



ACQUISITION RESEARCH PROGRAM SPONSORED REPORT SERIES

Measure and Assess the Effectiveness of Navy and DoD Pilot BA-08 (Software) Program Performance

June 2024

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

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ABSTRACT

The software development problem within the Department of Defense (DOD) is that the software acquisition process is not optimized for continuous development. A disconnect exists between best practices in software development and the ability to balance and deliver utilizing multiple appropriations. The software and digital technology pilot program, BA-08 pilot program, was formed to explore the benefits of single appropriation acquisition and how it could assist in mitigating the software development problem. The following questions are addressed: Does realigning funding provide a more manageable acquisition path for continuous delivery of software capability? How are the DOD's current software acquisition practices providing a hindrance to continuous delivery of capability? Is the BA-08 program most effective with commercial or DOD-specific software? We concluded that the report findings did not present enough evidence to conclude that the improvements seen across the programs could be singularly tied to the programs' participation in the BA-08 pilot because the majority of the programs are also enrolled in additional initiatives. Additionally, there was not enough data collected by the program to come to a conclusion on the distinction if the BA-08 program was most effective with the acquisition of commercial software, or with DOD-specific capability.



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TABLE OF CONTENTS

I.	INTRODUCTION.....	1
A.	RESEARCH PURPOSE AND OBJECTIVE.....	1
B.	RESEARCH QUESTIONS.....	2
C.	METHODOLOGY	2
D.	THESIS ORGANIZATION.....	3
II.	BACKGROUND	5
A.	BIG “A” ACQUISITION, JCIDS, DAS, AND PPBE	5
B.	ADAPTIVE ACQUISITION FRAMEWORK	10
C.	DEVSECOPS, SOFTWARE FACTORY, AND CONTINUOUS ITERATIVE DEVELOPMENT	15
D.	APPROPRIATION CATEGORIES, FEDERAL FUNDS, AND BUDGET ACTIVITIES	17
E.	SOFTWARE ACQUISITION PROBLEM AND SWAP BACKGROUND	19
III.	LITERATURE REVIEW	27
A.	REPORT TO CONGRESS: JOINT EXPLANATORY STATEMENT ACCOMPANYING THE DEPARTMENT OF DEFENSE APPROPRIATIONS ACT, 2021 (PUBLIC LAW 116-260): INITIAL REPORT FOR SOFTWARE AND DIGITAL TECHNOLOGY PILOT PROGRAM, APRIL 2021	27
B.	DEPARTMENT OF DEFENSE SOFTWARE AND DIGITAL TECHNOLOGY PILOT PROGRAMS WHITE PAPER, JUNE 2021.....	43
C.	REPORT TO CONGRESS JOINT EXPLANATORY STATEMENT ACCOMPANYING THE DEPARTMENT OF DEFENSE APPROPRIATIONS ACT, 2021 (PUBLIC LAW 116-260) INITIAL REPORT FOR SOFTWARE AND DIGITAL TECHNOLOGY PILOT PROGRAM, OCTOBER 2021	48
IV.	ANALYSIS	53
A.	REPORT TO CONGRESS JOINT EXPLANATORY STATEMENT ACCOMPANYING THE DEPARTMENT OF DEFENSE APPROPRIATIONS ACT, 2021 (PUBLIC LAW 116-260) INITIAL REPORT FOR SOFTWARE AND DIGITAL TECHNOLOGY PILOT PROGRAM OCTOBER 2021	53
B.	REPORT TO CONGRESS JOINT EXPLANATORY STATEMENT ACCOMPANYING THE DEPARTMENT OF	



	DEFENSE APPROPRIATIONS ACT, 2021 (PUBLIC LAW 116-260) INITIAL REPORT FOR SOFTWARE AND DIGITAL TECHNOLOGY PILOT PROGRAM JANUARY 2022.....	62
C.	REPORT TO CONGRESS JOINT EXPLANATORY STATEMENT ACCOMPANYING THE DEPARTMENT OF DEFENSE APPROPRIATIONS ACT, 2021 (PUBLIC LAW 116-260) INITIAL REPORT FOR SOFTWARE AND DIGITAL TECHNOLOGY PILOT PROGRAM NOVEMBER 2022	72
D.	REPORT TO CONGRESS JOINT EXPLANATORY STATEMENT ACCOMPANYING THE DEPARTMENT OF DEFENSE APPROPRIATIONS ACT, 2021 (PUBLIC LAW 116-260) INITIAL REPORT FOR SOFTWARE AND DIGITAL TECHNOLOGY PILOT PROGRAM FEBRUARY 2023.....	77
V.	CONCLUSION	85
A.	FINDINGS.....	85
B.	RECOMMENDATIONS AND NEXT STEPS.....	87
	LIST OF REFERENCES.....	89



LIST OF FIGURES

Figure 1.	Big “A” Acquisition. Source: R. Mortlock (PowerPoint slides, April 27, 2023).	6
Figure 2.	Goals of PPBE. Source: D. Kaczorowski (PowerPoint slides, May 19, 2020).	10
Figure 3.	Adaptive Acquisition Framework. Source: DAU (n.d.-a).	12
Figure 4.	DevSecOps. Source: Lam, T., & Chaillan, N. (2019, p. 19).	16
Figure 5.	Software Acquisition and the Color of Money. Source: J. Dunlap (Powerpoint slides, undated).....	20
Figure 6.	The Software Acquisition Pathway. Source: OUSD (A&S, 2020).	21
Figure 7.	DOD Process Changes over Time. Source: Greenwald & Patt (2021, p. 40).	34
Figure 8.	Initial Timeline of the BA-08 Program. Source: DOD (2021a, p. 10).	36
Figure 9.	Total Single Backlogs vs. Multiple Backlogs. Source: DOD (2021c, p. 13).	58
Figure 10.	Fishbone Diagram Summarizing the Disconnect between Best Practices in Software Development and the Ability to Balance and Deliver Utilizing Multiple Appropriations	61
Figure 11.	Initial FY 2021 Funding Allocation for Congressional-Approved FY 2021 Pilots. Source: DOD (2022a, p. 10).	65
Figure 12.	Initial FY 2022 Funding Allocation for Department Proposed FY 2022 Pilots. Source: DOD (2022a, p. 11).	66
Figure 13.	Single Appropriation Impact on Current FY 2021 BA-8 Programs Across Initial Findings. Source: DOD (2022a, p. 13).....	67
Figure 14.	Potential Single Appropriation Impact on FY 2021 Traditional Appropriation Programs. Source: DOD (2022a, p. 14).	68
Figure 15.	Deployment Frequency FY 2021 BA-8 Programs. Source: DOD (2022a, p. 15).	69
Figure 16.	FY 2021 BA-8 Programs: Single Appropriation Impact Based on Functional Role. Source: DOD (2022a, p. 16).....	70



Figure 17. FY 2021 Traditional Programs: Multiple Appropriations Impact based on Functional Role. Source: DOD (2022a, p. 17).71

