would help with the relationship between Marine Corps Systems Command and the fleet due to the short turnaround time associated with COTS and simple modernizations. Commanders could see their inputs in real time and potentially while they were still in command.

The final aspect and the most important is that the process would allow for innovation and modernization to keep pace with innovations and modernizations in industry. One example is the electric chainsaws. Currently they are not powerful enough to meet the mission needs. The pioneer kit is currently under modernization and will most likely not adopt the electric chainsaw as a new item within modernized kits. Laws occurring in the United States, especially in California, will most likely force manufacturers to develop an electric chainsaw that is as powerful as gas-powered ones. The system described above would be able to act on that industry change, giving the warfighter a more expeditionary chainsaw that does not require a second fuel type and

can be charged using the charging equipment available, batteries, generators, vehicles, and pumps.

(2) Option 2

Another option is to keep the overall acquisition strategies for procuring the kits within the major capability's acquisitions pathway. This is the current pathway used for a majority of other programs of recording within PMES. The change and innovation within this option would be to the sustainability feedback loop and in an update to the engineering change proposal (ECP) and modification instruction (MI) process. This option will focus on those processes that are within sustainability, while leaving the acquisition strategy pathway (major capability acquisition pathway) that the engineer kits currently follow unchanged and unadjusted. It is primarily a pull strategy with the burden of labor falling on the warfighter and the warfighters willingness to participate and give feedback.

The current process for making a sustainment change is that a product quality deficiency report (PQDR) is generated and submitted from the active-duty forces with the concern or complaint about an item within the kit. The PQDR is submitted from Marines to the commanding officer of their unit to be signed or signed by someone delegated the authority to sign. The commander or delegated authority makes a decision on if the PQDR that was submitted by the Marine is relevant to the community and whether the PQDR should be endorsed. It is important to note that the PQDR cannot proceed without command endorsement, which is usually at the 0–5 level of command. Some of these commanders are not engineers and may not have detailed understanding of engineer equipment. This occurs most often when an engineer platoon is attached to another unit such as an infantry or logistics battalion. That PQDR is submitted to Marine Corps Logistics Command where it is evaluated and responded to within 3 -10 days based on coding. If during the investigation the issue is deemed significant to be elevated to the program office, it can be used as justification for an ECP/MI. When enough similar PQDRs are put into the program office a decision is made by the program manager and team assigned to the sustainment of the equipment, about if the program of record will need to be updated or modified to remedy the deficiency identified. That data supplied by

Marine Corps Logistics Command is currently being compiled by a member of the staff at the program office. That remedy could become an engineering change proposal. The ECP is developed, accepted, and funding is sourced, a modification instruction goes out to the fleet and the equipment is updated. It is important to note that PQDRs could be submitted to, and a response generated without the program teams' input and simply based on input from Marine Corps Logistics Command. (Marine Corps Logistics Command, 2014)

The other option for updating a system within the current acquisition framework is that an item of equipment becomes obsolete and a like item is used to replace the obsolete item within the procurement system. For the Marine Corps Engineer Kits these items can be found either ServMart or Global Combat Support System Marine Corps (GCSS-MC). GCSS-MC is the primary way that replacement parts and equipment are sourced with ServMart or open purchase being a tertiary route in the event that the item is not provisioned within GCSS-MC.

Option 2 would be to streamline the PDQR to ECP/MI process, along with an addition of a process to identify capability deficiencies with the equipment that has already been procured and fielded. There is not currently a process that allows for a capability gap to be identified without the submission of a needs statement. Option 2 focuses on making changes to the processes that are already in place, without making adjustments to the current acquisition strategy (major capability acquisitions pathway) to the programs of record that have been approved and are currently in sustainment. The processes that are being identified for improvement can be streamlined within the engineer community with minimal authority outside of LCES, and without changes to the requirements or the approved acquisition baselines associated with the kits that are currently fielded. It also will not require an update to what the expected acquisitions baselines would be for programs that are scheduled to be modernized.

