NPS-AM-24-195

ACQUISITION RESEARCH PROGRAM SPONSORED REPORT SERIES

Thematic Analysis for the Loss of Enhanced Imaging Capabilities on Coast Guard MH-65 Search and Rescue Assets

June 2024

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The research presented in this report was supported by the Acquisition Research Program of the Department of Defense Management at the Naval Postgraduate School.

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ABSTRACT

This study answers the following research questions: what policies and procedures within United States Coast Guard Acquisitions, as well as external factors, may have contributed to the failed sustainment of the Electro-Optical Sensor System (ESS) and the critical capability it provides? And what process changes could be implemented to prevent similar capability loss? This thematic case analysis explores how the ESS was lost and what acquisition-related decisions and processes ultimately contributed to the removal of the ESS without a viable replacement in hand. It also provides a quantitative analysis of the impact the removal of the ESS had on Coast Guard search and rescue operations. Our findings suggest that the loss of the ESS on the MH-65 was a consequence of the segregation of responsibilities between the program's acquisitions and its sustainment resulting in the system being overlooked and the Coast Guard being caught unprepared by the end-of-life notification from Teledyne/FLIR in 2019. This analysis results in initial insights, recommendations, and potential acquisition policy improvements that can be applied to enhance the Coast Guard's ability to sustain key aviation capabilities long-term and prevent similar scenarios in the future.

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ABOUT THE AUTHORS

LCDR Christopher Monacelli, USCG is a MH-65 helicopter pilot for the Coast Guard. He graduated from the United States Coast Guard Academy in 2012. Following receiving his commission he reported to the CGC CYPRESS in Pensacola, FL as a Deck Watch Officer. He then attended naval flight training in Pensacola, where he earned his coveted wings of gold. After receiving his qualification as a MH-65 pilot, he reported to Coast Guard Air Station San Francisco and then completed a follow-on tour at Coast Guard Air Station Detroit. LCDR Monacelli married his wife in 2019 and they are currently raising a beautiful daughter. Upon graduating from Naval Postgraduate School, he will be reporting to Coast Headquarters as the aviation missionization testing liaison at Naval Air Station Patuxent River.

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ACKNOWLEDGMENTS

This research could not have been conducted without the support of some incredibly intelligent and influential individuals. First, we would like to thank the individuals at the USCG Headquarters offices responsible for the acquisition and sustainment of the ESS, including CG-711 (Aviation Operations), CG-41 (Aviation Engineering), and CG-931 (Aviation Acquisitions). Your knowledge and passion for the work that you do gave our research meaning and allowed us to dive deep into the world of Coast Guard Acquisitions. We'd also like to thank the staff of the NPS Acquisition Research Program. Your expertise helped us focus our research and deliver a product that we hope will have a positive impact on the Coast Guard. Finally, to our advisors Kathryn and Bryan. None of this research would have been possible without your guidance and support. Two of our favorite professors quickly became the best advisors we could possibly ask for. Thank you for all that you do and for pushing us to be better every day.

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LIST OF ACRONYMS AND ABBREVIATIONS

AAF	Adaptive Acquisition Framework
ACAT	acquisition category
ADE	acquisition decision event
AUF-CD	airborne use of force counter drug
DAP	defense acquisition process
DAS	defense acquisition system
DAU	Defense Acquisition University
DHS	Department of Homeland Security
DOD	Department of Defense
DODD	Department of Defense directive
EMD	engineering and manufacturing development
ESS	electro-optical sensor system
FLIR	forward looking infrared
FOC	full operational capability
FY	fiscal year
GAO	Government Accountability Office
GDP	gross domestic product
JCIDS	Joint Capabilities Integration and Development System
MARFLIR	maritime forward looking infrared
MCA	major capability acquisition
MDA	milestone decision authority
MDE	milestone decision event
MRR	medium range recovery
MSA	material solution analysis
O&S	operations and support
P&D	production and deployment
PIW	person in the water
PM	program manager
PMO	program management office
POC	probability of containment

POD	probability of detection
POS	probability of success
POSCUM	cumulative probability of success
PPB&E	Planning, Programming, Budgeting, and Execution System
PWCS	ports, waterways, and coastal security
R&D	research and development
RWAI	rotary wing air intercept
SAR	search and rescue
SAROPS	Search and Rescue Optimal Planning System
SLEP	service life extension project
SRR	short range recovery
TMRR	technology maturation and risk reduction
UON	urgent operational need
USCG	United States Coast Guard

I. INTRODUCTION

On February 19, 2019, Teledyne/FLIR Corporation issued an end-of-life notification for the Electro-Optical Sensor System (ESS) utilized by the U.S. Coast Guard due to component and parts obsolescence by 2025 (Mauro & Yoder, 2024). The ESS is an important sensor package the Coast Guard employs, providing visible and infrared imaging capability, laser range-finding, recording, advanced stabilization, geo-location capabilities and search functionality to aid operators in the conduct of search and rescue (SAR), law enforcement, and marine/environmental protection (Teledyne FLIR, 2023). Following the global impacts of the COVID-19 pandemic, Teledyne/FLIR issued an updated end-of-life notification in 2022, stating the ESS was no longer supportable effective immediately, 3 years earlier than expected (Mauro & Yoder, 2024). This announcement forced the Coast Guard to consolidate its remaining available ESS units to preserve its capability, resulting in its removal from all MH-65 SAR units that provide maritime SAR coverage for 50% of the U.S. coastline (Mauro & Yoder, 2024). This case analysis examines the Coast Guard's loss of the ESS and the decisions that led to this loss, which are representative of shortcomings in the way the Coast Guard currently does business. The analysis identifies root causes that may lead to acquisition program failures such as Deepwater, and more recently, the Offshore Patrol Cutter, the most expensive acquisition program in the service's history (O'Rourke, 2023).

The Coast Guard is unique among the military services in a myriad of ways, arguably most significantly that it is the only branch of military service in the United States that falls outside the Department of Defense (DOD). This unique placement serves a purpose, namely allowing the Coast Guard to wield broad law enforcement authority that the DOD cannot (Coast Guard, 1949). This placement also comes with significant disadvantages in many areas, especially in the realm of acquisitions. With a much smaller, and separate acquisitions enterprise, the Coast Guard is not only disadvantaged by a proportionally smaller budget ($13.82 billion versus $816 billion for the DOD in fiscal year 2024), but also by the support and collaboration that are not available because of the Coast Guard's separation from the DOD (OUSD(C), 2023; United States Coast Guard [USCG], 2023a). The history of shortcomings and failures within the Coast Guard acquisitions enterprise is long and well-documented. Perhaps the most famous failure is the program known as Deepwater, an attempt by the Coast Guard to replace and modernize its maritime and aviation fleet in the late 1990s (O'Rourke, 2012). This failure now serves as a case study in the mismanagement of defense acquisitions. Since then, still plagued by budget and cultural constraints, the Coast Guard has diligently pressed on doing "more with less" without the opportunity to evaluate and act on the root causes of many issues.

Teledyne FLIR was proactive with their service life updates of the ESS to the Coast Guard, and although the end of service life had been reached three years earlier than expected, the ESS had already been in service for nearly 15 years by 2022. This case analysis explores how the Coast Guard was caught in this situation and why the Coast Guard was not proactive in ensuring it would have an ESS replacement available. Our analysis identifies points within the acquisition process when different decisions could have been made to avoid losing the ESS's capability.

A. RESEARCH QUESTIONS

This research answers the questions, "What policies and procedures within Coast Guard acquisitions, as well as external factors, led to the failed sustainment of the ESS and the critical capability it provides?" and "What process changes could be implemented to improve acquisition programs and their sustainment, to prevent similar capability loss in the future?"

B. RESEARCH DESIGN

Through a qualitative, embedded case analysis (Yin, 2014) using thematic data analysis (Clarke & Braun, 2006) this research explores the failed sustainment of the Coast Guard's ESS. As the Coast Guard routinely manages hundreds of acquisition programs, the overarching and embedded cases are common; therefore, the policies and processes that influenced events and decisions are likely to represent those used for everyday acquisition situations (Yin, 2014). The overarching case focuses on the sustainment decisions for the ESS program throughout its life cycle, between February 2019 and May 2024. The roles and decisions of the three Coast Guard headquarters offices responsible for sustaining the ESS program make up the three embedded cases. We analyzed diverse types of data. To understand the effectiveness of the ESS, we used the Coast Guard's SAR planning software to simulate 16 scenarios with varying environmental conditions, both with the ESS installed on the search asset and with ESS removed, , which we compared. To gain a thorough understanding of the ESS program itself and the Coast Guard's acquisition system, we reviewed the organization's primary acquisition directive and conducted interviews with seven individuals involved in the ESS acquisition and sustainment efforts at Coast Guard headquarters. We interviewed one member from the Office of Aviation Operations (CG-711), five members from the Office of Aviation Engineering (CG-41), and one member from the Office of Aviation Acquisitions (CG-931). We analyzed interview transcripts to identify trends, patterns, and gaps within the Coast Guard's acquisition system. Finally, we reviewed four reports produced by the Government Accountability Office (GAO) to identify additional trends and patterns within the Coast Guard's acquisition system based on historical performance.

C. CONTRIBUTIONS AND SCOPE

The findings of this analysis are exploratory and based on only one of many programs the Coast Guard manages. Therefore, these findings are not generalizable to all acquisition programs. However, by furnishing a detailed understanding of the Coast Guard's acquisition system, the analysis identifies trends, gaps, and recommendations for future improvements.

From our analysis, we found that the organizational root cause for the failed sustainment of the ESS program was the defined segregation of responsibilities between program acquisition and program sustainment. This separation of program responsibility created barriers in communication, authority, funding, and planning which led to the neglect of the ESS program. Based on our findings, we recommend eliminating the segregation of responsibility between sustainment and acquisition or to bridge the gap through the establishment of offices responsible for the centralized management of acquisition programs from cradle to grave like Program Management Offices (PMOs) in the DOD. Additionally, our findings show that the Coast Guard has not adequately tested the effectiveness of the ESS in SAR scenarios, which was highlighted by the results of our Search and Rescue Optimal Planning System (SAROPS) scenarios. Based on these findings, we also recommend that the Coast Guard conducts future testing to get more accurate data pertaining to the ESS's effectiveness.

While this case study examines errors and failures by a large organization, it is not our intent to place blame on any individuals or organizations. The Coast Guard is staffed with hard-working, well-intentioned, and capable individuals who make necessary and difficult decisions to the best of their abilities, given circumstances. Our analysis recommends areas for growth and change as an organization in the way the Coast Guard approaches the acquisition life cycle. Through the implementation of our recommendations, the Coast Guard can better plan for and execute aviation sustainment programs in the future.

II. BACKGROUND

The DOD and the Department of Homeland Security (DHS) use two different acquisition systems to acquire and sustain assets and operate under different levels of constraints related to funding, personnel, and resources. These differences reveal the gaps in the Coast Guard acquisition system that seriously affect the service's ability to effectively acquire and sustain key assets and technologies. This chapter first provides a brief history of the Coast Guard as a service and its aviation past and then gives an overview of the service's rotary wing fleet and operational status. Next, the chapter provides an overview of the ESS, including its acquisition history and an in-depth look at its capabilities. This is followed by a review of how the Coast Guard coordinates SAR missions and how the ESS is integrated into search planning. Finally, this chapter examines both the DOD and Coast Guard's acquisition policies, highlighting key differences between the two, as well as the historic performance of Coast Guard acquisitions since transferring to the DHS.

A. OVERVIEW OF THE COAST GUARD

While the United States Coast Guard is responsible for a wide array of missions, at its core it is a "maritime law enforcement, regulatory, environmental and humanitarian agency" (USCG, 2012). The history of the service can be traced back to 1790, when Alexander Hamilton's proposal for the construction of 10 vessels, to enforce tariff and trade laws and to prevent smuggling, was approved by Congress, creating the Revenue Cutter Service (USCG, n.d.-d). The Coast Guard was officially established as military organization in 1915 following the implementation of Title 14, which merged the Revenue Cutter Service and Life-Saving Service, forming a single maritime service responsible for enforcing maritime laws and saving lives at sea (Coast Guard, 1949). Since its inception, the Coast Guard has continuously evolved, transferring departments, absorbing other organizations, and adopting new responsibilities and missions to meet the nation's requirements. Today, the Coast Guard is part of the Department of Homeland Security (DHS) following the implementation of the Homeland Security Act of 2002, and is comprised of 55,000 active duty, Reserve, and civilian members, as well as 21,000 volunteer Auxiliarists (Fagan, 2023). The service is charged with 11 statutory missions: SAR, ports waterways and coastal security (PWCS), drug interdiction, migrant interdiction, defense readiness, marine safety, aids to navigation, living marine resources, marine environmental protection, ice operations, and other law enforcement (USCG, n.d.-e).