Figure 18. BA-8 Deployment Frequency Trends. Source: DOD (2022c, p. 8).....76

Figure 19. DCO Percentage Carryover of Funds. Source: DOD (2023, p. 8).....79

Figure 20. DCO Funding FY18–FY22. Source: DOD (2023, p. 9).80

Figure 21. AIE Funding FY20–FY22. Source: DOD (2023, p. 10).....81

Figure 22. UNO Funding FY19–FY22. Source: DOD (2023, p. 10).....82



LIST OF TABLES

Table 1.	Budget Activities for RDT&E Appropriation Type. Adapted from AcqNotes. (n.d.-d).....	18
Table 2.	Ten Most Important Things to Do (Starting Now!). Source: McQuade et al. (2019, p. xv).	24
Table 3.	Primary Recommendation A2: New Appropriation Category. Source: McQuade et al. (2019, p. S4).	25
Table 4.	Summary of Previous Reports. Source: (McQuade et al., 2019, pp. 19–21)	28
Table 5.	Congressionally Approved FY2021 BA-08 Programs. Source: DOD (2021a, p. 11).	37
Table 6.	FY2021 Traditional Appropriation Programs. Source: DOD (2021a, p. 12).	37
Table 7.	Metrics. Source: DOD (2021a, p. 12).	38
Table 8.	Data Collection Template for Current Pilots. Source: DOD (2021a, p. 13).	39
Table 9.	NDAA Title VIII Sections: Acquisition Policy Acquisition Management and Related Matters. Source: DOD (2021a, p. 13-14).	43
Table 10.	Current Programs Involved in the BA-08 Pilot. Source: DOD (2021c, p. 5).	49
Table 11.	Congressionally Approved FY2021 BA-08 Programs. Source: DOD (2021c, pp. 5–6).	49
Table 12.	FY2021 Traditional Appropriation Programs. Source: DOD (2021c, p. 6).	50
Table 13.	FY2022 Proposed BA-08 Programs. Source: DOD (2021c, p. 7).	50
Table 14.	BA-08 Pilot Timeline. Source: DOD (2022a, pp. 6–7).	62
Table 15.	BA-08 Pilot Program Nomination Evaluation Areas. Source: DOD (2022a, pp. 8–9).	63
Table 16.	Themes Identified by FY 2021 Congressionally-Approved BA-8 Programs. Source: DOD (2022a, p. 18).	72



Table 17. BA-8 vs. Other Factors that Influence Software Measures
(Quantitative). Source: DOD (2022c, p. 6).....74

Table 18. BA-8 vs. Other Factors that Influence Software Measures
(Qualitative). Source: DOD (2022c, p. 7).....75



LIST OF ACRONYMS AND ABBREVIATIONS

AAF	Adaptive Acquisition Framework
AAFDID	Adaptive Acquisition Framework Document Identification
AFIPPS	Air Force Integrated Pay and Personnel System
AIE	Accessions Information Environment
ASN(FM&C)	Assistant Secretary of the Navy, Financial Management and Comptroller
ATO	authority (or authorization) to operate
AWCFT	Algorithmic Warfare Cross Functional Team
AWF	acquisition workforce
AV	acquisition visibility
BA	budget activities
BES	budget estimate submission
BMA _s	battle management aids
BPC	Building Partner Capacity
BTR	below threshold reprogramming
CAPE	Cost Assessment and Performance Evaluation
CIO	Chief Information Officer
CJCSI	Chairman of the Joint Chiefs of Staff Instruction
CLIN _s	Contract Line Item Numbers
CNA	Center for Naval Analysis
CNS	capability needs statement
COCOM	combatant command
CRS	Congressional Research Service
VCJCS	Vice Chairman of the Joint Chiefs of Staff
DAS	defense acquisition system
DAU	Defense Acquisition University
DBS	defense business system



DCO	Defense Cyber Operations
DCSA	Defense Counterintelligence and Security Agency
DEAMS	Defense Enterprise Accounting and Management System
DevSecOps	Development, Security, and Operation
DFAS	Defense Finance and Accounting Service
DHA	Defense Health Agency
DIB	Defense Innovation Board
DISA	Defense Information Systems Agency
DOD	Department of Defense
DODI	Department of Defense Instruction
DON	Department of the Navy
DPG	Defense Planning Guidance
DSB	Defense Science Board
ePS	Electronic Procurement System
ESI	Enterprise Software Initiative
FAR	Federal Acquisition Regulation
FFRDC	Federally-Funded Research and Development Center
FMB	Office of Budget
FMR	Financial Management Regulation
FOC	full operational capability
FY	fiscal year
GAO	General Accounting Office
GAP CIE	Global Adaptive Planning and Collaborative Information Environment
GCCS-J	Global Command and Control System–Joint
IT	information technology
JAIC	Joint Artificial Intelligence Center
JCIDS	Joint Capabilities Integration and Development System
JES	Joint Explanatory Statement



JOMIS	Joint Operational Medicine Information Systems
JROC	Joint Requirements Oversight Council
LFT&E	live-fire test and evaluation
LRIP	low rate initial production
MDA	milestone decision authority
MFP	major force program
MILCON	military construction
MILPERS	military personnel
MTA	middle tier of acquisition
MTC2	Maritime Tactical Command and Control
NBIS	National Background Investigation Services
NCMA	National Contract Management Association
NCSA	Navy Cyber Situational Awareness
NDAA	National Defense Authorization Act
NGEN	Next Generation Enterprise Network
NMCI	Navy-Marine Corps Internet
NRC	Nuclear Regulatory Commission
NSC	National Security Council
NPES	Nuclear Planning and Execution System
OA	operationally accepted
O&M	operations and maintenance
OODA	Observe, Orient, Decide, and Act
OPNAV	Office of the Chief of Naval Operations
OSD	Office of the Secretary of Defense
OUSD(C)	Office of the Undersecretary of Defense Comptroller
PEO	Program Executive Office
PM	program manager
POM	program objective memorandum
PPBE	Planning, Programming, Budgeting, Execution



PPBS	Planning, Programming, and Budgeting System
R&D	research and development
RDT&E	research, development, test, and evaluation
RFP	request for proposals
RMI	Risk Management Information
SAC-D	Senate Committee on Appropriations Subcommittee on Defense
SAE	Service Acquisition Executive
SEI	Software Engineering Institute
SI	supporting information
SWAP	software acquisition and practices
TACS	Theater Air Control System
T&E	Testing & Evaluation
TMRR	technology maturation and risk reduction
UNO	Unified Network Operations
USD(A&S)	Under Secretary of Defense for Acquisition and Sustainment



I. INTRODUCTION

The software development problem within the Department of Defense is that the software acquisition process is not optimized for continuous development. The DOD's mission is to always be warfighter ready; while they excel in the hardware aspect of that goal, the software component is lagging. Wars are now being fought not only on the ground but also via cyber attacks. The ability to quickly utilize software to compete with our adversaries is a matter of national security (McQuade et al., 2019. p 1). As the Joint Force Quarterly article titled *Intelligence in a Data Driven Age* states,

The future battlespace is constructed of not only ships, tanks, missiles, and satellites, but also algorithms, networks, and sensor grids. Like no other time in history, future wars will be fought on civilian and military infrastructures of satellite systems, electric power grids, communications networks, and transportation systems, and within human networks. Both of these battlefields—electronic and human—are susceptible to manipulation by adversary algorithms (Weinbaum & Shanahan, 2018).

The DOD has software implemented in all aspects, but we focus on the ability to enable capability delivery and access enabling technologies through single appropriation. The Defense Acquisition System has standard types of money, processes, and requirements that make it challenging for software development efforts to upgrade systems at the pace the threats change. As stated in the BA-08 pilot program's FAQ document, a “disconnect exists between balancing multiple appropriations and the modern software development best practices” that support continuous delivery of capability (DOD, 2020b, p. 2). Through multiple studies over many years, recommendations have been made to adapt to changing software needs. However, many were not taken into account and, while considered a good idea, the recommendations were not implemented (McQuade et al., 2019. p 18).

A. RESEARCH PURPOSE AND OBJECTIVE

In 2019, the Defense Innovation Board published the software acquisition and practices (SWAP) study (McQuade et al., 2019. p 1). This study looked at the obstacles that prevented software recommendations from being fully implemented and suggested ways in which the acquisition and governmental process should change. With this



knowledge, as well as other findings from the February 2017 Defense Science Board Design and Acquisition of Software for Defense Systems Report and the January 2019 Section 809 Panel discovery, the software and digital technology pilot program, also known as the BA-08 pilot program, began. The BA-08 program is built to allow the program to acquire hardware, software, infrastructure, cloud services, tools, and rapid prototyping services that would ordinarily require a mix of research, development, test, and evaluation (RDT&E), procurement, and operations and maintenance (O&M) funding.

As part of the BA-08 initiative, the team was responsible for producing quarterly reports to Congress describing the pilot's qualitative and quantitative data. From the quarterly reports that the BA-08 team provided that go into detail about the pilot's qualitative and quantitative data, we studied the inner workings of the pilot program and drew conclusions about the benefits of single appropriation acquisition. In this capstone applied project, we analyze the data presented in the *Report to Congress Joint Explanatory Statement Accompanying the Department of Defense Appropriations Act, 2021 (Public Law 116-260) Initial Report for Software and Digital Technology Pilot Program for October 2021, January 2022, November 2022, and February 2023* and address the questions posed in the next section.