To streamline the PQDR to ECP/MI process software would be developed and/or procured to update the PQDR process in order to allow lower levels of chain of command to report issues and problems. This will help to mitigate the cumbersome approval process for the current PQDR process. This software would need to be available and

allow access for all service members within the engineer community and have the ability to make reports on the equipment. This software would also allow for a request for additional equipment to be added to the kits based on an identified capability gap within the current configuration of the kit. The determining factor for access to the software system would be based on military occupational specialty (MOS). Those Marines holding MOSs that are associated from the program documents with the program of record will be given access to submit PQDRs. An important aspect of this is that the current process would need to be adjusted to account for the increase in submissions. To avoid overloading the program office or Marine Corps Logistics Command machine learning and AI systems would be added to the process to avoid having to use man hours to process the expected volume of increase to the submission of PQDRs. Machine learning and AI systems could be developed and used as a filter and group these issues or deficiencies to create a percentage of problems that seem related. For PQDRs that require immediate assistance and do not just represent general complaints or capability lapses another process outside of the AI and machine learning could be set up. This process would still maintain commander approval before being submitted. Once a category of grouped issues reaches a predetermined threshold, a notification could be created as a trigger for the program office to initiate an investigation into the supposed issues. The threshold to initiate investigations would be set by the PM based on each individual kit and the percentage of the engineer population that uses the kits. That investigation would involve contacting the major engineer commanders and inquiring if a proposed change would be beneficial to their mission capabilities. This would allow for the major commanders within the community to have input on any ECP/MI prior to changing the equipment. It represents a change in process from the current endorsement process without completely removing the commanders from the equation. The response from the commanders would drive the decision to initiate a ECP or not. This would ensure that senior level warfighting opinions were considered. If the commanders responded back that an ECP and MI would be needed, then the current process could begin.

The key aspect of this option that should be noted is that the warfighter is inherently responsible for the initiation of the process. Without warfighter PQDR submissions the threshold to initiate a change would not be reached and changes cannot

be triggered. Educating the warfighter at the junior most level would be crucial for this option to be successful. This is because the turnover of junior officers and junior Marines averages 1–4 years for a complete turnover of personnel within any given unit. Education would need to be revisited by either an outside training organization such as the Marine Corps Engineer School or on the job training conducted by the unit to ensure that the knowledge is not lost during turnover of personnel.

D. DEFINE DECISION CRITERIA TO COMPARE OPTIONS

Table 1 outlines the decision criteria for the comparison of the two options presented.

Table 1. Decision Criteria

	PMO Workload	Warfighter Workload	Warfighter Engagement	Sustainability	Funding Risk	Totals

The decision criteria for evaluating the two options are found in Table 1: PMO Workload, Warfighter Workload, Warfighter Engagement, Sustainability, and Funding Risk. The item that has the lowest value in the total is the overall best choice. PMO Workload focuses on the amount of man hours each option would cause the program office to undertake. This is measured in the amount of effort that the individuals on the program design and sustainment team would be required to commit to make the option presented a success. Warfighter Workload focuses on how much time would need to be expended on the part of the warfighter outside of the current requirements to make the option a successful strategy. Things to consider during the analysis of these criteria are time taken into account for education on the system and time taken away from operation commitments. Warfighter Engagement is focused on the amount of input that the lowest levels engineer community has access to and the amount of involvement the community has in the process. It is a judgement of how open the option is to the possibility of the lowest level Marine to propose and effectuate change. Sustainability is directly focused on if the new process will last or if the process will devolve back into the current system over time. Funding risk focuses on which option is most likely to receive funding. This criterion is focused funding year over year and looks at the ability of the funding to be

included in the Program Objective Memorandum each year and to make it through the PPBE process and into appropriation.

E. CONSTRAINTS AND CONSIDERATIONS

1. Constraints

Option 1 is constrained by the willingness of the program office to take on the challenges implementing an innovative acquisition strategy. The strategy outlined would be a deviation from the norm and face inertia from within the program office. It would take a strong advocate and a program manager who would be willing to see the change through the first few iterations of the strategy. The other constraint is getting the funding document through the first budget that it appears on due to the addition of a new funding line. It would take buy-in at a much higher level than option 2.

Option 2 constraints are focused on the acquisition of a new software program of record. This is not something the PMES has experience in doing and would require additional personnel and funding. That funding would be 3–5 years before arriving at the program office with another 3–5 years for the development of the software systems. This means that the innovation is potentially 10 years away. The other constraint is one that the current system faces is that every time an issue or deficiency is identified funding will have to be sourced from available funds within other procurements or programs of record.