1. Aviation Within the Coast Guard

The Coast Guard has had a hand in aviation since its inception, when in 1903 a crew from the Kill Devil Hill Life Boat Station assisted the Wright brothers with their infamous first flight (Scheina, 2004). However, it wasn't until 1920, after WWI, that the Coast Guard established its first air station in Morehead City, NC, utilizing six aircraft borrowed from the U.S. Navy (Scheina, 2004). Throughout the 1940s, the Coast Guard once again made aviation history, playing a pivotal role alongside Igor Sikorsky to advance and integrate the helicopter into the U.S. Navy (Scheina, 2004). In 1951, after several years of intense research, development, and testing, the service finally received its first helicopter outfitted to conduct SAR (Scheina, 2004). Continuing throughout the years, the Coast Guard has utilized a vast variety of different airframes, but today its aviation fleet is comprised of 47 fixed-wing aircraft and 146 helicopters, that are distributed among 25 operational air stations, strategically located across the United States (MacLeod, 2024).

2. The Coast Guard's Rotary Wing Fleet

The Coast Guard's current rotary wing fleet comprises MH-65 and MH-60 helicopters that were originally acquired to modernize its aviation fleet throughout the 1980s and early 1990s. The MH-65 was the first of these two acquisitions; in 1978, the Coast Guard identified the need for a Short Range Recovery (SRR) asset, thereby initiating the MH-65 program (Storm, n.d.). Understanding that there was a lack of in-house acquisition expertise and to expedite the overall acquisition process, the Coast Guard elected to design the MH-65 around a pre-existing aircraft frame versus designing a new airframe using defined mission requirements (Storm, n.d.). Selecting an aircraft already in production and used by other agencies also helped to ease the obsolescence concerns that come with acquiring service unique assets. Eventually the contract was awarded to the company Aerospatiale (now Airbus) in 1979, with the first MH-65 entering service in 1985 (Storm, n.d.). Since then, the MH-65 has gone through four model upgrades, each providing increased performance and enhanced capabilities, with the most recent Echo model update still in progress (MacLeod, 2024). The MH-65 is a unique platform in that it is used to perform two specific missions that no other Coast Guard aviation can, Airborne Use of Force – Counter Drug (AUF-CD) and Rotary Wing Air Intercept (RWAI) for National Defense (MacLeod, 2024). The Coast Guard currently operates the largest fleet of Airbus H-65 helicopters in the world, 98 in total, and has played a pivotal role in its continued sustainment worldwide (Airbus, n.d.; Macleod, 2024).

The Coast Guard's acquisition of the MH-60 began in 1986, as the H-65 began to be fielded operationally (USCG, n.d.-b). This acquisition took a much different approach than the acquisition of the MH-65, as the MH-60 had already been used by the U.S. Army and Navy since the late 1970s (PEO Aviation, 2018; U.S. Navy, n.d.). Instead of having to start the H-60 program from scratch, the Coast Guard was able to implement a suitable replacement for its Medium Range Recovery (MRR) helicopters that was already designed to military specifications. The Coast Guard leveraged the research and development already completed by the DOD, reducing its overall acquisition costs while expediting the process. After some slight service specific modifications, the first MH-60 was delivered to the Coast Guard in 1990 (USCG, n.d.-a). Since its original acquisition, the MH-60 has gone through one model upgrade as part of the Deepwater Program, to enhance its avionics suite and provide additional mission capability (USCG, n.d.-a). The Coast Guard currently operates a fleet of 46 MH-60 helicopters (Macleod, 2024).

Today, both airframes are beginning to reach the end of their originally slated service life of 20,000 flight hours, forcing a new era of fleet modernization (MacLeod, 2024). The Coast Guard has not identified long-term replacements for either the MH-65 or MH-60, so current modernization efforts are occurring through service life extension projects (SLEPs). The goal of these sustainment efforts is to prevent the Coast Guard's rotary capability from being significantly degraded, while serving as a bridging strategy until a suitable replacement can be obtained through leveraging the DOD's Future

Vertical Lift Program (Acquisition Directorate, n.d.). The SLEPs complete specific airframe replacements, repairs, and modifications intended to add 10,000 flight hours to each aircraft in the inventory, extending the service life of the MH-65 to the mid-2030s and MH-60 into the 2040s (MacLeod, 2024).

Despite the current modernization of the MH-65, the aircraft is reaching obsolescence much quicker than the MH-60, as the aircraft and several of its components are no longer in production, creating serious sustainment challenges (Hooper, 2022). However, the H-60 is still in full production and being utilized by four U.S. military branches, the armed forces of 34 other countries, and numerous U.S. state agencies (Lockheed Martin, n.d.). To offset this predicament, the Coast Guard has elected to consolidate its rotary wing fleet to a single MH-60 airframe by 2040, retiring the MH-65 (Acquisition Directorate, 2024). To do this, the service is not only extending the service life of its current fleet of 46 helicopters, but it will also convert retired H-60 hulls received from the U.S. Navy as well as receive newly manufactured hulls directly from Lockheed Martin/Sikorsky, to reach a final fleet total of 127 MH-60 helicopters (Acquisition Directorate, n.d.; MacLeod, 2024). In the meantime, as the new airframes are delivered, the Coast Guard will strategically begin transitioning MH-65 air stations to MH-60 air stations, while retiring aging MH-65 assets.

B. THE ELECTRO-OPTICAL/INFRARED SENSOR SYSTEM (ESS)

The Electro-Optical/Infrared Sensor System or ESS for short is an important sensor package the Coast Guard employs, providing visible and infrared imaging capability, laser range-finding, recording, advanced stabilization, geo-location capabilities and search functionality to aid operators in the conduct of search and rescue (SAR), law enforcement, and marine/environmental protection. The ESS is also often colloquially referred to as the "FLIR" (forward looking infrared, also the name of the manufacturer). Throughout this analysis we will refer to it as the ESS, which encompasses all the capabilities of the sensor.

The ESS was first acquired and installed on U.S. Coast Guard helicopters following contract award in 2007 (FLIR Systems, 2007). The ESS provides a suite of capabilities designed to enhance the aircraft's mission effectiveness in Search and

Rescue, Law Enforcement, Security, and Environmental Protection missions (FLIR Systems, 2007).

- Thermal Imaging: According to Kirk Havens and Edward Sharp's book *Thermal Imaging Techniques to Survey and Monitor Animals in the* Wild, thermal imaging is defined as "the process of converting infrared (IR) radiation (heat) into visible images that depict the spatial distribution of temperature differences in a scene viewed by a thermal camera" (2016, p. 121). The ESS can provide imagery that contrasts temperature variations and displays them to an operator at varying levels of zoom (Teledyne FLIR, 2023). This is the primary capability of the sensor system and provides the most value in finding people or vessels on the water especially at night, whether for law-enforcement or rescue purposes.
- Visible Spectrum Imaging: Spectrum imaging is the process of creating a spectral map of an object by illuminating that object with several different wavelengths of light, taking images of the object each time it is exposed to a new wavelength, and then combining those images (Wisnicki & Ball, 2017). During daylight or high illumination operations, the ESS provides imaging at up to 10x zoom in color in the visible spectrum (Teledyne FLIR, 2023). This capability allows for identification of vessels, people, and objects at significant range.
- Laser Illumination: Laser illumination is the process of using a sharply focused beam of laser light to brighten an object, allowing it to be imaged accurately over great distances (Giglio et al., 2013)In instances of extremely low light, the ESS can provide laser illumination of targets that allows other assets with compatible night vision equipment to see a target clearly (Teledyne FLIR, 2023).
- Recording: Recording is the process of saving visual, audio and data collected by a system. The ESS provides recording capability essential for evidence collection, training, and documentation of missions (Teledyne FLIR, 2023).
- Target Geo-Location: Target geo-location is the systems ability to provide the geographic coordinates of an identified object. This is an essential capability that provides the operator with a specific location of a given target, which the operator can save and navigate to if sight is lost (Teledyne FLIR, 2023).
- Stabilization: Stabilization is process of dampening out the movement and vibrations of the helicopter, providing a steady recording platform. Stabilization allows for a high-quality image at significant range even from an unstable, moving, and vibrating platform like a helicopter (Teledyne FLIR, 2023).
- Multi-Target Autotracking: Multi-target autotracking is the system's ability to automatically detect, lock on to, and follow identified objects of interest. This capability allows the ESS to continue to track a designated target without user input (Teledyne FLIR, 2023). In a high-workload

environment like a helicopter in pursuit, this allows the operator to tend to other duties on the aircraft without losing tracking.

1. Coast Guard ESS Program

In 2007, the Coast Guard purchased ESS systems to outfit both the H-60 and H-65 fleet of helicopters. This procurement included sustainment and support for a 10-year period (FLIR Systems, 2007). Following that 10-year support period, extensions were negotiated for shorter periods of time, between 1 and 3 years, until the manufacturer issued an end-of-life notification in 2019, for stop of support in 2025 due to obsolescence (Mauro & Yoder, 2024). In 2022, Teledyne FLIR issued an updated notification to the Coast Guard that, due to various economic and industrial reasons following the COVID-19 pandemic, the ESS had reached its end of service life, 3 years earlier than expected (Mauro & Yoder, 2024).

In response to this announcement, with no replacement system available or identified, the Coast Guard elected to preserve the ESS units they had by reducing the operational capability by approximately 40%, to around 60 units (Mauro & Yoder, 2024). The goal of this effort was to extend the service life of the ESS by 3 years, to reach the originally expected end-of-service-life date in 2025, affording the Coast Guard more time to obtain a new sensor system, without losing the capability entirely. The rationale behind the decision was that by reducing the number of operational ESS units, the Coast Guard could reduce maintenance demand and increase its stock of available obsolescent parts.

Leadership used aviation policy and utilization data to prioritize which missions and Coast Guard Air Stations received the remaining 60% of authorized ESS units. Per the Coast Guard's Air Operations Manual, assets executing the Airborne Use of Force – Counter Drug (AUF-CD) mission were the only ones required to be equipped with an ESS; therefore they received the highest priority (USCG, 2021). For every other aviation mission, including SAR, the system was optional. Therefore, the decision was given to the two highest operational commands, Coast Guard Pacific Area and Coast Guard Atlantic Area, to distribute the remaining ESS units to their respective Air Stations. Ultimately, the system was removed from nearly every MH-65 Air Station dedicated solely for SAR.

2. Utilization in Aviation Communities

ESS systems are widely used in the public service aviation sector. While not every system provides identical capabilities, the core capabilities of image stabilization, zoom, and infrared spectrum video are nearly universal. Other public sector aviation operators utilize their sensors in similar ways to the Coast Guard, including law enforcement and SAR. Teledyne/FLIR, the manufacturer of the Coast Guard's ESS systems and one of the world's largest suppliers, has seen continuous demand growth for their airborne thermal imaging sensors (Vertical, 2016). There is no doubt that such a system is an operational requirement for the Coast Guard and the operational requirements documents of every aviation platform require it (USCG, 2021).

C. COAST GUARD SEARCH AND RESCUE

The process by which the Coast Guard conducts SAR operations is primarily data driven. As assets are dispatched to the scene of an SAR operation, there is an enormous amount of planning going on in the command center responsible for a given SAR effort. The primary tool that the Coast Guard uses in its search planning function is an environmental modeling software that was developed for the Coast Guard called the Search and Rescue Optimal Planning System (SAROPS; Kratzke et al., 2010). Figure 1 depicts a sample search pattern generated using SAROPS (USCG, 2013).

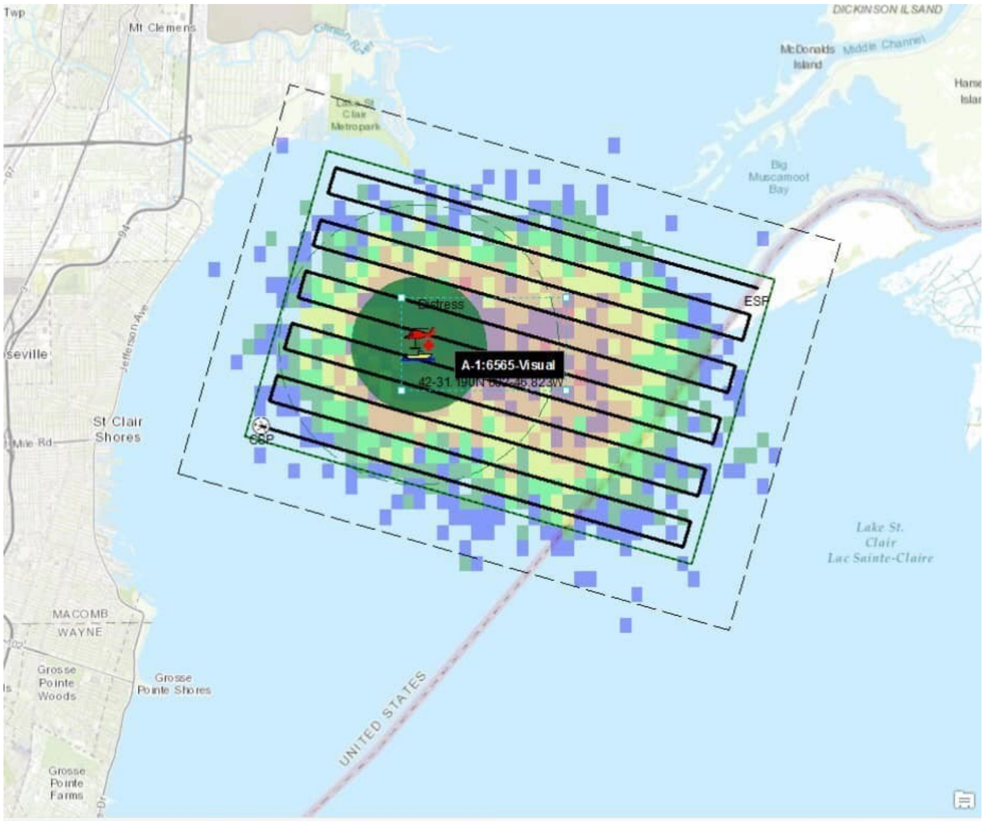


Figure 1. Search Pattern and Drift Modeling from SAROPS. Source: USCG (2013).