B. RESEARCH QUESTIONS

In this thesis, the following questions are addressed: Does realigning funding provide a more manageable acquisition path for continuous delivery of software capability? How are the DOD's current software acquisition practices hindering continuous delivery of capability? Is the BA-08 program most effective with commercial software or DOD-specific software? (Bianco & Hujber, 2023).

C. METHODOLOGY

The research methodology is a qualitative analysis of the current DOD software acquisition process and reports from the DOD to Congress, as well as a review of the data provided by the program sponsors and for BA-08 acquisition efforts. Additionally, Chapter II provides some general information about the DOD's acquisition process that is needed



to understand where BA-08 came from, and its complex connections to the entire acquisition process.

The Defense Innovation Board's (DIB) *Software Acquisitions and Practices (SWAP) study: Software is Never Done*, the Defense Science Board's *Design and Acquisition of Software for Defense Systems*, and the Section 809 Panel's *Streamlining and Codifying Acquisition Regulations (FY16 NDAA Sec 809)* are considered the BA-08 pilot's primary sources for investigating the DOD's software problem (DOD, 2020b, p. 2). The provided reports from the Office for the Under Secretary of Defense for Acquisition and Sustainment (OUSD [A&S]) are considered a secondary source. Due to the relative newness of the BA-08 pilot program and the lack of approved expansion of additional programs participating in the pilot, the ability to obtain quantitative data was limited. Testimonials from pilot participants, as well as self-analyzed progress reported by OUSD (A&S) within the reports, in conjunction with the quantitative data provided was used to draw conclusions about the successfulness of the program. The programs participating in the BA-08 effort had other factors in addition to the single appropriation implementation, so it is difficult to isolate and attribute the improvements solely to participation in the BA-08 pilot program.

D. THESIS ORGANIZATION

Chapter I introduces the purpose of the thesis. Chapter II covers the background knowledge needed to understand BA-08 initiative focusing on Big "A" acquisition, the Adaptive Acquisition Framework (AAF), Development, Security, and Operations (DevSecOps), appropriation categories, and the software problem. Chapter III goes through details pertaining to the BA-08 pilot program with the specific background and purpose. By exploring the current practices of managing different commercial vendor licenses, subscriptions, and services and how they unnecessarily introduce multiple complexities that make it more challenging to be responsive to the warfighter, deliver at the speed of relevancy, and meet program expectations. Chapter IV analyzes the qualitative and quantitative data found in reports provided by the BA-08 team. Chapter V concludes the previous chapters and provides recommendations and next steps.



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II. BACKGROUND

Chapter II covers knowledge that is needed to understand the change from old acquisition processes to new processes and explains the genesis of the BA-08 pilot program. To start, the acquisition process and its relation to the Joint Capabilities Integration and Development System (JCIDS), defense acquisition system (DAS), and the Planning, Programming, Budgeting, and Execution (PPBE) process is described. The PPBE process needs to be further examined since it is the process that undergoes significant changes with the BA-08 pilot program. Additionally, the Adaptive Acquisition Framework (AAF), specifically the software pathway, should be understood. AAF consists of six pathways a program manager can choose from for acquisition within the DOD. More specifically, Department of Defense Instruction (DODI) 5000.87 was written to describe the new software acquisition pathway within the AAF. The pathway utilizes modern software techniques (for example, agile and DevSecOps) to update outdated methods. An in-depth understanding of appropriations, funding codes, and budget activities (BAs) leads to an ability to evaluate issues found with previous acquisition regulations and the laws surrounding software acquisition. The SWAP concepts and recommendations are then identified and linked to the BA-08 pilot program.

A. BIG “A” ACQUISITION, JCIDS, DAS, AND PPBE

The software acquisition process is encompassed within the Big “A” acquisition process. Big “A” acquisition consists of three decision support systems: the DAS, the PPBE, and the JCIDS. Each part works with the others and has its own responsibilities and requirements. They stand alone in that JCIDS identifies requirements, PPBE allocates the resources and budgeting, and DAS develops and/or buys the item (Lofgren, 2019). The JCIDS process is guided by Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 5123.01I 30 October 2021, CJCSI 3170.01I February 2015, and the JCIDS Manual with oversight provided by the Vice Chairman of the Joint Chiefs of Staff (VCJCS) and the Joint Requirements Oversight Council (JROC). (D. Kaczorowski, PowerPoint slides, May 19, 2020). The DAS process is guided by DOD Directive 5000.01 *The Defense Acquisition*



System effective September 9, 2020, DOD Instruction 5000.02 Operation of the Adaptive Acquisition Framework effective January, 23, 2020, and the Defense Acquisition Guidebook with oversight provided by the milestone decision authority (D. Kaczorowski, PowerPoint slides, May 19, 2020). The PPBE process is guided by DOD Directive 7045.14 effective January 25, 2013, Incorporating Change 1, August 29, 2017, with oversight provided by the Deputy Secretary of Defense (DEPSECDEF) (D. Kaczorowski, PowerPoint slides, May 19, 2020). Figure 1 shows each part, where they overlap, and what requirements guide each, along with what drives each decision (calendar, needs, events).

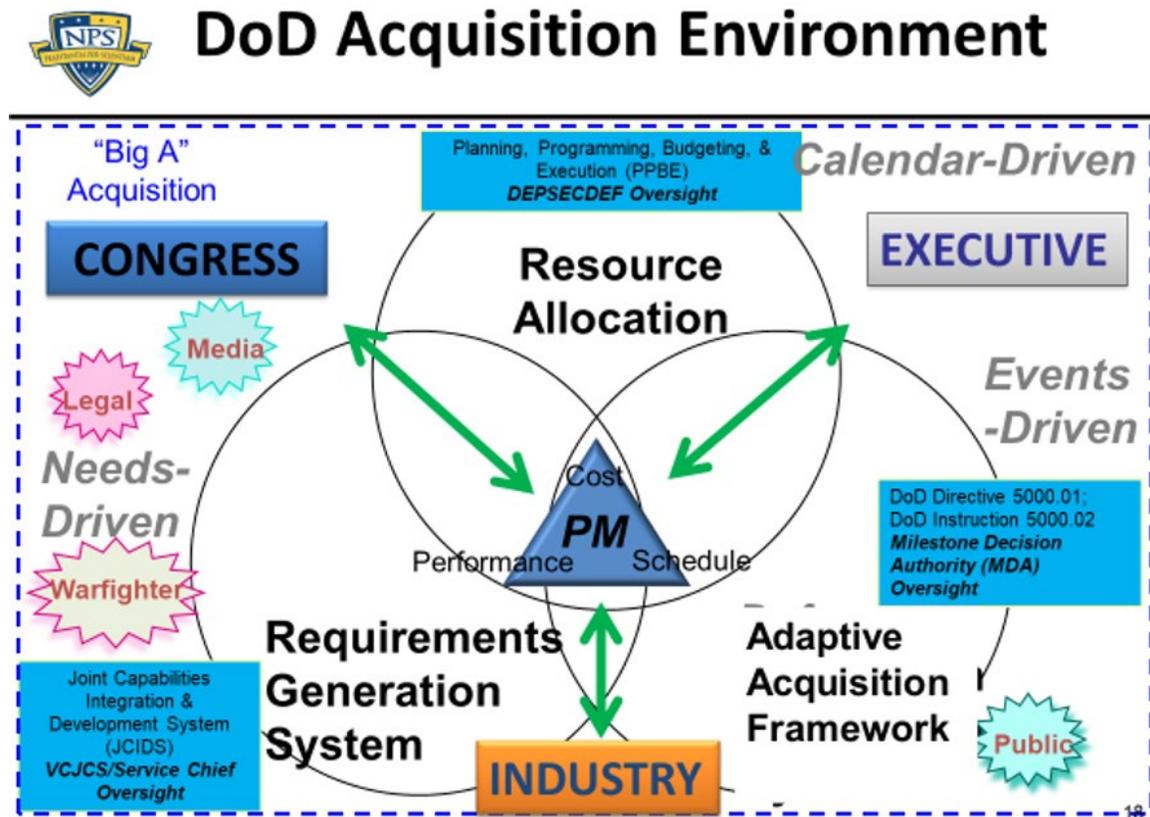


Figure 1. Big "A" Acquisition. Source: R. Mortlock (PowerPoint slides, April 27, 2023).