2. Considerations

The key considerations for option 1 are the development of the new acquisition strategies, getting it through the approval process, and getting the line items into the budget. After that, the next major hurdles will be the reviews in the coming years. It will be important to stagger the kits so that the funding is constantly being spent to upgrade one of the programs each year. This way there are no gaps in funding or a need to source funding from another location. Personalities within the program office and CD&I should also be considered when working through this option. The stakeholders and their mentalities are key to success or failure if this option is executed.

The key consideration for option 2 is the education needed throughout the process. The education is based on gaining knowledge in regard to the machine learning and AI software systems, in addition to the new PQDR portal that would need to be created and incorporated into the training pipelines. that will need to be learned and implemented at all levels. The success of this option is based on if the junior Marines and junior offices have the ability to access the system and the knowledge to input data. That data then needs to be translated to the machine learning and AI systems that have to be managed at the program level. Those individuals responsible for managing the system also have to be educated in the technology.

F. SENSITIVITY ANALYSIS WITH DEFINED CRITERIA

1. Criteria Analysis Without Weights

Table 2 is the analysis of the options against the criteria without weights being added.

Table 2. Decision Criteria Without Weights (Note: each option is ranked compared to the other with a lower score being better.)

	PMO Workload	Warfighter Workload	Warfighter Engagement	Sustainability	Funding Risk	Totals
Option 1	2	1	2	1	1	7
Option 2	1	2	1	2	2	8

Without any weights being applied to the decision criteria option 1 is the better choice. This is due to this option having the least funding risk and a better chance for overall sustainability into the future. Funding risk is important because unlike option 2, option 1 proposes a continual line of funding to modernize the kits incrementally. This line of funding is more stable than gathering the scrapes from other programs or risking funding in the out years as need arises. It focuses on steady funding that is less likely to be questioned after the first iteration of the POM that it is put in. The justification is also simple because of the overwhelming number of items that it applies to. This funding can also be obligated relatively easily due to the any number of items needing to be modernized at any given time. Option 1 is also more sustainable than option 2 due to the

overall strategy relying on more stable billets and positions to ensure that the actions outlined in the strategy come to fruition.

These options should be viewed with the use of subjective lenses. Stakeholders and their relative power in relation to each other should be taken into consideration when making a decision. The next section will detail two of those stakeholders who not only hold the most power, but also have the highest level of interest in the strategies.

2. Criteria Analysis of adjusted Weights

The weighted tables will focus on two of the main stakeholders that will be impacted the most by adjustments to the status quo. Those stakeholders are the warfighters, more specifically the recipients of the programs of records within the engineer community. Those are the 11xx and 13xx MOS fields. The other stakeholder group that would be most affected by adjustments to acquisition strategy changes or changes to the overall processes is the program office. This is because these individuals are responsible for the development, implementation, and sustainment of the strategies and programs. The program office would be responsible for implementing the changes proposed and therefore need to be considered heavily when weighting the criteria. Table 3 shows the adjusted weights in relation to the program office.

Table 3. Adjust Weights Program

	PMO Workload	Warfighter Workload	Warfighter Engagement	Sustainability	Funding Risk	Totals
Weight	3	1	2	2	2	
Option 1	6	1	4	2	2	15
Option 2	3	2	2	4	4	15

The first of the weighted tables is focused on what the program office would like to see in the acquisition strategies. The program office historically focuses on cost, schedule, and performance as tenets of program management. The other aspect that is important to any program office is workload. Many times, the program office teams are responsible for many programs, projects, and initiatives. The less additional work being placed on them the better the option to the program office as a whole. PMO workload, sustainability, and funding risk are therefore given a heavier weight when comparing the

options. It is important to note that it was due to long term sustainability. This option did not do well in terms of PMO Workload and places a majority of the workload on program office individuals who have to execute the strategy. Option 1 does, however, take away uncertainty in the long run. This is because while option 1 would be difficult to implement in the short term, the long-term sustainability of the option would reduce cost and funding risk. Not a part of the criteria being measured but important to note is that option one provides better performance on a simple and timely internal that does not have much risk of funding, and the cost can be tailored to specific asks by the Fleet Marine Force. This means that in addition to option 1 meeting the compared criteria it also is better in terms of Cost, Schedule, and Performance.