SAROPS runs thousands of simulations to determine where it is most likely that a given object has drifted in a body of water (Kratzke et al., 2010). It does this by taking user inputs like type of search object, current environmental conditions, and the likely time that the object entered the water and simulates thousands of possible points that this object could have drifted (Kratzke et al., 2010). This model is provided back to the user as thousands of points plotted on a chart, that the system then overlays with search patterns designed specifically to increase the probability of detection by the search assets (Kratzke et al., 2010). This is shown graphically in Figure 1. The way that these search patterns are designed is heavily dependent on the capabilities of the search asset (helicopter, boat, ship, plane, etc.) and the environmental conditions at the time of the search. The pattern assigned to each asset is designed specifically to maximize the effectiveness of the search, given the asset's capabilities (USCG, 2013). Whether an asset is equipped with an ESS affects the probability of detection of a search object and is considered in search planning (USCG, 2013).

D. THE DEFENSE ACQUISITION SYSTEM

Today, defense spending makes up roughly 15% of the government's total annual budget and averages a little over 3% of the country's total GDP (O'Hanlon, 2019). The Defense Acquisition University (DAU) defines acquisition as "the conceptualization, initiation, design, development, test, contracting, production, deployment, integrated product support, modification, and disposal of weapons and other systems, supplies, or services (including construction) to satisfy DOD needs, intended for use in, or in support of, military missions" (DAU, 2023). Together, these various activities and phases that constitute an acquisition create what is known as the acquisition life-cycle. This life-cycle serves as the foundation for the acquisition processes.

Defense acquisitions are highly scrutinized to justify governmental purchases to taxpayers. To ensure prudent spending, the government developed the Defense Acquisition System (DAS). According to Department of Defense Directive (DODD) 5000.01, *The Defense Acquisition System*, "the acquisition system will be designed to acquire products and services that satisfy user needs with measurable and timely improvements to mission capability, material readiness, and operational support, at a fair and reasonable price" (DOD, 2022b). The DAS structure consists of three interdependent and interrelated systems, the Joint Capabilities Integration and Development System (JCIDS), the Planning, Programming, Budgeting and Execution system (PPB&E), and the Defense Acquisition Process (DAP; Fox, 2011). JCIDS is the process for creating service requirements based on national strategy guides and then identifying potential programs needed to fulfill them. PPB&E then facilitates requests and coordinates the funding required for the programs identified by JCIDS. Finally, the DAP supports program execution and operational implementation.

Although it is an armed service, since the Coast Guard is a component of the DHS and not DOD, the service follows DHS acquisition policy. Therefore, it does not adhere to the DAS; however, it has established a similar system within its internal organizational structure through four main offices (USCG, n.d.-c). First, the Office for the Assistant Commandant for Capability (CG-7) fulfills the role of the JCIDS, identifying requirements and capabilities needed to meet the service's missions. Next, the Office for the Assistant Commandant for Resources (CG-8) serves the role of the PPB&E process, allocating and providing funding for the Coast Guard's programs (USCG, 2023b). Finally, the role of the DAP is executed by the Office for the Assistant Commandant for Acquisition (CG-9) and the Office for the Assistant Commandant for Engineering and Logistics (CG-4). CG-9 manages the early phases of the acquisition life-cycle, while CG-4 manages the later phase of program sustainment once the capability has been deployed to the fleet. Each of these offices, except CG-8, is then divided into smaller departments with more targeted responsibilities, such as maritime forces or aviation forces. The respective offices for aviation forces are CG-711, CG-931, and CG-41. We focus on the Coast Guard's version of the Defense Acquisition Process for its aviation forces offices.

1. The Department of Defense Process

The Defense Acquisition Process comprises five distinct and sequential phases of the acquisition life cycle: Material Solution Analysis (MSA), Technology Maturation and Risk Reduction (TMRR), Engineering and Manufacturing Development (EMD), Production and Deployment (P&D), and Operations and Support (O&S; DOD, 2022a). The progression through the phases is typically illustrated as an acquisition "pathway." The acquisition process then applies specific policies and procedures to execute and complete each phase before moving onto the next.

In 2020, the DOD released the most recent reform to its acquisition policy, transitioning from a singular "Major System Acquisition" pathway model to what is known as the Adaptive Acquisition Framework (AAF), depicted in Figure 2 (DOD, 2022b). The AAF provides six acquisition pathways, which coincide with the DOD's most common acquisition profiles. Although the six pathways may all look very different, the Major Capability Acquisition (MCA) pathway serves as the baseline process, and the others are simple variations of the MCA. Each variant still incorporates the five phases of the MCA. The five phases are either condensed or modified to better support that specific type of acquisition relevant to the chosen pathway. The additional pathways also provide acquisition decision authorities and program managers with a broader authority to plan and manage their acquisitions, increasing the overall efficiency of the acquisition process.

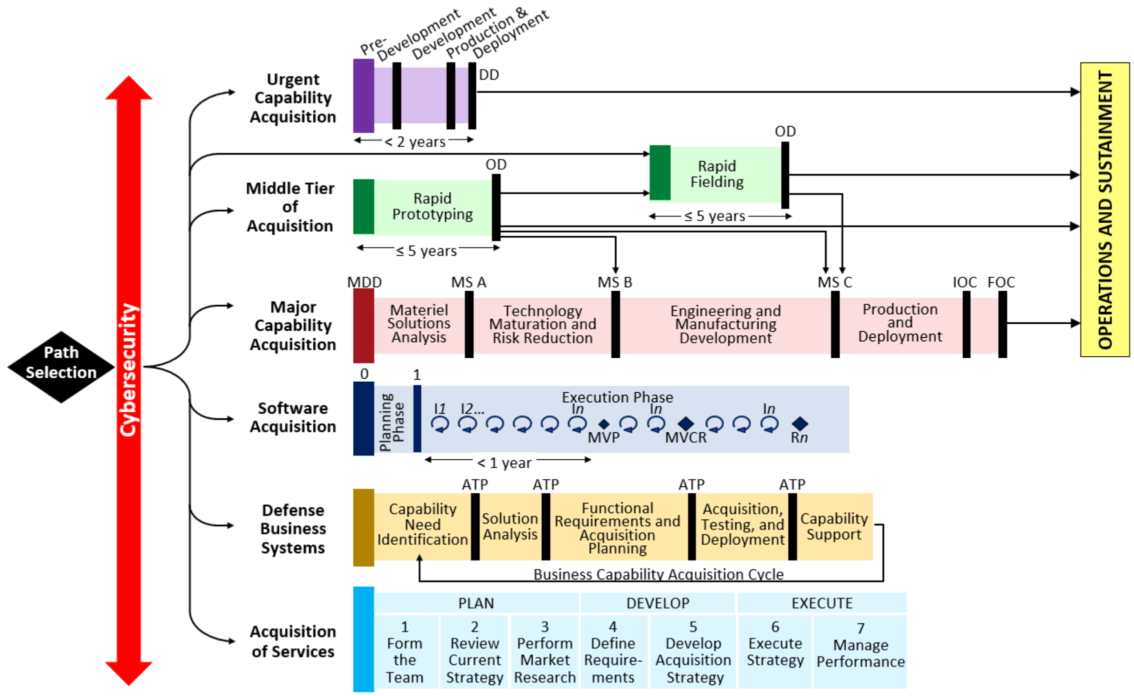


Figure 2. DOD Adaptive Acquisition Framework. Source: DOD (2022b).

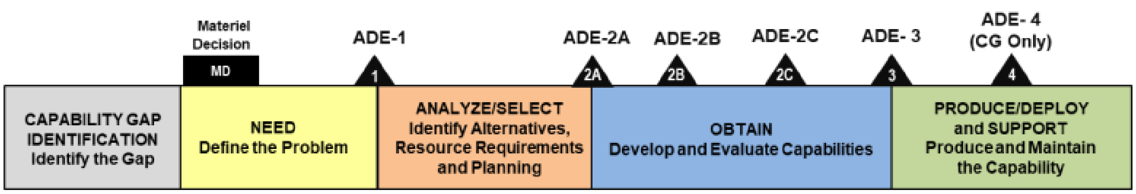
The Defense Acquisition Process is not used for everyday governmental spending. It is used on programs deemed as a major system or capability acquisition. To help further define what constitutes a major system or capability and determine the appropriate decision authority for each acquisition, the process assigns each program an Acquisition Category (ACAT) level, typically associated with a cost threshold. There are four levels, depicted in Table 1.

Table 1. DOD ACAT Levels. Adapted from DAU (2023).

DOD Acquisition Category (ACAT) Levels	
Level	**Cost Threshold**
I	• Research and Development (R&D) > $525 million • Total Procurement > $3.065 billion
II	• R&D > $200 million • Total Procurement > $920 million
III	• Programs do not meet ACAT II-dollar thresholds • Not designated a "major system" by the Milestone Decision Authority (MDA)
IV*	• Program not designated as ACAT III in accordance with service specific policy
*Navy, Army and Marine Corps Only	

2. The Coast Guard Process

According to its Major Systems Acquisition Manual, the Coast Guard defines major system acquisitions as “any equipment, services, and intellectual property (e.g., software, data, etc.) that are acquired by the Coast Guard through purchase, construction, manufacture, lease, or exchange and may also include improvements, modifications, replacements, or major repairs” (USCG, 2023b). Following the acquisition reform of the AAF in the DOD, the Coast Guard released an updated acquisition policy in August 2023. Unlike the DOD, the Coast Guard utilizes a single acquisition pathway known as the Major Systems Acquisition Life Cycle Framework, depicted in Figure 3. This framework is most similar to the DOD’s MCA pathway. Despite the different names of the phases, the framework still follows the basic phases of the governmental definition of acquisition above. Although the Coast Guard did not adopt the AAF in the new update, the framework does outline seven types of acquisition programs that correspond to the six pathways: capital asset, services, hybrid, urgent operational need (UON), DHS rapid, selective, and special interest (USCG, 2023b).



Materiel Decision (MD): See page 2-15 or the glossary for a definition of MD.
ADE-1: Validate the Need.
ADE-2A: Approve the Program and Initiate Obtain Phase Activities.
ADE-2B: Approve the APB and Continue Obtain Phase Activities.
ADE-2C: Approve Low-Rate Production or Incremental Delivery.
ADE-3: Produce and Deploy Program Products.
ADE-4: Acquisition Program Ends. Responsibility fully transferred to sustainment.

Figure 3. Coast Guard Life Cycle Framework. Source: USCG (2023b).

The Coast Guard also assigns an acquisition level to programs based on life-cycle cost thresholds, depicted in Table 2. These thresholds are significantly lower than the DOD’s, primarily due to the Coast Guard’s smaller annual budget.

Table 2. System Acquisition Level Determination (Capital Assets, Services). Source: USCG (2023b).

Acquisition Level	Cost Thresholds Capital Assets	Cost Thresholds Services Acquisition	ADA
Level 1[1,2] (Major)	PLCCE: ≥ $1B TAC: > $300M	Annual costs ≥ $1B	DHS USM
Level 2[1,2] (Major)	PLCCE: > $300M, < $1B TAC: > $100M, ≤ $300M	Annual costs ≥ $100M, < $1B	DHS USM
DHS Level 3/ Title 14[3]	PLCCE: ≤ $300M TAC: > $100M	N/A	CG-CAO
Level 3[4] (Non-Major)	PLCCE: ≤ $300M TAC: ≤ $100M	Annual costs: < $100M	See Intentionally Left Blank Table 2-2: Acquisition Decision Authorities

The DHS and Coast Guard's acquisition policies are still relatively infantile in comparison to the DOD's, which can trace the roots of its acquisition procedures back to as early as 1945 (Converse III, 2012). After its establishment in 2002, the DHS had to quickly form a new organizational structure and operating policies. To avoid reinventing the wheel, the DHS implemented acquisition policies based on the DOD's DAS; however, reports suggest these policies were not properly administered until around 2008 (Fein, 2008). Even now, these policies are evolving as the organizations continue to mature and gain more experience with each new acquisition program.