Focusing in on software and the relationship to the DAS, DODI 5000.87 states,



The overarching management principles that govern the defense acquisition system (DAS) are described in DOD Directive 5000.01 and DOD Instruction (DODI) 5000.02. The objective of the DAS is to implement the national defense strategy, through the development of a more lethal force based on U.S. technological innovation and a culture of performance that yields a decisive and sustained U.S. military advantage. To achieve that objective, DOD will employ an AAF comprised of multiple acquisition pathways. The AAF supports the DAS with the objective of delivering effective, resilient, supportable, and affordable solutions to the end user while enabling execution at the speed of relevance (Office of the Under Secretary of Defense for Acquisition and Sustainment [OUSD(A&S)], 2020, p. 3).

The change within Big “A” acquisition using the AAF, specifically, the software pathway, updates software acquisition to align with modern practices.

A change within Big “A” acquisition is how software development and procurement efforts get approved requirements. As stated, JCIDS deals with requirements which are needed to initiate acquisition efforts. Within the new AAF software pathway, an official JCIDS-approved requirement document is no longer required (OUSD[A&S], 2020, p. 10). The software pathway is further detailed in section B of Chapter II. DODI 5000.87 states,

Programs executing the software acquisition pathway are not subject to the Joint Capabilities Integration and Development System (JCIDS), and will be handled as specifically provided for by the Vice Chairman of the Joint Chiefs of Staff, in consultation with Under Secretary of Defense for Acquisition and Sustainment (USD[A&S]) and each service acquisition executive (OUSD[A&S], 2020, p. 3).

Programs that already have approved JCIDS documents can still transition to the software acquisition pathway (OUSD[A&S], 2020, p. 11). There are two options when this occurs. A program can maintain their documents and continue to use the approved requirements or the program can determine current software unique needs and create a capability needs statement (CNS) to be updated periodically. A CNS library is maintained by the vice chairman of the Joint Chiefs of Staff for programs utilizing the software pathway (OUSD[A&S], 2020).



The purpose of PPBE is to provide a tool for strategic planning, management control, and operational control of resources, specifically funding. There is a process that occurs; the details are dependent on what is needed.

First is the planning concept of the PPBE. The political environment and world security is assessed, and the National Security Council (NSC)/the President create a National Security Strategy. The DOD then creates military plans and lower-level strategies that meet the functional needs of the national security strategy and compares those needs to existing capabilities (D. Kaczorowski, PowerPoint slides, May 19, 2020). The planning is done by the Office of the Secretary of Defense (OSD), the Joint Chiefs of Staff, and Service secretaries, as well as the Office of the Chief of Naval Operations (OPNAV)3/5 (for the Navy), by utilizing the National Security Strategy, and National Military Strategy. The assessments are completed by the intelligence and planning cells (J2/J5) for operational capability, logisticians (J4) for support capability, program analysts, and OPNAV N81 (for the Navy). They identify the gaps and overlap and analyze threats and responses compared to the current capability. The data is compiled by the Service headquarters staff, and the guidance is completed by the Service chiefs, who set the priorities taking in account current execution, state of the force, and Service budget (D. Kaczorowski, PowerPoint slides, May 19, 2020).

Next is the programming concept of the PPBE. The mix of programs created to meet the needs of the strategies are leveraged to minimize the differences over time between previous years. The programs include assets, skills, activities, and creates the program objective memorandum (POM). (D. Kaczorowski, PowerPoint slides, May 19, 2020). Each POM starts with the previous year's allocations, and the funding is reallocated for 5 years into the future. The programming balances major force programs, components, and appropriations using analytical methods and priorities.

The budget portion of the PPBE is where the DOD submits a budget estimate submission (BES) from which the President prepares and submits a budget request to Congress. Congress creates both authorization and appropriation bills from the budget request and submits these back to the president for approval. Within the DOD, commands create budgets that justify the program decisions and request funding for approved



programs (D. Kaczorowski, PowerPoint slides, May 19, 2020). The budget review goes through multiple reviews and offices before it exists. The program offices and field activities draft the budget documentation submission that goes to the budget submitting office, which reviews, consolidates, and submits to the Office of Budget (FMB) and, for the Navy, to the Assistant Secretary of the Navy, Financial Management and Comptroller (ASN[FM&C]). The FMB and ASN(FM&C) review the cost, schedule, and ability to execute and then submit to OSD. The OSD and Cost Assessment and Program Evaluation (CAPE) then review the document for compliance with the Defense Planning Guidance (DPG) and make decisions for the budget and program. The OMB and the President complete the final consolidation and approval. The president's budget then goes to Congress, which authorizes and appropriates the funds (D. Kaczorowski, PowerPoint slides, May 19, 2020).

Program offices then complete the execute portion of the PPBE by running the programs, sending the funding, and reviewing each to ensure the overall strategy in the plan is being met (D. Kaczorowski, PowerPoint slides, May 19, 2020). The funds are divided out based on the budget, sent to the stakeholders and those executing the work, and the information is reviewed and adjusted by the programs to ensure the program functions according to the plan.

Figure 2 shows the breakout and goals of each portion of the PPBE process as it stands prior to recommended changes.





The Major Part Goals

- Strategic Planning
 - Assessment
 - Baseline data & policy guidance
- Planning

Goal: identify gaps or overmatches between strategy and capabilities and produce objectives for programming. (Outputs: DPG/NSP/CNOG)

- Intermediate program proposals
 - Integration of proposals
 - Validation of proposals
- Programming

Goal: allocate resources among programs across a mid -range time horizon that best achieves the planning objectives. (Output: POM)

- Budget submission and legitimization
- Budgeting

Goal: justify the programming decisions in a format that serves the process of legitimization. (Output: PB)

- Budget and program execution
- Execution

Goal: implement the policy direction and create the desired capabilities.

DPG = Defense Planning Guidance NSP = Navy Strategic Plan
 CNOG = CNO's POM Guidance
 POM = Program Objectives Memorandum PB = President's Budget

Figure 2. Goals of PPBE. Source: D. Kaczorowski (PowerPoint slides, May 19, 2020).

B. ADAPTIVE ACQUISITION FRAMEWORK

The AAF was developed to allow more flexibility in the acquisition process. (AcqNotes. (n.d.-b)). This framework allows the program manager (PM) to determine what needs to be done and determine the best utilization of the pathways. The main tenets of the AAF are to simplify the acquisition policy, tailor acquisition approaches, empower PMs, provide data-driven analytics, actively manage risk, and emphasize sustainment (Defense Acquisition University [DAU], n.d.-c). This means that PMs can create smooth transitions at various points from one pathway to another (DAU, n.d.-c). This also allows the PMs the ability to identify and recommend the regulatory information and documentation for approval by the milestone decision authority (MDA) and other decision authorities. The AAF does not allow the PMs to waive any statutory requirements unless documented



elsewhere; this reduces double work and streamlines the process while still having required documentation. PMs can utilize the Adaptive Acquisition Framework Document Identification (AAFDID) and DODI 5000.85 *Major Capability Acquisition* to assist in determining statutory and regulatory requirements as well as timelines (DAU, n.d.-b). PMs also use DODI 5000.02 *Operation of the Adaptive Acquisition Framework* and DODI 5000.87 *Operation of the Software Acquisition Pathway* for software purposes (DAU, n.d.-a). The DODI 5000.02 states:

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

Figure 3 shows the AAF pathways with each phase. The Major Capability Acquisition pathway has the materiel solutions analysis, technology maturation and risk reduction (TMRR), engineering and manufacturing development, and production and deployment phases. The software pathway only has two phases: planning and execution.