Table 4 shows the adjusted weights in relation to the warfighters.

Table 4. Adjusted Weights Warfighter

	PMO Workload	Warfighter Workload	Warfighter Engagement	Sustainability	Funding Risk	Totals
Weight	1	2	3	1	1	
Option 1	2	2	6	1	1	12
Option 2	1	4	3	2	2	12

Overall, both options offer favorable outcomes for different parts of the warfighting community. This is why the options end up being even. The sensitivity of the weights is based on the overall warfighter community and does not show preference to one thought process or one subset group within organizational structure of the community.

The warfighters and more specifically the Marine Corps engineer community is the other stakeholder group that needs the most attention. This is because they are the end users and the reason for the changes. The goal of programs of record is to fill capability gaps identified by the warfighters. Capability is the driving principle behind what the warfighter wants. Warfighters as a stakeholder tend to care less about cost and focus more on the performance of the system being provided. The other aspect of the strategy at affects the warfighters is the effort they need to put in to make the strategy a success. That effort is measured in workload taken from other tasks and the engagement opportunities to provide input. With these in mind the criteria that are the most important

to the warfighter are warfighter engagement and warfighter workload. Warfighter workload holds more weight due to it representing the man hours taken up by the process innovation to change the system. The workload would be measured by the additional man-hours a Marine would have to do in order to make the new process success. Option 2 relies heavily on warfighter engagement and input. This option places a majority of the effort on the warfighter with the program office taking a passive role until thresholds are met. This is why option 1 would be more favorable to the warfighter in terms of workload. In terms of warfighter engagement at the lowest levels. Option 2 offers a greater opportunity for that to occur. Option 2 places the ability to create change directly in the hands of the individuals using the equipment. Unlike option 1 that still places requests for changes in the hands of senior leaders, option 2 opens the door to direct uncensored input from the users at the lowest levels of the organization. Looking at the totals for criteria adjusted to be viewed through the warfighter's lens of understanding, both options would be acceptable. This is because within the warfighter stakeholders there is a constant battle between time and input. The warfighter wants to provide the most up to date input so that they can receive the best capability but would like to do this while not expending too much time. What would make option 2 the better option in the warfighter's viewpoint would be to weigh warfighter engagement even higher than it already is. This would be for senior leaders to decide if the extra workload would be worth having lower levels of input.

3. Analysis with Final Weighting

Table 5 is the final weighting with both the warfighter and program office concerns taken into account.

Table 5. Decision Criteria with Weights

	PMO Workload	Warfighter Workload	Warfighter Engagement	Sustainability	Funding Risk	Totals
Weight	1	2	3	3	2	

The final criteria weights are based on a subjective assertion on which ones are more important overall when comparing the two options. They are a combination of what would be important to the warfighter and what would be important to the program office.

PMO Workload has the lowest ranking because this is the job of the program office. The individuals who hold the billets within the organization are there because they have the skills to develop and sustain programs. This is a part of their job description. Warfighter Workload is given a higher weight due to the fact that while the warfighter wants a better capability providing inputs and making adjustments to capabilities are technically not in their job description. Warfighter Engagement holds a weight of 2 due to the fact that both options rely on some level of warfighter input. Warfighter engagement is also the key criteria for selecting an option and is also open to the most subjectivity. This subjectivity comes from two groups of warfighters, Senior leader's vs. rank and file. Warfighter Engagement measures input from across the board. This is why option 2 is overall a more engaging option. However, if the community wanted to control the narrative and control messaging going to the program office option 1 would be the only one to allow that. This weight could fluctuate in further research if senior leaders from throughout the community were asked to weigh in on the strategies. For now, it is recognized as having equal importance to sustainability into the future. Funding risk also holds a weight of 2 because it represents the survivability of the changes being proposed. Funding is key and without funding these are just good thoughts. Funding is the life blood that allows for changes to occur and therefore needs to hold a higher or equal criteria weight for the options being evaluated. Sustainability is the final criterion that was evaluated. It was equal to warfighter engagement in the weights because if a strategy is not sustainable it is more likely to fail. The goal would be to have a lasting impact that can include warfighter involvement but would also not become a misunderstood cumbersome process. The strategy innovation that is chosen will need to be responsive to the constantly changing environment and make the capability the kits offer sustainable into the future.