3. Process Comparison

While the DHS and DOD's acquisition policies are very similar, they each have unique nuances resulting in subtle differences. Other than the nomenclature, there are four main differences between the DOD and Coast Guard acquisition processes. The first is the number of required decision events throughout the acquisition life cycle. The Coast Guard refers to these as Acquisition Decision Events (ADEs) while the DOD refers to them as Milestone Decision Events (MDEs); however, they are essentially identical. Decision events are critical knowledge-based, event-driven decision points when decision authorities assess a program's readiness and risk given where it is within the acquisition life cycle (USCG, 2023b). In some instances, an acquisition may be canceled if it is unable to move on to the next phase without proper justification. Within the DOD process, there are four milestone decision events (Materiel Development Decision, MS-

A, MS-B, and MS-C), and each coincides with the transition to the next phase. The Coast Guard process has seven milestone decision events (Materiel Decision, ADE-1, ADE-2A, ADE-2B, ADE-2C, ADE-3, and ADE-4) with three of them occurring during the "Obtain" phase, which is the point at which the service decides what it will be acquiring. The additional three events are both beneficial and problematic. The benefit is that the additional decision events provide an increased layer of risk mitigation to ensure a specific acquisition is unquestionably ready to move on to the next event, improving its likelihood of succeeding operationally. The issue is that these events require a lot of time for planning and execution, potentially delaying the service's ability to acquire required capabilities promptly.

The next main difference is how the two processes delineate their phases. Although the phases seem similar, the purpose and goals of each as defined by their respective organization directive, show that they are not a one-for-one swap. The first three phases of the Coast Guard process (Capability Gap Identification, Need, and Analyze/Select) align with the first two phases of the DOD process (MSA and TMRR). The Coast Guard Obtain Phase is similar to the DOD's EMD Phase; however it also incorporates elements of the TMRR phase. Finally, the Coast Guard combines the last two DOD phases of Production and Deployment and Operations and Support into a single phase. These variations highlight two things. The first is that the Coast Guard focuses a larger chunk of resources and time on the research and analysis of alternatives for an acquisition. Again, this just provides an extra level of risk mitigation to help ensure the chosen solution will indeed fill the identified capability gap. The second is that it shows the Coast Guard has implemented a more cautious approach to acquisitions. This mindset stems from the Coast Guard's relatively small budget in comparison to the DOD, lending to the notion that it must be more selective and careful with its acquisitions with less room for failure.

The third difference revolves around how a program is managed throughout its life cycle. For both the Coast Guard and the DOD, after an acquisition request has become a formally funded program, that program is then assigned to a specific Program Management Office (PMO) where it is managed by an appointed Program Manager (PM). For the Coast Guard, these PMOs fall within the organizational structure of CG-9

(USCG, 2023b). Within the DOD, the PMO manages every aspect of the program, including its development, production, deployment, sustainment, and disposition (DOD, 2022a). Within the Coast Guard, the role of the PMO is similar to the DOD; however, after a program has been completely deployed operationally, sustainment responsibilities are then transferred to the appropriate CG-4 office (USCG, 2023b). For example, CG-41 manages the sustainment of the MH-65 helicopter and all of its installed components and systems (USCG, n.d.c). CG-9 becomes involved with sustainment only when the program requires the acquisition of new capabilities or significant modifications, such as in this case of an aircraft model upgrade (USCG, 2023b).

The final acquisition process difference between the Coast Guard and DOD relates to its personnel. Acquisitions is a specialized career path, with formalized training, in each military branch within the DOD. There is no official acquisition career path in the Coast Guard; however, training is available through the DHS and the Defense Acquisition University. Most mid-level officers enter their first Coast Guard acquisition jobs with little to no prior acquisition experience and return to the operational fleet immediately following the end of their tour (Mak, 2018). In contrast, once DOD members enter their respective acquisition career fields, they remain in acquisition-related jobs throughout the remainder of their careers (DOD, 2022a). The impacts of these four differences on the Coast Guard's acquisition system are analyzed and discussed in Chapter IV: Analysis.

4. Historic Performance of Coast Guard and DHS Acquisitions

According to the Government Accountability Office (GAO), when the DHS was established in 2002, the resulting federal restructuring was identified as "the largest government reorganization effort in the last 50 years," and with that came the need for significant strategic and long-term planning (GAO, 2005). Unfortunately, even today, the Coast Guard has not developed the ability to perform long-term planning, exhibiting constant low strategic thinking, which has resulted in its inability to appropriately build for the future (Valentine, 2022). This trend is further highlighted by the fact that the Coast Guard, and other agencies in the DHS, have struggled in the acquisition and sustainment of essential assets.

According to a 2017 GAO report, “The Department of Homeland Security’s (DHS) component agencies—such as the U.S. Coast Guard and Customs and Border Protection—lack the information needed to effectively oversee their non-major acquisitions because they cannot confidently identify all of them” (Mackin, 2017, p. 2). This report further found that the DHS had 38 non-major acquisitions for FY2017, 23 of which did not have approved funding baselines, totaling nearly half of the $6 billion in non-major acquisitions for that fiscal year (Mackin, 2017). With an inability to identify and keep track of active, non-major acquisitions and a further inability to manage those without established baselines, it is evident the DHS and the Coast Guard have a history of neglecting non-major acquisition programs.

Additionally, a GAO report in 2018 identified discrepancies between the Coast Guard’s annual budget plan and its 5-year Capital Investment Plan, “negatively affecting recapitalization efforts and limiting the effectiveness of long-term planning” (Mak, 2018, p. 2). This report also noted, “the Coast Guard has a management body in place to conduct oversight of its major acquisitions programs; however, this management body has not conducted oversight across the entire acquisition portfolio from a collective approach” (Mak, 2018, p. 28) to facilitate a balanced, affordable portfolio.

Finally, a 2023 GAO report highlighted that these issues with acquisition program management continue to persist. Of the 40 recommendations the GAO provided the Coast Guard regarding acquisition improvements over the last decade, only 26 have been implemented, with 14 still open for action (Mak, 2023). The report found that the Coast Guard’s acquisition policy and particular program practices do not align with proven industry best-practices, which resulted in continual cost growth and schedule delays (Mak, 2023). It also summarized that all seven of the Coast Guard’s approved recapitalization programs are delayed based on their initial full operational capability (FOC) dates (Mak, 2023). This summary is illustrated in Table 3.

Table 3. Delays in FOC of USCG Recapitalization Programs. Source: Mak (2023).

	Initial DHS-approved FOC date	FOC date (as of January 2017)	Current FOC date[a]
Offshore Patrol Cutter	2034	2035	2039
Fast Response Cutter	2022	2027	2027
National Security Cutter	2016	2020	TBD
Polar Security Cutter	2029	N/A	2031
Waterways Commerce Cutter[c]	N/A	N/A	2032
Medium Range Surveillance Aircraft (HC-144A/C-27J)	2020	2025	2032
Long Range Surveillance Aircraft (HC-130J)	2017	2027	2030[b]
Medium Range Recovery Helicopter (MH-60T)[c]	N/A	N/A	TBD
Short Range Helicopter (H-65)	2020	2020	2024

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III. METHODS

This research explores the questions, “What policies and procedures within Coast Guard Acquisitions, as well as external factors, may have contributed to failed sustainment of the ESS and the critical capability it provides?” and “What process changes could be implemented to prevent similar capability loss? Our study employs a single, embedded case analysis (Yin, 2014) with a thematic analysis of the data (Clarke & Braun, 2006). The overarching case focuses on the Coast Guard’s response to sustain the ESS program between February 2019 and May 2024, after receiving an initial end-of-life notification from the original equipment manufacturer. The roles and decisions of the three Coast Guard headquarters offices responsible for sustaining the ESS program comprise three embedded cases. The ESS provides a sensor suite that has enhanced the capabilities of the Coast Guard’s helicopter fleet and its ability to effectively execute its statutory missions. Airborne thermal imaging technology has vastly improved since the Coast Guard first acquired it in 2007, expanding its use from military aviation to public sector aviation, making it commonly utilized equipment (FLIR Systems, 2009).

A. DATA COLLECTION AND SOURCES

We gathered and analyzed the data in two phases. The first phase focused on the ESS’s impact on search and rescue (SAR) efforts. The second phase focused on the case itself. The software program SAROPS was the primary data source for our Phase 1 analysis, while interviews were the primary source for our Phase 2 analysis. We also collected current organizational directives and policies, as well as reports on the Coast Guard’s acquisition performance in recent years.

We used SAROPS to run a variety of SAR scenarios. Each scenario differed by altering search conditions that impacted the effectiveness of the ESS. Each individual scenario was also run twice, once with the ESS equipped and once without it installed. We collated the information into a single database organized by specific search variables. It took one day to run the initial set of scenarios, and an additional day to run follow-on scenarios.

We selected interviewees based on their experience within Coast Guard acquisitions and their roles in the ESS program. We completed semi-structured interviews via video conference and telephone. We took detailed notes during these interviews, which we then organized into a database sorted by interview date and time. These interviews each lasted between 1 to 2 hours. Additionally, we conducted a few follow-up interviews primarily through email.

The research design was reviewed by the NPS IRB. The IRB determined that the research is not generalizable and thus does not meet the federal definition of human subjects research. The research team followed accepted practices of informing participants about the study, gaining their oral consent to be interviewed and recorded, and maintaining the confidentiality of their responses.

1. Phase 1: ESS Effectiveness Data

The goal of the Phase 1 analysis was to highlight the capabilities of the ESS, its impact on SAR efforts, and the effects of the failed sustainment and removal from operational SAR units on the Coast Guard. To collect data for this phase, we worked with the Command Center at Coast Guard District 11, which is responsible for initiating and coordinating SAR operations along the California coast.

We ran 16 scenarios in SAROPS comparing theoretical search area probability of success based on 2 hours of search at night and varying environmental conditions. We ran each scenario twice, the first with the ESS installed on the aircraft and the second with it removed. SAROPS allows for the customization of several environmental factors; however, we focused the scenarios on those conditions that are directly affected by the ESS's capabilities including nighttime illumination, sky cloud coverage, visibility, and the search object. Illumination was either 0 or 100%, cloud coverage was either clear or overcast skies, visibility varied between 2, 5 or 10 nautical miles, and the search object was either a person-in-the-water (PIW) or a 20-foot vessel. The remaining variables remained constant throughout all scenarios. Based on the negligible search impacts for a 20-foot vessel identified in our initial scenarios, we elected to not run those scenarios again with varying visibilities. Table 4 summarizes the ESS effectiveness data collection and sources.

Table 4. ESS Effectiveness Data Summary

Scenario	Search Object	Illumination	Cloud Coverage	Visibility
1	PIW	0%	Clear	2 NM
2	PIW	100%	Clear	2 NM
3	PIW	0%	Clear	5 NM
4	PIW	100%	Clear	5 NM
5	PIW	0%	Clear	10 NM
6	PIW	100%	Clear	10 NM
7	PIW	0%	Overcast	2 NM
8	PIW	100%	Overcast	2 NM
9	PIW	0%	Overcast	5 NM
10	PIW	100%	Overcast	5 NM
11	PIW	0%	Overcast	10 NM
12	PIW	100%	Overcast	10 NM
13	20ft Vessel	0%	Clear	10 NM
14	20ft Vessel	100%	Clear	10 NM
15	20ft Vessel	0%	Overcast	10 NM
16	20ft Vessel	100%	Overcast	10 NM
Notes: All scenarios are based on 2 hours of aerial searching at night using an MH-65D. Each scenario was run twice, once with the ESS installed and once without. Additional variables not defined remained constant throughout every scenario. We collected 64 pages of search pattern data.				

2. Phase 2: Case Data

The goal of the Phase 2 analysis was to identify key decision points, actions, and processes in the Coast Guard acquisition system that led to the loss of the ESS. In Phase 2, to develop the case, we conducted interviews with acquisition professionals assigned to the Coast Guard Headquarters offices responsible for the ESS program from 2019 to 2024, and reviewed Coast Guard acquisition directives. Interviewees included one member from the Office of Aviation Operations (CG-711), five members from the Office of Aviation Engineering (CG-41), and one member from the Office of Aviation Acquisitions (CG-931). We also collected the acquisition directives for the Coast Guard, as well as the DOD, and reports relating to the historical performance of Coast Guard and DHS acquisition programs.