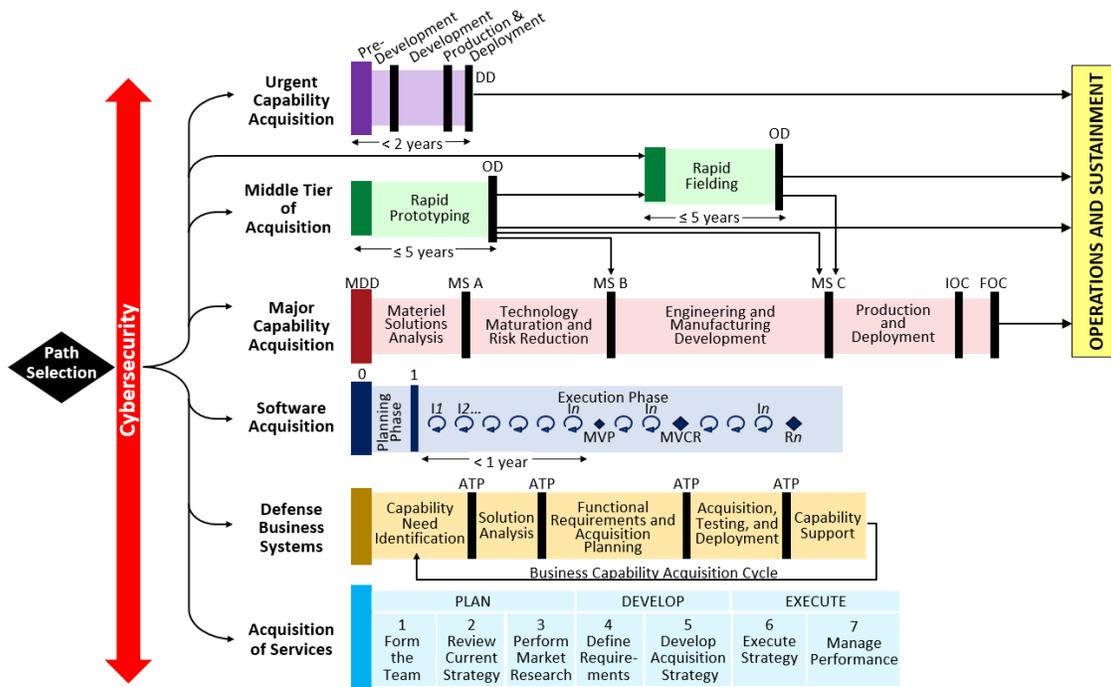


Figure 3. Adaptive Acquisition Framework. Source: DAU (n.d.-a).

There are six pathways that all include the need for cybersecurity. The Urgent Capability Acquisition is used to support fielding of capability for warfighter requirements rapidly in less than 2 years. With respect to Fiscal Year (FY) 2020, this acquisition pathway cannot exceed \$3.065 billion in procurement or \$525 million in research, development, and test and evaluation. This streamlines the required documents to acquire the capability within 2 years (DOD, 2020a).

The Middle Tier Acquisition (MTA) pathway is used to field prototypes within a program with proven technologies. This is typically done to rapidly prototype, experiment, or demonstrate new capabilities. The policy used for this pathway is DODI 5000.80 *Operation of the Middle Tier of Acquisition (MTA)*. MTA intends for production to begin within 6 months and must be completed within 5 years. To do this, the JCIDS process and some procedures in DOD Directive 5000.01 are not required unless specified. Instead, the PM can determine the reviews, assessments, and documentation needed to support the program and the fielding (DOD, 2020a).



Many of the previous acquisition development timelines and processes became the Major Capability Acquisition pathway. The policy used for this pathway is DODI 5000.85 *Major Capability Acquisition*. This pathway is used for major systems, major defense programs, and complex acquisitions that provide lasting capability. This is used to acquire and modernize military programs and is the base pathway that others can smoothly branch to and from as needed. The DODI 5000.02 states,

These acquisitions typically follow a structured analyze, design, develop, integrate, test, evaluate, produce, and support approach. This process is designed to support major defense acquisition programs, major systems, and other complex acquisitions. Acquisition and product support processes, reviews, and documentation will be tailored based on the program size, complexity, risk, urgency, and other factors. Software-intensive components may be acquired via the software acquisition pathway, with the outputs and dependencies integrated with the overall major capability pathway. (DOD, 2020a, p. 13)

The software acquisition pathway is used to deliver software capability in a rapid and iterative way to the user. This includes any software intensive system, component, or subsystem. According to DODI 5000.02,

This pathway integrates modern software development practice such as Agile Software Development, Development, Security, and Operations (DevSecOps), and Lean Practices. Small cross-functional teams that include operational users, developmental and operational testers, software developers, and cybersecurity experts leverage enterprise services to deliver software rapidly and iteratively to meet the highest priority user needs. These mission-focused, government-industry teams leverage automated tools for iterative development, builds, integration, testing, production, certification, and deployment of capabilities to the operational environment. (DOD, 2020a, p. 14)

The AAF put into place the software pathway to align more with the current industry standard. The policy used for this pathway is DODI 5000.87 *Operation of the Software Acquisition Pathway*. The software pathway has a few policies that set it apart. If the definition for the defense business system (DBS) software is met, then the software pathway should not be utilized and the DBS pathway should be utilized. Programs utilizing the software acquisition pathway are not treated as major defense acquisition programs (OUSD[A&S], 2020). Additionally, the DODI 5000.87 denotes that any program must



demonstrate viability and effectiveness for operations use within 1 year of the funds being obligated. The new capabilities will be delivered at least annually following delivery, with more frequent updates when possible (OUSD[A&S], 2020). The software teams should use teams consisting of government and contractors utilizing modern iterative software development, tools and techniques, and design processes that are human-centered in order to iteratively deliver software to meet user needs. Utilizing agile, lean, and DevSecOps practices, end users will be actively involved with the development to ensure maximum mission impact. On the software pathway, it is recommended to leverage existing enterprise services instead of creating unique ones for each program. Cybersecurity, software assurance, and testing and evaluation are all continually assessed with mitigation actions executed regularly. All intellectual property (IP) is considered at the start and throughout the life cycle and polices ensure program strategies align with competitive options and investment returns. To accelerate timelines, all developmental/operational testing, security certifications, and safety assessments are integrated throughout the process and automated when possible (OUSD[A&S], 2020). Two phases make up the software acquisition pathway. The first is the planning phase. DODI 5000.87 states the purpose of the planning phase “is to better understand the users’ needs and plan the approach to deliver software capabilities to meet those needs” (OUSD[A&S], 2020). The other is the execution phase. The DODI 5000.87 further states, “the purpose of this phase is to rapidly and iteratively design, develop, integrate, test, deliver, and operate resilient and reliable software capabilities that meet the users’ priority needs” (OUSD[A&S], 2020). There is a key limitation within this pathway in that it is only applicable for acquisition efforts that are software development efforts.

The DBS acquisition pathway is used to acquire capabilities and supporting business systems. These provide solutions related to financial, contracting, logistics, planning and budgeting, installations management, human resources management, and training and readiness systems. This pathway aligns with commercial products, existing government solutions, and commercial software with minor/limited modifications (DOD, 2020a). The policy used for this pathway is DODI 5000.75 *Business Systems Requirements and Acquisition*.