Table 6 is the comparative analysis with the input data from Table 1.

Table 6. Comparative Criteria with Weights

	PMO Workload	Warfighter Workload	Warfighter Engagement	Sustainability	Funding Risk	Totals
Weight	1	2	3	3	2	
Option 1	2	2	6	3	2	15
Option 2	1	4	3	6	4	18

Option 1 is the overall better option after inputting the numbers into the final weighted criteria. This is due to the fact that it is the option that is best for the warfighter in terms of time spent devoted to the strategies success, it is more sustainable over time, and once funded has the least funding risk in the out years. It is responsive to a changing environment and does not rely simply on user feedback to be pulled from the program office to initiate changes to the program. It is also responsive to changes in industry and can react better to those changes. This is because the program office is more engaged with industry than your average warfighter, and they have a better understanding of what technologies are present. While not explicitly noted as part of the strategy, option 1 always for an opportunity for the program office to suggest new technologies during the solicitation for changes in year 3 of the incremental life cycle. The program office can push that understanding and market research down to the warfighter as part of the solicitation of changes packet at the 3-year mark. It is also more sustainable both from a requirements capability standpoint and from modernization of the kits in a timely fashion. Once adjusted the requirements associated with the kits would most likely not have to be revisited until the capability gap that is being filled by the kits is obsolete. Option 1 will be the most difficult to fund at the beginning of the transition to the new acquisition strategy, but once implemented the funding will be sustainable and less likely to be questioned year of year due to the relatively lower dollar value associated with sustainment dollars.

4. Summary of Analysis

With respect to total life cycle costs, option 1 would be the better option. This is due to the fact that once option 1 is implemented the cost associated with the total refresh of the engineer program of records at the end of their life cycle. Option 1 removes or extends the need to have controlled obsolescence of the kit as a whole, which results in lower costs based on the fact that less items are updated with each refresh. Option 1 is also cost-effective in that a software system does not need to be created and maintained. Software systems tend to have hidden costs and grow in cost over years of use. The Marine Corps experienced this most recently in changing from Oracle to CACI. CACI

was selected due to the increased cost oracle had to continue the sustainability of the software. (Business Wire, 2019)

For PMO Workload option 2 is the better option. It puts the initiative on the warfighter and allows the program office to be passive observers until a threshold is met that would cause the office to engage. The software that would be in place could also be applied to systems not associated with engineer kits but that share similar parts or components. The ability to harvest data without extended man hours would be a benefit to the program office in more ways than one.

For Warfighter Workload, option 1 is the better option. This is due to the fact that option 1 puts the control of the cycle and control of the conversation on acquisition professional rather than the warfighter. It is the acquisitions professional's responsibility to engage the warfighters at the 3-year mark, gather the information, make decisions, and produce a product at the 5-year mark, starting the cycle over. The main actions outside of providing data are done by the program office. This takes a majority of the work that option 2 places on the warfighter out of the equation.

Warfighter engagement really relies on which warfighters are being engaged. For the purposes of this analysis the whole warfighting community was taken into account. From the senior leaders to the most junior Marine. In this case option 2 would have a greater benefit to the community as a whole. This is because it solicits more input and greater crowdsourcing of changes. It does, however, cut out the discretion of senior leaders and is susceptible to changes in the threshold levels put in place by the program office.

Option 1 is higher in sustainability due to the fact that acquisitions professionals tend to stay in their positions longer than military members. This workforce continuity will be key in ensuring that the transition from the current acquisitions strategy to a new strategy is successful. Without continuity of personnel the likelihood of success is decreased. Service members tend to rotate every 1–4 years, making the continuity of personnel low to non-existence. The few continuity points within a unit are also not key decision makers within the unit. These individuals tend to be lower-level enlisted personnel who do not have decision authority. While they are subject matter experts, they

do not make solid points of continuity in regard to an acquisition innovation. The acquisitions professional might stay within the same job for 20 years but is more likely to remain in a position for 5–10 years. This means that option 1 has a better chance of becoming the way of doing business and the ability to survive past the initial turnover that will occur with option 2.