We asked these acquisition professionals to provide a narrative of their experiences while working with the ESS program. Interviewees provided background information on the program before the initial end-of-life notification in 2019 and then described the decisions made following that notification, the decisions made after the second end-of-life notification in 2022, and their subsequent impacts. They also described the responsibilities for program acquisition and sustainment, highlighting that they are split between two different offices and not maintained by a single program office. Finally, they discussed the working relationships between the four main offices responsible for supporting Coast Guard acquisitions.

Commandant's Instruction 5000.10H, The Major Systems Acquisition Manual, is the Coast Guard's primary acquisition directive (USCG, 2023b). DOD Directive 5000.01, The Defense Acquisition System, is the DOD's equivalent (DOD, 2022a). These two directives are the governing acquisition policies and procedures for their respective organizations, providing a baseline for our analysis. Table 5 summarizes the case data collection and sources.

Table 5. Case Data Summary

Interview Type	Semi Structured (14 questions)
Interviewees	Parties responsible for ESS Sustainment from 2019 – Present 5 members from CG-413 1 member from CG-7115 1 member from CG-931
Interview Duration	1–1.5 hours
Interview Records	Detailed Notes (10 pages) Follow-on emails (7 pages)
Operational Documents	COMDTINST 5000.10 *Major Systems Acquisition Manual* (280 pages) DOD Directive 5000.01 *The Defense Acquisition System* (17 pages)
GAO Reports	4 Reports 2005–2023 Total 115 pages

B. DATA ANALYSIS APPROACH

The Coast Guard's SAR Addendum (USCG, 2013) guided our analysis of the Phase 1 data, while the Coast Guard's Major System Acquisition Manual (USCG, 2023b) provided framework for our analysis of the Phase 2 data. Our analysis was completed in different steps. First, we analyzed the ESS effectiveness data using the SAR Addendum to build an understanding of the impacts of the ESS on SAR efforts and its importance for SAR assets. Next, we used the Major Systems Acquisition Manual to analyze our case data to develop an understanding of the decisions and events that took place, as well as the policies and procedures followed leading up to the Coast Guard's loss of the ESS capability. Finally, we merged our analyses of the two phases to answer the study's research questions.

We started by compiling the 64 pages of SAROPS data into a one-page summary. We then compared the search area probability of success percentages to measure the effectiveness of the ESS during search efforts, by calculating the differences between the results with the ESS and the results without the ESS. Utilizing search planning requirements within the SAR Addendum, we then used the calculated search area saturation differences to determine changes in flight hours necessary to meet mission requirements. We were then able to quantify the flight-hour difference based on the MH-65's operating cost per hour. This analysis resulted in a key cost measure to establish the importance and effectiveness of the ESS.

Next, we reviewed and annotated the interview transcripts, notes, and emails, and operational documents related to the case. We created a 16-page case narrative summarizing the case. We then highlighted key decisions and events, arranging them in chronological order (Yin, 2014). We conducted thematic analysis of the narrative focusing on the procedures, policies, and practices used for the sustainment of the ESS (Braun & Clarke, 2006). Using the Major Systems Acquisition Manual, we then coded this information to distinguish the procedures, policies, and practices that aligned with the directive from those that didn't. We then reviewed GAO reports to identify historic trends within the Coast Guard's acquisition system and potential best practices.

Finally, we integrated the two phases of analysis. We used the effectiveness data to assess the ESS's value and the cost implications of failing to sustain the equipment. We then compared trends within the ESS program's sustainment with organizational policy and the trends identified by the GAO's historical performance reports. The integration of the two phases of analysis highlighted deficiencies and gaps that exist in the Coast Guard's acquisitions system and potential areas of improvement within the framework to prevent program sustainment issues in the future.

C. CONCLUSION

Our analysis predominantly focused on a single case drawing on the recollections of key events and decisions of those who experienced it. While our case design is appropriate for identifying and analyzing trends related to the management of the ESS program, it does have shortcomings. Our study is exploratory in nature, so our results do not generalize trends within all Coast Guard acquisition programs. Instead, the study is intended to generate actionable recommendations and recognize potential areas for further study.

IV. ANALYSIS AND FINDINGS

In Chapter IV, we present our analysis and findings within our two primary areas of research. First, we present our findings and analysis of ESS effectiveness in Coast Guard SAR planning, and then we present our thematic analysis of the loss of ESS capability in the MH-65 SAR fleet. Through the course of our research, we reexamined and refined our approach, especially with regard to quantifying the effectiveness of the ESS. In doing this, we also discovered a likely contributing factor to the loss of the ESS for SAR: the Coast Guard has not quantified the effectiveness of the ESS system in the SAR environment and, therefore, was ineffective at defending it as a capability that should be prioritized. Our analysis led to significant findings that resulted in extensive recommendations for changes to the Coast Guard's acquisition enterprise. Through the course of our interviews, we reached saturation on every significant theme and very little disagreement among subjects across a wide variety of ranks and backgrounds about the need for significant changes to the Coast Guard's acquisitional processes.

A. ESS EFFECTIVENESS ANALYSIS AND FINDINGS

This section presents the analysis and findings of the data we gathered from the SAROPS simulations we conducted with the Command Center at Coast Guard District 11. Our analysis quantifies the effectiveness of the ESS within SAR operations and the consequences of its removal from SAR assets. While this portion of our analysis does not directly answer our research questions, it provides valuable insight into developing the case narrative and answers the question "Why does this matter?" Our findings also identified potential root causes for some of the decisions and events that are a part of our case analysis.

1. SAR Planning Requirements

Coast Guard SAR planning and coordination is spearheaded through operational units known as districts and sectors. Districts are the second tier of the Coast Guard's operational hierarchy, responsible for managing missions and assets within larger geographic chunks, illustrated in Figure 4. Sectors are sub-units of districts, responsible for managing missions and assets within more localized areas, depicted in Figure 5. Within each district and sector is an operations command center, which is ultimately responsible for managing assigned SAR cases, comparable to a dispatch center for local emergency services. These centers field distress calls, formulate search action plans, and coordinate search assets.

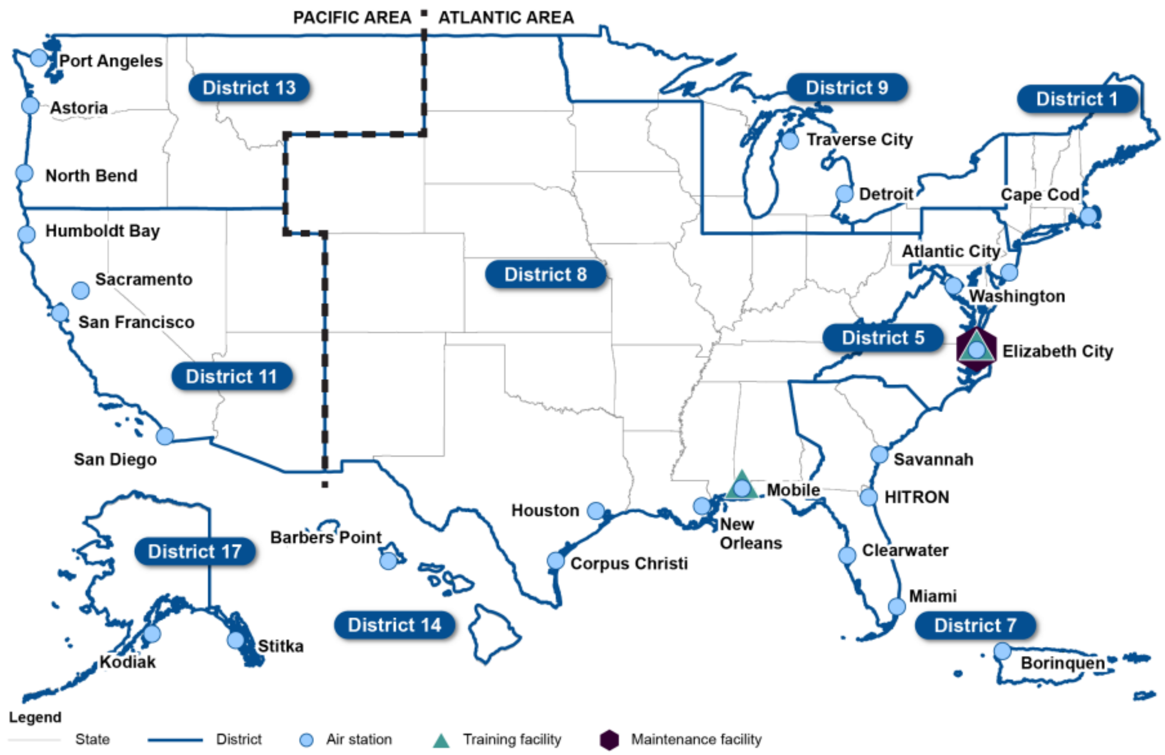

Figure 4. Coast Guard District Map. Source: MacLeod (2024).

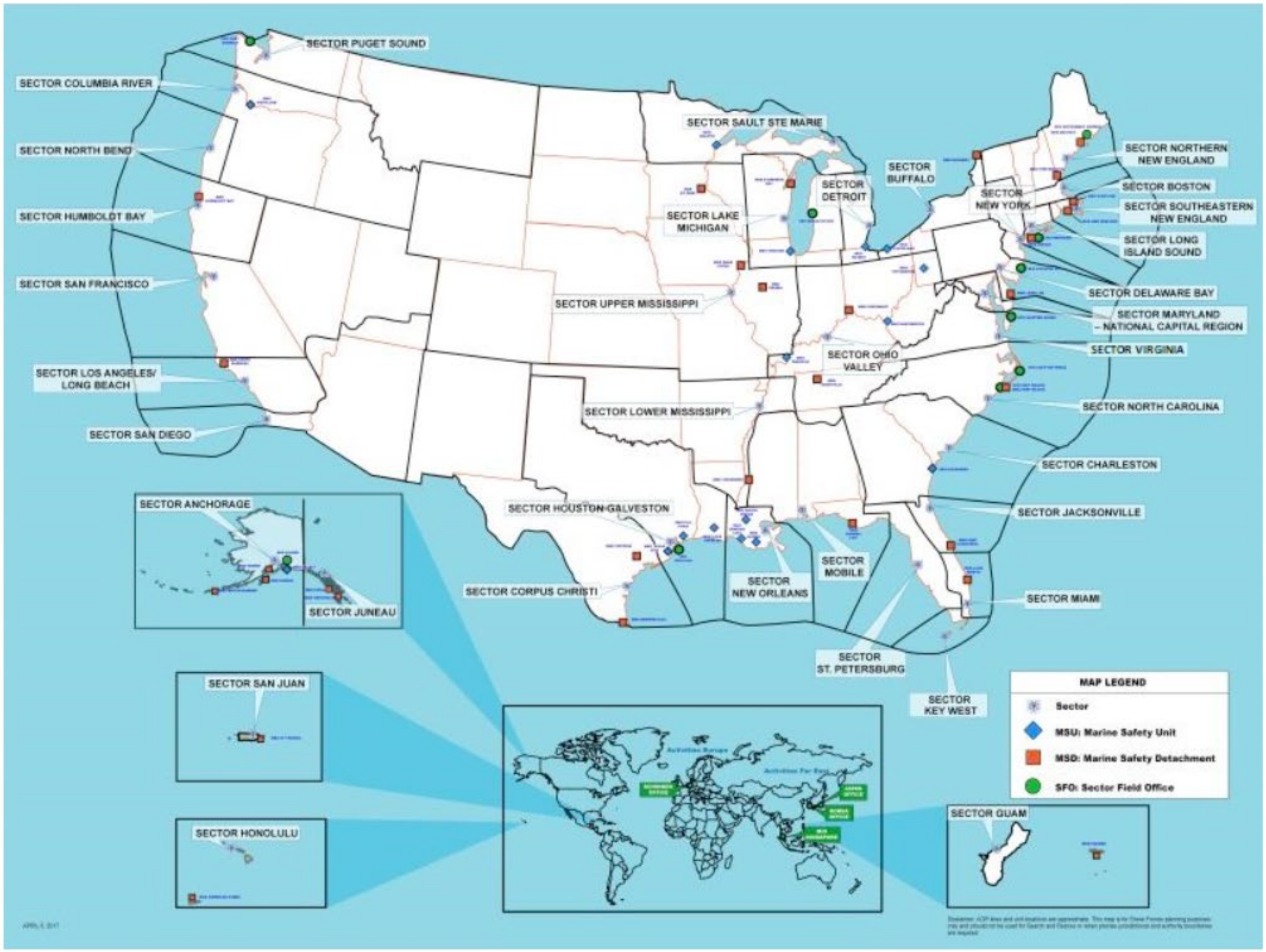

Figure 5. Coast Guard Sectors Map. Source: USCG (2017).