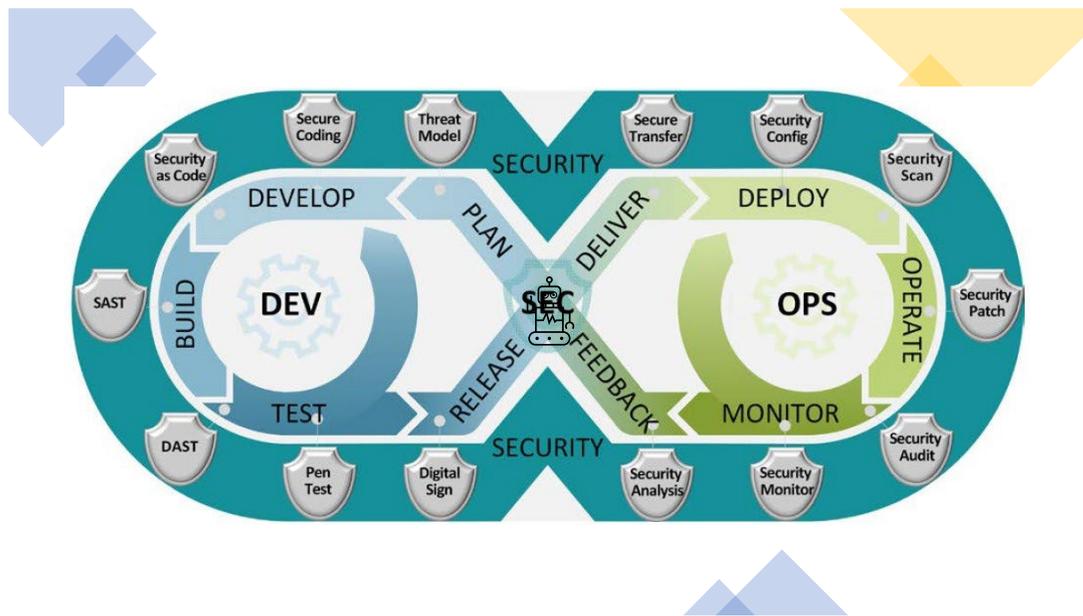
The last pathway is Defense Acquisition of Services, where the private sector is leveraged to provide services related to knowledge, construction, equipment, logistics, electronics, communications, facilities, medical, transport, and research and development. This includes a planning phase, a development phase, and an execution phase. Within the three phases, seven steps guide the process for acquiring services (DOD, 2020a). The policy used for this pathway is DODI 5000.74 Defense Acquisition of Services.

C. DEVSECOPS, SOFTWARE FACTORY, AND CONTINUOUS ITERATIVE DEVELOPMENT

Section B covered an overview of software acquisition pathway with the AAF. In section C DevSecOps, software factories, and continuous iterative development is explained and defined in order to fully understand the concepts the BA-08 initiative is utilizing and to link the AAF software pathway to current industry standards.

DevSecOps, which stands for Development, Security, and Operation, is an industry standard (McQuade et al., 2019. p S112). There are resources that are available—including a DAU course, which explains in-depth how DevSecOps can be utilized to meet mission requirements (Skertic, 2020). Throughout the software acquisition process a plan is put into place, developed, tested, and built. This plan is secured and deployed into operation where it is monitored with feedback and is done continuously in the DevSecOps process. Looking at the surface level, DevSecOps is explained in Figure 4; this shows the plan, develop, build, test loop as well as the release/deliver, deploy, monitor, feedback loop. Each step integrates different aspects of cybersecurity (shown on the outer section of the figure) testing, scans, models, audits, and patches throughout the system to ensure it is secure.





Note: SAST is Static application security testing and DAST is dynamic application security testing

Figure 4. DevSecOps. Source: Lam, T., & Chaillan, N. (2019, p. 19).

DODI 5000.87 defines DevSecOps as

an organizational software engineering culture and practice that aims at unifying software development, security, and operations. The main characteristic of DevSecOps is to automate, monitor, and apply security at all phases of the software life cycle: plan, develop, build, test, release, deliver, deploy, operate, and monitor. In DevSecOps, testing and security are shifted left through automated unit, functional, integration, and security testing—this is a key DevSecOps differentiator since security and functional capabilities are tested and built simultaneously. (OUSD[A&S], 2020, p. 20)

The main takeaway for DevSecOps is to stay current, cyber secure, and operationally relevant, the software must continually receive updates on a time scale of weeks to months instead of years.

The utilization of the software factory is important as well. This is highlighted in the Defense Science Board task force on the design and acquisition of software for defense systems (Defense Science Board, 2018). The task force determined that the DOD could utilize best practices of iterative development including in mission critical systems. They

made seven recommendations, but all had the importance of a software factory as the base concept (Defense Science Board, 2018). A software factory is “low-cost, cloud-based computing used to assemble a set of tools enabling developers, users, and management to work together on a daily tempo” (Defense Science Board, 2018). The first recommendation is for a common list of source selection criteria to be created for the DOD to be able to evaluate software factories. The next step is for contractors to have to show they can construct a software factory with a pass–fail metric. This allows the DOD to utilize the iterative development expertise during source selection, which leverages the talent efficiently (Defense Science Board, 2018).

Another recommendation linked to DevSecOps is continuous iterative development. This includes agile concepts and DevSecOps where software is continuously updated through sustainment because software is never done. This sustainment is part of the recommendations that software is immortal and, therefore, sustainment does not end; it continues to develop. The Defense Science Board states in the *Design and acquisition of software for defense systems*,

Requests for proposals (RFPs) for acquisition programs entering risk reduction and full development should specify the basic elements of the software framework supporting the software factory, including code and document repositories, test infrastructure (e.g., gtest), software tools (e.g., fuzz testing, performance test harnesses), check-in notes, code provenance, and reference and working documents informing development, test, and deployment. (Defense Science Board, 2018)

This is what should also be in the source selection criteria. These are three of seven recommendations related to modern software development techniques.

D. APPROPRIATION CATEGORIES, FEDERAL FUNDS, AND BUDGET ACTIVITIES

To understand what BA-08 funding does within the software pathway of the AAF (described in Chapter II Section B), there needs to be an understanding of the specific types or colors of money used which the DOD calls appropriation categories. There are five appropriation categories in the DOD—research, development, test, and evaluation (RDT&E); Procurement; Operation and Maintenance (O&M); Military Personnel



(MILPERS); and Military Construction (MILCON) (DAU. (n.d.-d). Appropriations limit amounts that agencies can obligate over a specific timeframe. The enactment of authorizing and appropriating legislation by an act of Congress permits federal agencies to incur obligations and pay from the treasury (DAU. (n.d.-d). This is how budget authority is given. Each appropriation category is divided further into appropriation accounts with a unique code for each specific designation of federal funds. Each code is then further broken into budget activities for each appropriation. These BAs identify the purpose, project, or type of activity (AcqNotes, n.d.-d).

RDT&E appropriations are used to research and develop materials, equipment, and computer application software. Testing and evaluation (T&E) is also funded, including everything needed to test as well as the initial operational test and evaluation (IOT&E) and live-fire test and evaluation (LFT&E). Research and development (R&D) program funds can be used to fund operations of R&D activities. RDT&E funds are provided incrementally and must be used within 2 years (AcqNotes. (n.d.-c)). RDT&E funds are broken into budget activities 01 through 07 (shown in Table 1); the pilot program that is being researched is budget activity 08.

Table 1. Budget Activities for RDT&E Appropriation Type. Adapted from AcqNotes. (n.d.-d).

Type of appropriation	BA#	BA name
RDT&E	01	Basic research
	02	Applied research
	03	Advanced technology development
	04	Advanced component development and prototypes
	05	System development and demonstration
	06	RDT&E management support
	07	Operational system development
	08	Software and Digital Technology Pilot Program



Once a program has been approved for production, procurement appropriations are used. For the production approval to occur there should be a low-rate initial production (LRIP) of specified quantities. Additionally, all costs required for delivery of an operationally usable or storable product are included through delivery. These funds are given in full and are available for 3 years with ships funding available for 5 years (AcqNotes, n.d.-c).

O&M appropriations are funded annually to be used within 1 year. O&M funds travel, civilian salary, small construction, training and education, base operations support, stock funds, depot maintenance, and operating military forces (AcqNotes, n.d.-c). O&M funds often support operation and sustainment (O&S) costs and activities.

MILPERS are appropriations for military personnel (active and retired) as well as reserve forces. This covers salaries and compensation that is funded annually and must be used within 1 year (AcqNotes, n.d.-c).

MILCON is funded fully with funds available for 5 years. Bases, storage facilities, medical clinics, schools, maintenance facilities, libraries, and military family housing are funded through MILCON appropriations (AcqNotes, n.d.-c).