G. RECOMMENDATIONS

From the comparison and based on the evaluated criteria, option 1 is the recommended option. This is because it provides the warfighter with the best value for upgrading and continual development of the capabilities that engineer kits provide. It is the overall most cost-effective option in regard to total life cycle cost. It also is less likely to be a failed experiment or to slip back into the way things have always been done, because the experiment is controlled by the acquisitions professionals who tend to be more long term than their warfighting counterparts. This option also guarantees funding, which is something that option 2 cannot do. In the event that no funding is available, option 2 would create a backburner situation, similar to the one that currently exists within the program office. This could leave the ECP in limbo until funding was pulled from the scraps of other programs or until funding could be added to a future budget. Option 1 avoids that possibility by including yearly funding to effectuate change in the engineer kits. Option 1 provides the most opportunities for continual improvement, which is at the root of the issue being evaluated.

V. CONCLUSIONS

A. SUMMARY (ANSWERS TO RESEARCH QUESTIONS)

(1) What is the most appropriate acquisition strategy for USMC Engineering kits going forward?

The appropriate strategy going forward is an incremental approach that leverages the authorities allowed within the AAF. This incremental approach would allow for the MDA to approve a strategy of continuing improvements over a 5-year cycle. This cycle would allow for rapid replacement of the equipment and the use of both O&M funding and PMC. This would create a scenario in which only a few items would need to be replaced, which avoids the massive consumption of time that a full modernization causes and still gives the warfighter the kit that they need.

(2) Does an incremental strategy offer the opportunity for increased capability faster than current strategy?

Yes, this is because the increase in capability is focused on one or two items. These items can be things like an updated air compressor, nail gun that runs on battery, or asphalt zipper that might have been left out of the original procurement.

(3) Can the program office sustain and maintain capability released incrementally?

Yes, the program can sustain and maintain a capability release incrementally better than a complete modernization. This is due to the limited number of items that would need to be replaced or added. The amount of time and personnel cost associated with these smaller tasks are less than those required for a full-on modernization of the kits. A majority of the work would also be placed on the fleet in regard to the review of the kits in their entirety.

(4) Does this strategy leverage commercial off the shelf (COTS) products?

Yes, it does leverage COTS equipment. This is no change from the current system, which leverages the same amount of COTS equipment.

(5) If an incremental acquisitions approach is appropriate, how would it be implemented?

The implementation of this approach would be difficult to get approved at first, due to it going against the grain. It would take some thought and development of the APB and SAMP of the first engineer kit to implement this strategy. After the first one is approved, all other kits would be an easy sell. That first kit though would have to have the buy-in from the PfM and the PM. It would most likely have to go to Marine Corps Systems Command Commanding General for approval and review. A majority of leaders are risk-averse and will most likely want to elevate the risk decision to the highest level possible. This is because it would be a deviation from the norm. It would then have to be adhered to rigidly for the next 5 years or through the first round of increments. After that first round of increments, it would become the way business is done and flows relatively smoothly. Anything that is a deviation from the norm, though, will receive pushback at the beginning of the implementation, and this will be no different. The rewards for this though are great and create a vehicle for continuous improvement and modernization of the engineer kits.

B. RECOMMENDED ACTIONS

The action that is recommended following the research is to try and put this strategy into action with the development of the Carpenter and Pioneer Kits. Their modernization provides an opportunity to test this strategy out in real time.

The other recommendation is to bring up this strategy at the engineer summit. PMES would propose this recommended strategy for the kits and see if the engineer commanders would be interested in having that much input.

C. RECOMMENDED FUTURE RESEARCH

The rate at which the industrial sector is modernizing is outpacing the acquisitions community. The world and the landscape of conflict is changing rapidly, and the pathways and authorities developed during the 1960s may not be the right answer to providing the best products to the fleet. Industry has seemed to change into providing new models at a rapid rate and the acquisitions community should try and follow suit.

Research needs to be conducted on how innovative acquisition strategies can be tailored to help programs and capabilities maintain a course with industry innovations and changes to the operating environment.

The other recommended future research would be to survey the community and see which option would have the greatest buy in from the community at large. This type of research would need to be conducted over the course of years rather than months so that the turnover of billets could be factored into the analysis. This would also be the best way to solidify the criteria of comparison, warfighter engagement.

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

www.acquisitionresearch.net