SAR planning is both an art and a science, carefully balancing the experience and intelligence of human operators with the accuracy and efficiency of computer-based tools. This is even more applicable to SAR within the maritime domain, where the environment is extremely dynamic and search conditions can change rapidly. According to the Coast Guard SAR addendum, the goal of search planning is "to find the survivors of a distress incident as quickly as possible" (USCG, 2013, p. 507). This is achieved by developing the most efficient and expedient search plans possible, given the resources and assets available, to increase the cumulative probability of success (POS_{CUM}). SAROPS assists in this endeavor, running numerous simulations simultaneously to develop a near-optimal search plan based on specific search variables, maximizing POS_{CUM}. Additional search plans are completed as needed to increase a search case's POS_{CUM} and to satisfy search requirements.

a. Search Requirements

According to the Coast Guard SAR addendum, search operations conclude based on one of three possible outcomes: information is obtained verifying that the search object(s) is not in distress, the search object(s) has been found and assisted, or it has been determined that additional searches would be futile since further efforts would not increase POS_{CUM} (USCG, 2013). Search efforts must continue until one of those three conditions has been met. Regarding the third possible outcome, there is no defined search threshold or POS_{CUM} value that must be achieved before ceasing search efforts. The policy was left intentionally vague because it is understood that every SAR case is different, and with limited time and other resources, there are instances when high probabilities of success are unattainable.

b. Measures of Search Effectiveness

While there are many ways to evaluate search planning effectiveness, the Coast Guard specifically uses probability of success (POS), probability of detection (POD), and probability of containment (POC) to measure the quality of their searches. The SAR addendum (USCG, 2013) defines these measures as follows:

- POS is the probability that a given search will succeed in locating the search object(s). It relies on both the POD and POC of the search plan and is mathematically the product of the two, POS = POC x POD. (p. 227)

- POD is the statistical measure of average detection performance over a searched area. It is a function of coverage and the total number of searches in an area and describes the thoroughness of a single search or the cumulative thoroughness of multiple searches of the same area relative to the search object(s). (p. 595)
- POC is the probability that the search object(s) are contained in a particular area. SAROPS develops POCs for a particular instant in time based upon drift and scenario assumptions. (p. 597)

Ultimately, SAR planners are focused on identifying and maximizing the POS_{CUM}, which is the probability of success of detecting the search object(s) based on all combined search efforts. An optimal POS_{CUM} would be 100%; however, due to the extreme variability of maritime searching, it is impossible to achieve that value. A near optimal POS_{CUM} solution of approximately 97% to 98% is considered an ideal search plan, though that is not always possible, either (USCG, 2013).

c. Existing Data on ESS Effectiveness

Since acquiring the ESS in 2007, the Coast Guard has not conducted extensive testing on the system to determine its effectiveness as an airborne resource for SAR operations (USCG, 2013). In fact, most of the airborne test data the Coast Guard obtained for the ESS is based on a completely different FLIR system utilized by helicopters in the U.S. Navy (USCG, 2013). Additionally, the search specifications pertaining to the ESS coded into SAROPS, such as search sweep widths, are based on limited testing of a maritime FLIR (MARFLIR) system used on ships, since the Coast Guard has not acquired similar information from airborne tests (USCG, 2013). This lack of data was the driving force behind our team's decision to determine the ESS's impact on airborne SAR operations. This lack of data also seems to be the root cause of many of the strategic decisions for the management of the ESS program, including why it is not a required piece of equipment for SAR and why it was ultimately removed from SAR assets.

2. Description of Data

With little existing data, and much of the existing data coming from different FLIR systems in different contexts, the overarching goal of our data collection and analysis was to determine if the ESS impacts SAR planning. To do this, we conducted 16 SAR simulations using SAROPS, which are discussed in Chapter III, Methods, to calculate the changes in

POS_{CUM} based on varying search conditions. Our initial assumption when starting this study was that since the ESS provides enhanced imagining capabilities, it would increase the overall effectiveness of search efforts regardless of search conditions. This would therefore be illustrated as an increased POS_{CUM} in a search with the ESS versus one without it.

Our SAROPS simulations, however, only showed a slight positive correlation between ESS effectiveness and SAR operations. Half of the simulations resulted in an increase of POS_{CUM} when the ESS was installed on the search asset, while the other half resulted in no change. The key difference between the scenarios that resulted in an increased POS_{CUM} and those that did not was the defined cloud coverage. The scenarios with ESS use during overcast cloud coverage resulted in increased effectiveness, while those with ESS use during clear cloud coverage remained unchanged. The total increase was further affected by the defined illumination levels. Illumination defined at 0% resulted in a greater increase in ESS effectiveness compared to illumination levels at 100%. There was generally little to no impact on ESS effectiveness with variations in search visibility or when the search object was something other than a PIW. For the scenarios that enhanced POS_{CUM}, it was generally a 1%–2% increase; however, there were three scenarios where the ESS increased the POS_{CUM} by 17% or more. These three scenarios each had a combination of overcast cloud coverage and 0% illumination. It is difficult to discern when a change in POS_{CUM} is considered "significant" because policy does not define this and there is no operational "rule-of-thumb." The determination for what is considered significant is subjective and based on the opinions of those coordinating search efforts within the Command Center, taking into account numerous variables surrounding the SAR case, like weather, survivability, and asset capabilities. This is the aspect of SAR coordination that blends human intelligence and experience with scientific, computer-driven data. Table 6 provides a summary of the data collected.

Table 6. SAROPS Data Summary

Scenario	ESS: Installed (I) Removed (R)	Degraded Search Conditions (YES/NO)	POS_{CUM}	ESS Impact on POS_{CUM}
1	I	YES	56%	+1%
	R		55%	
2	I	NO	98%	±0%
	R		98%	
3	I	YES	55%	±0%
	R		55%	
4	I	NO	98%	±0%
	R		98%	
5	I	YES	47%	-1%
	R		48%	
6	I	NO	97%	±0%
	R		97%	
7	I	YES	64%	+17%
	R		47%	
8	I	YES	98%	+2%
	R		96%	
9	I	YES	64%	+17%
	R		47%	
10	I	YES	97%	+1%
	R		96%	
11	I	YES	59%	+18%
	R		41%	
12	I	YES	96%	+2%
	R		94%	
13	I	NO	99%	±0%
	R		99%	
14	I	NO	99%	±0%
	R		99%	
15	I	YES	99%	+1%
	R		98%	
16	I	YES	99%	±0%
	R		99%	

Note:

1. Scenarios are based on two 1-hour search patterns conducted at night by an MH-65.
2. Scenario descriptions are provided in Chapter III, Methods.

a. Assessment of Findings from SAR Simulations

Our assessment of the data we gained from the simulations provided two key insights to our case analysis. The first is that, based on the Coast Guard's current methods for SAR planning, the ESS generally increases search effectiveness during less-than-ideal search conditions. Therefore, by removing the ESS from MH-65 SAR helicopters, the Coast Guard reduced its searching capabilities and, consequently, its overall operational effectiveness. While the results we gathered were not as significant as we expected them to be, they are also not conclusive as to the overall effectiveness of the ESS on search efforts. This is because the data we obtained is predicated on testing information from a different system utilized by a vastly different asset. However, these results cannot be completely dismissed, either, since the tested platform used for SAROPS does provide similar capabilities to the ESS.

The second takeaway is that the Coast Guard is potentially not taking full advantage of the ESS's effectiveness in SAR operations. The basis of this argument is that the Coast Guard does not fully understand the capabilities of the ESS due to the overwhelming lack of operational testing of the system. Definitive operational test data could provide potential upgrades to the SAROPS software that more accurately reflect the ESS's effectiveness. This could result in more substantial variations in POS_{CUM} calculations that allow for the development of more efficient search plans. This takeaway also correlates to the Coast Guard's management of minor acquisition programs. The decision to forgo operational testing, specifically with regard to search, during the ESS's initial acquisition ultimately impacted future sustainment decisions, such as determining from which assets to remove the system from service following the end-of-life notification from FLIR.

b. Limitations and Constraints

Our initial plan for this analysis was to calculate the cost effectiveness of the ESS. We expected to compute the cost differences in search resource allocation with and without the ESS utilized. However, after conducting our analysis, we determined that this approach was not feasible for two primary reasons.

The first is that there is no definitive goal to reach to end search efforts. Regardless of the nature of the incident, searching continues until planning proves additional efforts do not increase the POS_{CUM}. Due to the dynamic nature of maritime SAR, a decision to cease efforts is not as simple as continuing searching until a specific POS_{CUM} is achieved, as that may not be possible. There may be instances when environmental conditions only allow for a POS_{CUM} well below optimal values even after the completion of several search plans, and the case will still be ended. Therefore, there is too much variation to pinpoint how many additional resource hours may be needed even if the ESS increases a search's POS_{CUM} without extensive simulation, which would exceed the scope of our research.

The second reason is because there is no conclusive operational test data for the Coast Guard's rotary wing ESS. While our analysis suggests that the ESS generally does increase search effectiveness, particularly in less-than-ideal conditions, without any official test data for the specific model in question, we cannot definitively quantify the specific increase ESS provides in effectiveness. Therefore, we cannot calculate accurate cost effectiveness estimates based on hypothetical data coded into SAROPS.

B. CASE ANALYSIS AND FINDINGS

In conducting our research, we relied primarily on interviews from various stakeholders involved in the acquisition and sustainment of the Coast Guard's ESS program. Unfortunately, specific dates and times from each timeline event have often been lost to time, not well documented, or are not publicly available due to their nature as "competition sensitive" for vendors involved. Through the course of our interviews, we were able to find broad agreement on the general timeline, which was more than adequate to conduct our analysis of the events and decisions that led to the eventual loss of capability.

1. Timeline

Figure 6 shows a graphical depiction of the timeline that we built through the interviews for our case analysis of the Coast Guard's ESS program.

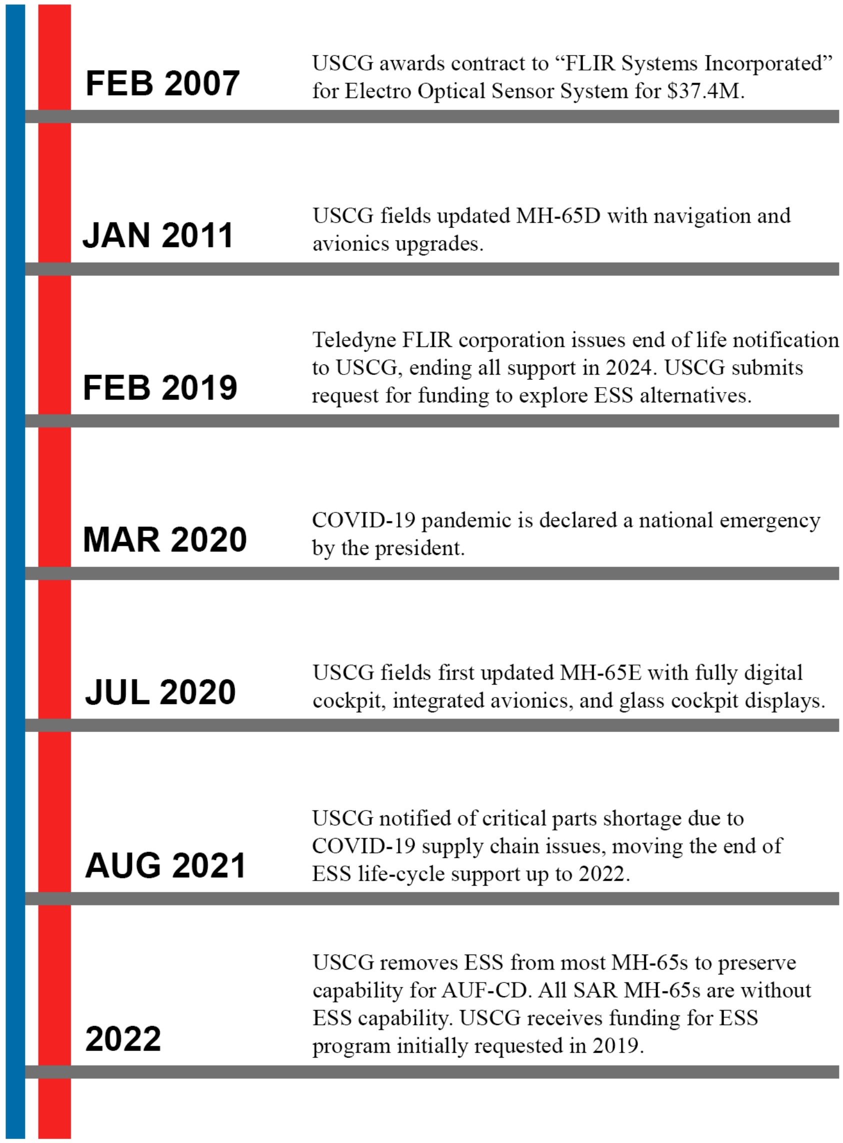

Figure 6. Graphical Depiction of Case Timeline

2. Narrative

In February 2007, to address a capability need for infrared imaging in its rotary wing fleet, the U.S. Coast Guard awarded a contract valued at $37.4 million over 10 years to acquire and sustain the ESS system for USCG rotary aircraft (FLIR Systems, 2007). The ESS was designed to be installed on the MH-65 and MH-60 as a stand-alone contract (FLIR Systems, 2007). According to our interviews, this acquisition and initial years of sustainment were broadly a success. According to our interviews with CG-41 and CG-931, the Coast Guard Acquisition Directorate (CG-9) passed the responsibility for sustainment to the Coast Guard Engineering Directorate (CG-4) following the completion of delivery of the new capability. CG-4, and specifically the aviation engineering enterprise, continued to repair and support the ESS system through various follow-on contracts with the manufacturer. None of our interviewees reported knowledge of any serious issues with sustainment during the first 12 years of the capability being fielded.