E. SOFTWARE ACQUISITION PROBLEM AND SWAP BACKGROUND

The purpose of understanding Big “A” acquisition (Chapter II Section A), the AAF (Chapter II section B), and the appropriation categories (Chapter II section D) is to be able to evaluate how these decision support systems work together to serve the current need for software development and procurement efforts. The traditional acquisition strategy became the Major Capability Acquisition pathway in the AAF. The types of appropriations can be explained using this pathway. Figure 5 shows the types of funds associated with each phase in the process; RDT&E money is used prior to milestone C, the procurement money is used following milestone C, and operation and sustainment funds are used following full operational capability (FOC).



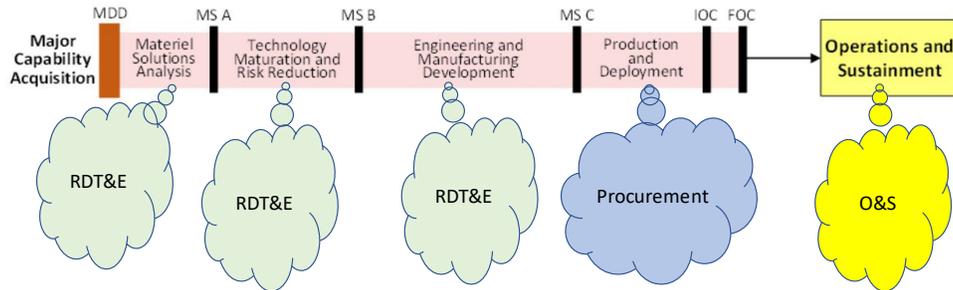


Figure 5. Software Acquisition and the Color of Money. Source: J. Dunlap (Powerpoint slides, undated).

A traditional acquisition program that requires development and integration activities will typically follow the Major Capability Acquisition pathway and may take years to complete. In 2019, prior to the AAF, the SWAP reported “the current approach to software development is broken and is a leading source of risk to DOD: it takes too long, is too expensive, and exposes warfighters to unacceptable risk by delaying their access to tools they need to ensure mission success” (McQuade et al., 2019). The risk was due to the software tools needed for mission success not being readily accessible with access taking too long (McQuade et al., 2019). For software to be more easily accessed, the AAF software pathway, which allows for continuous development, was implemented. Figure 6 shows the two phases (planning and execution) utilized in the software acquisition pathway. This shows the activities that enable iterative software development rapidly through delivery.

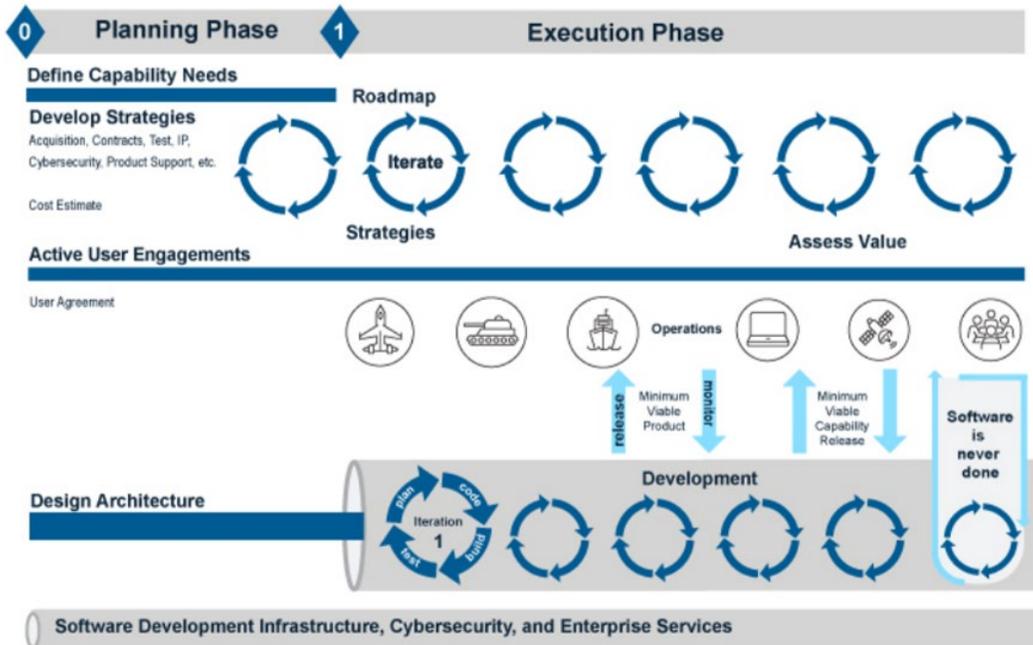


Figure 6. The Software Acquisition Pathway. Source: OUSD (A&S, 2020).

The interesting concept Figure 6 illustrates is that software is never complete and delivery is never final leading to an appropriation conundrum. For funding to move into operations and sustainment funding, the product must be maintained; software being continually developed as described in section C and the software pathway of the AAF described in section B does not meet that criterion.

The Defense Innovation Board (DIB) worked on a study and engaged Congress, the DOD, contractors, the public, and federally funded research and development centers (FFRDCs) to have an active and iterative discussion on how to leverage the commercial software industry for the DOD. A 292-page study on software acquisition and practices (SWAP) provided a way for recommendations to be able to be utilized within the DOD (McQuade et al., 2019). This study showed that many recommendations previously set forth were not implemented due to many obstacles, and this study attempted to address how to overcome the obstacles—not just describe what should be done (McQuade et al., 2019).

The SWAP study found three themes that encompassed their recommendations: “1. Speed and cycle time are the most important metrics for software. 2. Software is made by people and for people, so digital talent matters. 3. Software is different than hardware (and not all software is the same)” (McQuade et al., 2019, p. vii–viii).

What speed and cycle time means is that by developing, securing, and deploying software capabilities quickly, risk is reduced and the warfighter has software that is matched to the current needs. On the contrary, software development using the “waterfall” process may take years to develop requirements, select who would do the work, and then execute the requirements. By the time this process was complete, the warfighter was at risk and had new needs. This means that a faster process allows corrections to take place quickly and more often, which gives a tactical advantage and improves reliability (McQuade et al., 2019).

Digital talent matters and is not being utilized effectively within the DOD. The 2019 SWAP report points out that “talented software developers and acquisition personnel with software experience are often put in jobs that do not allow them to make use of those talents, particularly in the military where rotating job assignments may not recognize and reward the importance of software development experience” (McQuade et al., 2019). The DOD needs to harness the talent of civilians and government personnel in a more effective way (McQuade et al., 2019).

There is a big difference between software and hardware, and the way in which the DOD acquires hardware does not translate effectively to acquiring software. Hardware may have firm specifications, is procured to those specifications, is maintained by upgrades over long periods, and is upgraded by starting the process over. This does not work the same with software. The Defense Innovation Board states in the 2019 SWAP study,

Software should be developed, deployed, and continuously improved using much different cycle times, support infrastructure, and maintenance strategies. Testing and validation of software is also much different than for hardware, both in terms of the ability to automate but also in the potential vulnerabilities found in software that is not kept up to date. (McQuade et al., 2019)



This theme is addressed with in the AAF software pathway (Figure 6) where software is identified as never being done.

These three themes fall across the responsibility of multiple stakeholders who must all work together to have a legal, effective, and rapid software acquisition. There are four main lines of effort that are recommended by the SWAP study:

- A. (Congress and DOD) Refactor statutes, regulations, and processes for software, enabling rapid deployment and continuous improvement of software to the field and providing increased insight to reduce the risk of slow, costly, and overgrown programs. The management and oversight of software development and acquisition must focus on different measures and adopt a quicker cadence.
- B. (OSD and the Services) Create and maintain cross-program/cross-Service digital infrastructure that enables rapid deployment, scaling, testing, and optimization of software as an enduring capability; manage it using modern development methods; and eliminate the existing hardware-centric regulations and other barriers.
- C. (The Services and OSD) Create new paths for digital talent (especially internal talent) by establishing software development as a high-visibility, high-priority career track—with specialized recruiting, education, promotion, organization, incentives, and salary—and increasing the level of understanding of modern software within the acquisition workforce.
- D. (DOD and industry) Change the practice of how software is procured and developed by adopting modern software development approaches, prioritizing speed as the critical metric, ensuring cyber protection is an integrated element of the entire software life cycle, and purchasing existing commercial software whenever possible. (McQuade et al., 2019)

This defined the legal aspects that need to be updated, the change in the PPBE process that needs to be addressed, the AAF to be developed, and pilot programs to begin. In 2019, the SWAP identified two or three recommendations that were important to each of the four main lines of effort and are summarized in Table 2.