In the years leading up to the end-of-life notification, we found no evidence that the Coast Guard seriously considered efforts to address possible ESS obsolescence; they did the work needed to keep the ESS running, with seemingly little thought given to what came next.

On February 19, 2019, the Coast Guard received official end-of-life notification from the Teledyne/FLIR corporation. This notification informed the Coast Guard that parts and service would not be guaranteed past 2025, according to multiple interviews. This notification started the first serious efforts to identify a solution to modernize the ESS, including initiating the formal request for funding, with an eye toward fielding before 2025. However, even though the request for funding was approved in the latter half of 2019, the funds needed to begin modernization efforts were anticipated to be available in 2022 at the earliest due to the 3-year future years funding cycle.

During the COVID-19 pandemic in 2020, Teledyne/FLIR updated their projection for end-of-life to 2022 due to supply chain issues on several critical parts. This update forced the Coast Guard to examine projections for how quickly fielded units would start failing. Based on available failure rate data, the Coast Guard was able to determine that at current use rates, the ESS systems would become unavailable for missions well before a replacement could be fielded. This analysis forced senior decision-makers to remove systems from service in some missions to ensure availability for missions deemed critical. In our interviews with CG-711, the Office of Aviation Forces, we were able to determine that the decision was made to provide the ESS systems only to the AUF-CD mission, as Coast Guard doctrine mandated the use of the ESS in that mission. While the ESS boosts SAR capability, an ESS-equipped aircraft is not required per doctrine. In other words, without an ESS, the Coast Guard would still accept a SAR case, but they would not proceed with the AUF-CD mission. Due to that determination, senior leadership decided to remove the ESS capability from all MH-65 SAR units to preserve the service life for use in AUF-CD. According to interviews with CG-41, the efforts to field a replacement continue in earnest, but current estimates put likely fielding of an updated ESS into 2027, with no alternative to fill the gap.

3. Thematic Analysis

Throughout our research and analysis, our primary goal has been not just to tell the story of what happened in this particular case, but also, and more importantly, to identify significant themes within this case. Our interviews were conducted to both gather facts and evaluate various individuals' and offices' understanding and interpretation of Coast Guard acquisition processes and procedures and how the individuals and offices operate within those processes and procedures with regard to sustaining the ESS. We broadly identified four themes that continued to show up in every interview, to the point of complete saturation: communication, responsibility/authority, planning, and budgeting. Table 7 outlines each theme, its implications, and support directly from subject interviews.

Table 7. Thematic Analysis Support

Theme	Implications	Interview Support
Communications	• Decision-makers do not receive information until they must react to an immediate problem. • Correct information does not arrive at the correct office in enough time for effective planning.	• "The acceleration probably caught some people off guard when it first came up in 19." • "The fact that it went obsolete shouldn't have surprised us or became a challenge to support." • "So one of the things that I would say probably lacks in the Coast Guard is the communication between [CG]-9 and [CG]-4."
Responsibility and Authority	• No central management of platforms with cradle-to-grave life-cycle management. • Decision-making between offices happens	• "I bring that up because we have four different offices working this with four different admirals and four different visions of the future."

Theme	Implications	Interview Support
	at a very high level because "requirements," "acquisition," and "sustainment" happen under three separate chains of command that don't converge until the four-star level.	• "The ESS is an obsolescence-driven thing, and it falls under the sustainment umbrella…If CG-7, who drives capability, said they want an ESS or a sensor system that incorporates AI or, you know, any of those things, we're talking about enhancing capabilities, then they would say, 'I need to go buy this thing'. That would be an acquisitions function. And then it would be run by CG-9." • "So, whoever you speak with about this, you know whether they're CG-9 or whether they're here at ALC [Aviation Logistics Center]; everyone recognizes that there needs to be a change in the way that we manage acquisitions versus sustainment and the communication process between that."
Planning	• Without a comprehensive life cycle management plan, every obsolescence issue becomes a rapid reaction rather than an advanced plan. • Without a thorough plan, backed by robust facts, senior leaders cannot advocate for the budget required to sustain systems over an extended life cycle.	• "There's no office today in CG-931 that tracks avionics or manages that from a life-cycle perspective." • "There's maybe a thought initially of how long something should be in service, but we don't really do a good job tracking it and trying to make sure that we, you know, whatever the life cycle we expect to get out of it, that we're working towards getting it off wing by that period." • "We don't follow a good life-cycle management system, and we don't follow a good avionics life cycle like industry does." • "We're very reactionary in the Coast Guard, great at being reactionary."

Theme	Implications	Interview Support
		• "You've heard that before, but we definitely need to work on the planning side a lot."
Budget	• Chronic underfunding leads to capability loss and increased costs to reinstate those lost capabilities. • Without adequate information about upcoming obsolescence issues, and their direct impacts to operational effectiveness and costs, advocacy at the congressional level becomes impossible.	• "The aircraft could complete all its missions that it was designed to do without the system, and the ESS would be put on the back burner." • "But if you have to replace an entire fleet's worth of sensors at one time, that's beyond the budget." • "What's tough in our organization is this isn't the only project that those two people in 41 are managing; they're also managing a dozen others that are just like it." • "Capability, even if it's super important, it doesn't supersede airworthiness." • "There was about a billion dollars' worth of avionics sensors that needed to be replaced. There's just no budget in the Coast Guard to replace a billion dollars' worth of sensors."

a. Communication

There generally seemed to be good open communication between the various offices, specifically CG-931 (Acquisitions), CG-41 (Engineering), and CG-711 (Operations). It was clear throughout the interview process that there was no animosity, competition, or significant barriers to open communication. Each individual interviewed seemed to have the best interests of the organization and the users in mind and was willing to work with others to that end. We did see a lack of communication early in the process about obsolescence plans to modernize the ESS. Each of the three offices plays a significant role in ensuring the right equipment gets to the end user, but in this case, we found no evidence of sufficient communications about long-term planning for the ESS.

b. Responsibility/Authority

The second theme that we noted throughout our interviews was the lack of a central authority with overall responsibility for the platform and a responsibility to manage the platform from cradle to grave. Management of the H-65 platform largely passed between offices in entirely different chains of command, depending on the phase. As individuals in those offices explained, CG-7 would create a new requirement, CG-9 would then manage the acquisition of that requirement, and CG-4 would, finally, manage sustainment of the program. For example, major aircraft upgrades would be managed by CG-9 until the entire fleet of aircraft were upgraded, and then management responsibilities would be passed to CG-4 for sustainment. The problem seemed to come when the line was blurred between sustainment and acquisition. We were told over and over by every office we interviewed that *acquisition* is a new capability and *sustainment* is keeping an old capability working. This becomes problematic, especially with things like avionics that become outdated and unsupportable. The office that is responsible for sustaining that piece of equipment is completely separate from the office that would be responsible for acquiring a new one. For example, CG-41 and CG-931 had differing views on whether acquiring a new ESS system constituted an acquisition. CG-41 argued that it could be categorized as an acquisition, as they were looking at options to purchase an alternate system. CG-931 argued that it was a sustainment effort since, despite it being a new system, it would maintain an existing capability. Consequently, CG-931 opted not to take responsibility for sustainment efforts unless they received an explicit operational requirement for deploying a new capability. The net result of this is that a lack of overall direct responsibility and authority for a specific platform results in an inability to effectively plan for the future.

c. Planning

It quickly became clear during our research that long-term planning for the acquisition life cycle of the ESS was inadequate. Every major action that we found the Coast Guard had taken with regard to the long-term sustainment of the ESS was reactive. We found no evidence of serious attempts to plan for obsolescence and replacement of the ESS in advance of end-of-life notification. Despite that, interviewees were well aware of the typical life cycle of avionics components and their inevitable obsolescence, but this knowledge was unfortunately never translated into an executable plan to replace the ESS before it was forced out of service. When we asked these questions of interviewees, they typically remarked that even if the issues are brought to senior leadership, they are never prioritized because there are dozens of other components that have similar issues. This indicated to us that the problems are deeply systematic, and many problems come from being significantly resource-constrained.

d. Budgeting

Unquestionably, the most common theme that we extracted from the interviews was a shortage of resources, both human and fiscal. Every interviewee was quick to point out that the ESS made up a very small part of their portfolio and that the Coast Guard does not have the resources to address obsolescence risks before they become issues. Because the backlog of sustainment issues is so large across all programs, only the most urgent and immediate problems are addressed, at the expense of effective planning for sustainment. The budget process itself, and the way sustainment and acquisitions are funded differently, also contributed to problems managing the ESS life cycle. For example, the fielding of a significantly upgraded ESS needed to ensure sustainment requires the execution of a significant portion of the acquisition life cycle. This takes years of guaranteed funding, something that would normally be done by CG-9 utilizing research and development funds along with procurement funds, which have a combined 5-year timeline. In this case, because the ESS was in sustainment, the project could only use operations and sustainment funding, which has a 1-year timeline and must be completely spent within the fiscal year it is obligated. Without centralized management of these platforms, there is no ability to accurately project these problems and ensure that they are addressed adequately. Instead, we found that there are essentially two offices pointing at the other and saying, “this should be their problem.”

C. CONCLUSION

In initially forming our research questions, we sought to first evaluate whether the ESS system has a direct positive impact on SAR success, and we would measure that impact both in search success and search cost. We would then assess whether a failure of the acquisition process had led to a significant loss of capability that affected mission success budgetarily. In the end, we were not able to document, using the Coast Guard's own doctrine and simulations, that the ESS is indispensable. However, this inconclusive result should not be taken as a denigration of the ESS's effectiveness. Throughout the course of our analysis, we learned that in the 17 years the ESS has been fielded, the Coast Guard has completed no studies of the ESS's operational effectiveness in SAR and has instead relied on studies utilizing very different systems on different platforms. As we discussed in Chapter II, the effectiveness of infrared imaging systems is not in question, but without adequate testing in the maritime—and particularly the maritime aviation—domain, it is impossible to quantify that effectiveness and then adequately defend the capability. In short, the Coast Guard had a new capability for 17 years that it never bothered to prove was worth all the money that was spent on it and is now unsurprisingly struggling to make the case for its replacement.

In addition to that significant shortcoming in acquiring the relevant test data to prove ESS' worth, we also uncovered a staggeringly ineffective system for managing major capabilities like aircraft and their components. In the most simplified terms, the management of the life cycle of a major capability is divided between at least three major branches of the Coast Guard's organizational structure. Tracing the organizational structure to find the first person who has true overall responsibility and authority for the management of a major capability from cradle to grave would lead to the vice commandant, the number-two flag officer in the Coast Guard. Each phase of the acquisition life cycle is managed by completely different organizations with no central clearinghouse, and over the course of a 50-year program, like the SRR helicopter, the progression through the acquisition pathway is anything but linear. It is simply unrealistic to expect a single mid-tier officer, whose primary job responsibility is sourcing parts, to manage the life cycle of every component required to keep an aircraft functioning for 50 years. Similar to the DOD's use of service partners, the Coast Guard needs a commanding officer program manager who has absolute responsibility for the entirety of the acquisition life cycle for each of the service's major capabilities and the resources to effectively run a PMO that fills the functions currently filled by CG-7, CG-9, and CG-4.

V. RECOMMENDATIONS AND CONCLUSION

Through the course of our analysis, we learned a great deal about both this particular case study and the acquisition system within the Coast Guard. Unsurprisingly, with the benefit of hindsight, we noted things that could be improved and mistakes that were made. At no point did we encounter individuals at any level who were not working diligently and passionately to provide the Coast Guard's operators with what they need to complete the mission. While our recommendations and observations are pointed, they should not be taken as an affront to the organization or the individuals who run it, but rather as an outside perspective with some potential ideas for growth and improvement as an organization. We also make no attempt to represent our recommendations as detailed or perfectly thought-out courses of action. They are holistic ideas that would require focused effort by senior leaders to bring to fruition, but we believe that effort would pay dividends in the long run.

A. CONCLUSION

This section presents our integrated analysis and findings, derived from the data we gathered from both our SAROPS simulations as well as our interviews. This section uses the integrated analysis to then answer our research questions. Finally, based on our analysis and findings, we then provide two recommendations for the Coast Guard to implement to improve future aviation program acquisitions and sustainment.

1. Analysis Findings

Our primary research question was: What policies and procedures within Coast Guard acquisitions, as well as external factors, led to the failed sustainment of the ESS and the critical capability it provides?

Based on our analysis, we found that the organizational root cause for the failed sustainment of the ESS program was the defined segregation between program acquisition and program sustainment. The Coast Guard defines sustainment as maintaining a current capability, whereas acquisition is acquiring a new capability. While our analysis identified several issues within the management of the ESS program, we found that they stemmed from this delineation of responsibility. In terms of military acquisition policy, this transfer in program ownership after system fielding is unique to the Coast Guard. Every other service maintains a singular PMO, responsible for every aspect of the program from cradle to grave, including sustainment efforts. Within the Coast Guard, once a program has been transferred to sustainment offices, the respective PMO is disestablished if there are no further ongoing acquisition projects related to the program, though disestablishment rarely occurs.

We found that this separation of program responsibility created barriers in communication, authority, funding, and planning. While all interviewees agreed on how the Coast Guard policy defines sustainment and acquisition, they varied in their explanation of where exactly that delineation occurs operationally, meaning that depending on current leadership views and opinions, there is a great deal of subjectivism in how to apply these definitions to programmatic decisions. Regarding the ESS, there was disagreement between CG-41 and CG-931 as to whether purchasing a new ESS system was an acquisition or not. CG-41 believed it could be considered an acquisition because they were exploring purchasing a different system. However, CG-931 held that it was a sustainment effort because, although it would be a new system, it would provide an existing capability. Therefore, CG-931 would not get involved in any sustainment efforts unless they first received an operational requirement to field a new capability. This constant debate leads to ambiguity about who is ultimately responsible for particular aspects of a program, which in turn creates communication problems such as relaying information to the appropriate parties. This was the case with the ESS program, as sustainment concerns were communicated to CG-41 leadership but were never properly conveyed to CG-711 or CG-931 until it was too late.

Furthermore, this segregation between acquisition and sustainment creates significant funding issues that delay any serious efforts for future program sustainment efforts. Sustainment is primarily supported through annual O&S funding, which is not consistent and can be extremely volatile depending on what the Coast Guard defines as its top priorities for that fiscal year. Acquisitions are primarily driven by two types of multi-year funding. This funding provides the necessary security and consistency, despite changes in leadership and fluctuations in annual funding, needed for large, long-term modernization efforts, such as the ESS program. Our interviewees, who were responsible for the sustainment of the ESS, stated that limited and restrictive funding forced them to make decisions that aligned with higher Coast Guard priorities, ultimately pushing the ESS program to the back burner.

Ambiguity in responsibility combined with communication and funding barriers culminated in what was ultimately the reason for the ESS's failed sustainment, inadequate future planning. These issues constantly force sustainment officials to focus their limited resources on the now, hindering any efforts to pivot toward future program sustainment. This has cultivated a culture that is predominantly reactive only after a risk becomes an issue, rather than one that takes proactive measures to avoid or reduce program risks, such as parts obsolescence for the ESS, before it becomes an issue. Consequently, the Coast Guard has found itself in a self-inflicted, never-ending cycle of catch-up, dealing with only the biggest and foremost issues at hand, while postponing smaller problems for a later date. This has resulted in programs being managed strictly at a surface level instead of from a long-term, holistic approach.

The COVID-19 global pandemic was the only external factor that we identified in our analysis that impacted the sustainment efforts of the ESS program. The pandemic sent shockwaves throughout global supply chains, greatly altering the manufacturing landscape worldwide. The company Teledyne/FLIR was no exception, and supply chain shortages forced them to reexamine their portfolios, including the Coast Guard's ESS. This ultimately accelerated the ESS's end-of-life timetable by 3 years, from 2025 to 2022, the same year the Coast Guard was expecting to receive initial funding for ESS modernization efforts. This announcement caught the Coast Guard by surprise and, with no alternatives available, acted as the catalyst for the decision to remove operational ESS units from the field. This notification also acted as the kick-starter for more serious efforts to quickly identify a replacement for the ESS to minimize the duration of the capability gap. All of our interviewees agreed that, throughout the duration of their contracts, Teledyne/FLIR provided, and continues to provide, ample support for the continued sustainment of current ESS units in the Coast Guard. Although the pandemic affected Teledyne/FLIR's ability to continue support for the ESS, it had no impact on the Coast Guard's ability to develop future sustainment plans to reduce potential consequences of system obsolescence. The pandemic simply shed light on the Coast Guard's ineptitude in future planning and long-term acquisition portfolio management, an issue also documented in numerous GAO reports.

Our secondary research question was: What process changes could be implemented to improve acquisition programs and their sustainment to prevent similar capability loss in the future?

In the end, any process change must address the four primary themes we identified in our analysis: communication, authority, planning, and budgeting. Based on our findings, we believe the easiest change to implement to prevent cases similar to the ESS in the future is to either eliminate the segregation between sustainment and acquisition or bridge the gap between them through the establishment of offices responsible for the centralized management of acquisition programs from cradle to grave. While this policy change would not necessarily eliminate all communication, authority, planning, and budgetary issues within Coast Guard acquisitions, it is a viable starting point to alleviate them. It would also plant the seed for a long-overdue cultural change, shifting the Coast Guard's current program management approach from reactive to proactive. Finally, this policy change would be more in line with the acquisition policies of the other military services, allowing the Coast Guard to learn from the DOD's best practices. Our detailed recommendations are discussed in the next section of this chapter.

2. Recommendations

Our analysis revealed several areas for improvement within Coast Guard acquisitions, which, based on our findings and the identified thematic issues, provide the following recommendations:

(1) Centralized Management of Acquisition Life cycle

Our thematic analysis focused on four primary themes that made up the bulk of our interviews. Those themes were communication, responsibility/authority, planning, and budget. Centralizing management of the acquisition life cycle would, to some degree, address all four areas.

There is no doubt that communication within one organization is simpler than across different organizations. One organization allows for a shared mission and a common approach to appropriate life-cycle management. Through the course of our research, we noted numerous barriers to communication that stemmed from three different organizations owning different, ill-defined portions of the life cycle.

Responsibility and authority become much clearer when an organization is centralized. While it may seem unsurprising that three military officers are suggesting a centralized organization, it is important to note that we are not suggesting how that organization be structured, just that the responsibility for managing a major asset be the responsibility of one organization. As our analysis found, there is not a single person who is responsible and accountable for the entire life cycle of a major asset. This is in stark contrast to every other military service that employs a full-time program manager who has absolute responsibility for the life cycle of the asset. Bringing together aspects of CG-9 and CG-4 under one organization to fully manage major assets from cradle to grave would likely have a significant long-term impact on the assets' successful management.

With improvements in communications and responsibility/authority, the planning process will also naturally improve. Part of what continued to come up in our interviews was a very reactionary attitude across organizations. Once a problem was "solved," it dropped off the priority list and was not given any attention until it became an urgent problem again. When multiple organizations interpret their involvement in that planning differently and always point to another organization as either being responsible or the one that would have to execute a project, things get missed until the program becomes a problem. In this case, the problem came when Teledyne/FLIR provided their end-of-life notification and the Coast Guard was caught without a plan for its replacement in a timely manner. If the entire MH-65 program fell under one chain of command, at least there would be one person with overall insight into all parts of the program. As of now, anything that requires crossing between CG-9 and CG-4 requires the issue to be routed up and down two chains of command up to the three-star level. With one chain of command, one organization would be able to promote a clear, unified message to senior leaders about the need for maintaining a platform.

Budget is of course a challenge, especially in the Coast Guard, and we found throughout our research that it was often a scapegoat of sorts. Everyone we interviewed talked about budget constraints and human resource constraints, often musing that all of these problems would be solved if they had more resources. There is undoubtedly some truth to that, but our analysis showed that the Coast Guard has also failed to do the necessary work to present an accurate picture to senior leaders and Congress about the Coast Guard's budgetary needs. Through the themes discussed above, we pose a hypothetical: If the MH-65 program had been managed by a single organization directly tasked with managing the program from cradle to grave, communication would have flowed freely about upcoming obsolescence issues on components like the ESS. Those issues would have been fleshed out at the program manager level and assigned as part of a new component acquisition or as sustainment. The program manager would have known about the upcoming significant expense and been able to begin gathering data to defend the necessary budget years before it became an issue that affected the fleet. Instead, it now comes as a last-minute, significant budget request that only serves to highlight the incompetence of the organization and further degrade trust, making budget request approvals even more challenging. The Coast Guard absolutely needs more funding, but if they were given it, they would just repeat the same mistakes on a larger scale. These changes need to happen to get the budget they need; the changes will not happen because a bigger budget is approved.

(2) Acquisition Career Field

Another significant challenge that we noted through our research was the constant personnel turnover in key positions. While turnover in any organization presents a challenge, what we noticed was relatively unique to the Coast Guard compared to the DOD is that most Coast Guard acquisition positions are filled by individuals without any specialized training or experience in acquisitions. Personnel are generally assigned to acquisition jobs directly from their fleet jobs, spend most of their tour getting their acquisition training and certification complete, then depart back to fleet jobs, never to return to acquisitions. Unlike the Coast Guard's DOD peers, there is no designated acquisition corps or specialty. Other services typically have mid-career officers transition into acquisitions and then remain in the field as they continue their career.

The Coast Guard would be well-served by instituting a small career field that drew representatives from different operational communities to manage those communities’ assets under the newly formed program management offices that we discussed in our first recommendation. These career acquisition professionals would aspire to commanding officer roles as program managers for major systems, where they would be charged via a program managers charter with responsibility and authority for the entire life cycle of their system. These roles would be targeted toward highly successful operational officers who transitioned into the acquisition specialty and demonstrated an aptitude for planning, project management, engineering, and finance. This community would seek to closely align with the aeronautical engineering duty officer, and engineering duty officer roles in the Navy and the acquisition officer corps role in the Army.

3. Summary

Coast Guard acquisition policies and procedures are still relatively infantile compared to the DOD’s, creating several opportunities for improvement. The failed sustainment of the ESS program serves as a valuable case study for the Coast Guard to learn from its past mistakes and avoid losing effective operational capabilities in the future. This growth starts with initiating a cultural change that shifts acquisition program management from being reactive to being proactive. The best way to do this is by first establishing a centralized management authority that is responsible for every aspect of a program from cradle to grave. This will cultivate a shared mental model and common approach among all those involved, providing a better overall understanding of where a program currently stands and where it needs to go. Additionally, the Coast Guard needs to institute an acquisitions career field, similar to the other military services, to build a repository of acquisition professionals, enhancing the expertise and continuity the service is currently lacking. While our recommendations are not perfect solutions that eliminate every issue, they offer the fundamental cornerstones needed for continual growth and improvement.

B. AREAS FOR FUTURE RESEARCH

One of the biggest surprises from our analysis was discovering that the Coast Guard has never tested the ESS for effectiveness in airborne SAR. This is interesting because the Coast Guard recognizes that the ESS provides enhanced visual imaging capabilities, requiring it for AUF-CD and strongly recommending it for SAR; however, they don't fully understand to what extent it does so. This lack of test data is not only a failure of the ESS program's life-cycle management but also a mismanagement of the service's SAR assets. That is why our analysis and findings support this being an extremely valuable area of future research for two main reasons.

The first reason is because updated and accurate SAR effectiveness data could potentially alter the way that the Coast Guard executes SAR missions. If the data proves the ESS is more effective than currently believed, it would increase the efficiency of search plans generated in SAROPS, consequently reducing the required time to achieve search requirements. If the data proves the ESS is less effective, then the Coast Guard could explore potentially removing the equipment from service to save resources. Either way, the test data could prove beneficial to the Coast Guard.

The second reason is because accurate test data could assist with programmatic decisions revolving around future sustainment efforts of the ESS. Based on our experiences, most military decisions are based on statistics and the effectiveness of a system. In an organization where resources are limited and constantly fought for, not having the data to support a system's success or effectiveness makes it extremely difficult for military leaders to justify that particular program or system's existence, which is exactly what happened with the ESS. Since there is no test data, the Coast Guard cannot make the ESS a required piece of equipment for SAR, meaning it is considered a nicety and not a necessity, resulting in it being a low priority program. However, if decision-makers had this data, it would have helped justify the ESS's importance and overall impact on the service's ability to execute its operational missions, giving the ESS a higher priority.

One final recommended area for future study would be an in-depth comparative analysis of the Coast Guard's acquisition system with the DOD's acquisition system.

While this was outside the scope of our analysis, we did identify several areas within the Coast Guard that differed from previously researched acquisition best practices in the DOD. This type of analysis could provide potential solutions and recommendations for how to best implement those best practices into the Coast Guard's acquisition framework.

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LIST OF REFERENCES

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