Table 2. Ten Most Important Things to Do (Starting Now!). Source: McQuade et al. (2019, p. xv).

Line of Effort A (Congress and OSD): Refactor statutes, regulations, and processes for software	
A1	Establish one or more new acquisition pathways for software that prioritize continuous integration and delivery of working software in a secure manner, with continuous oversight from automated analytics
A2	Create a new appropriation category for software capability delivery that allows (relevant types of) software to be funded as a single budget item, with no separation between RDT&E, production, and sustainment
Line of Effort B (OSD and Services): Create and maintain cross-program/cross-Service digital infrastructure	
B1	Establish and maintain digital infrastructure within each Service or Agency that enables rapid deployment of secure software to the field, and incentivize its use by contractor
B2	Create, implement, support, and use fully automatable approaches to testing and evaluation (T&E), including security, that allow high-confidence distribution of software to the field on an iterative basis
B3	Create a mechanism for Authorization to Operate (ATO) reciprocity within and between programs, Services, and other DOD agencies to enable sharing of software platforms, components, and infrastructure and rapid integration of capabilities across (hardware) platforms, (weapon) systems, and Services
Line of Effort C (Services and OSD): Create new paths for digital talent (especially internal talent)	
C1	Create software development units in each Service consisting of military and civilian personnel who develop and deploy software to the field using DevSecOps practices
C2	Expand the use of (specialized) training programs for [chief information officers] (CIOs), [service acquisition executives] (SAEs,) PEOs, and PMs that provide (hands-on) insight into modern software development (e.g., Agile, DevOps, DevSecOps) and the authorities available to enable rapid acquisition of software
Line of Effort D (DOD and industry): Change the practice of how software is procured and developed	
D1	Require access to source code, software frameworks, and development toolchains—with appropriate IP rights—for DOD-specific code, enabling full security testing and rebuilding of binaries from source
D2	Make security a first-order consideration for all software-intensive systems, recognizing that security-at-the-perimeter is not enough
D3	Shift from the use of rigid lists of requirements for software programs to a list of desired features and required interfaces/characteristics to avoid requirements creep, overly ambitious requirements, and program delays



Recommendation A2 in Table 2 is directly linked to the creation of the BA-08 pilot program. Table 3 explains the stakeholders involved along with Congress and the laws and policies related to the software problem of appropriation types being misaligned with the current warfighter needs and modern software development.

Table 3. Primary Recommendation A2: New Appropriation Category.
Source: McQuade et al. (2019, p. S4).

Line of Effort	Refactor statutes, regulations, and processes for software.
Recommendation	Create a new appropriation category for software capability delivery that allows (relevant types of) software to be funded as a single budget item, with no separation between RDT&E, production, and sustainment.
Stakeholders	A&S, HAC-D/SAC-D, HASC/SASC, USD(C), CAPE, SAE, Service FM & PA&E, FASAB, OMB
Background	Current law, regulation, and policy treat software acquisition as a series of discrete, sequential steps; accounting guidance treats software as a depreciating asset. These processes are at odds with software being continuously updated to add new functionality, and they create significant delays in fielding user-needed capability.
Desired State	Appropriations for software and software-intensive programs use a Major Force Program (MFP) category that provides a single budget to support full life cycle costs of software, including development, procurement, assurance, deployment, and continuous improvement. Programs are better able to prioritize how effort is spent on new capabilities versus fixing bugs/vulnerabilities, improving existing capabilities, etc. Such prioritization can be made based on warfighter/user needs, changing mission profiles, and other external drivers, not constrained by available sources of funding.
Role of Congress	This should become the primary pathway that Congress uses to fund software and software-intensive programs and should provide Congress with the insight required to oversee software projects that move at a much faster pace than traditional HW programs, with traditional metrics and milestones replaced by more software-compatible measures of progress.

The SWAP goes into even more detail with draft implementations plans, input from concept paper recommendations, SWAP working group inputs, and recommendations from previous studies (including Section 809 January 2019 and General Accounting Office [GAO] reports) that support the recommendation.



Big “A” acquisition, AAF, DevSecOps, appropriation categories, and federal funding are factors that influence the software development and acquisition challenges. This chapter focused on the background knowledge needed to understand how the updated software pathway of the AAF requires the PPBE process to also be updated within Big “A” acquisition to not be at odds with each other. The explanation of what a BA is within the appropriation type also provides the input of why the pilot program is referred to as BA-08. The information discussed will be used to understand what the BA-08 pilot program is as described in Chapter III, Literature Review, and analyzed in Chapter IV, Analysis.



III. LITERATURE REVIEW

The BA-08 pilot program is an attempt to address recommendations to mitigate the software problem the DOD faces today (DOD, 2020b, p. 2). As part of the program requirements, the Office of the Secretary of Defense (OSD) must submit quarterly reports with qualitative and quantitative results so Congress can judge the effectiveness of single appropriation for software acquisition initiatives (DOD, 2021a, p. 4). Metrics are collected based on financial measures as well as performance measures. Financial measures are observed to measure impact on program decision-making and management overhead (DOD, 2020b, p. 8). Performance metrics are observed to assess the impact on overall delivery, efficiency and quality of work being delivered (DOD, 2020b, p. 8). The BA-08 program team has provided several reports that detail the purpose of the program and the background on how it was implemented. The chosen reports for this section will go into detail about the pilot program's background and purpose. The reports in the subsequent section analyze the qualitative and quantitative data in the later reports.

A. REPORT TO CONGRESS: JOINT EXPLANATORY STATEMENT ACCOMPANYING THE DEPARTMENT OF DEFENSE APPROPRIATIONS ACT, 2021 (PUBLIC LAW 116-260): INITIAL REPORT FOR SOFTWARE AND DIGITAL TECHNOLOGY PILOT PROGRAM, APRIL 2021

In the report to Congress titled *Joint Explanatory Statement accompanying the Department of Defense Appropriations Act, 2021 (Public Law 116-20)* from April 2021, the Office of the Under Secretary of Defense for Acquisition and Sustainment (OUSD[A&S]) detailed the overview and background of the origins of the software and digital technology pilot program. The program is an attempt to remedy the ongoing software problem previously detailed in Chapter II. The DOD has conducted several studies and has provided numerous recommendations for how the United States can compete with industry and with the United States' adversaries when it comes to software development and acquisition. Table 4 is from the 2019 SWAP study that lists previous reports focused on improving software acquisition and practices within the DOD with a



summary to highlight the major focus of each individual report (McQuade et al., 2019, p. 2).

Table 4. Summary of Previous Reports. Source: (McQuade et al., 2019, pp. 19–21)

Date	Org	Short title/ Summary of contents
Jul'82	DOD	<p>Joint Service Task Force on Software Problems 37 pp + 192 pp Supporting Information (SI); 4 major recommendations.</p> <p>The opportunities and problems posed by computer software embedded in DOD weapon systems were investigated by a joint Service task force. The task force members with software experience combined existing studies with the observations of DOD project managers. The task force concluded that software represents an important opportunity in regard to the military mission. Further, it was concluded that technological excellence in software is an important factor in maintaining U.S. military superiority, but that many problems facing DOD in software endangers this superiority.</p>
Sep'87	DSB	<p>Task Force on Military Software 41 pp + 36 pp SI; 38 recommendations</p> <p>The task force reviewed current DOD initiatives in software technology and methodology, including the Ada effort, the STARS program, DARPA's Strategic Computing Initiative, the Software Engineering Institute (SEI), and a planned program in the Strategic Defense Initiative. The five initiatives were found to be uncoordinated, and the task force recommended that the Undersecretary of Defense (Acquisition) establish a formal program coordination mechanism for them. In spite of the substantial technical development needed in requirements setting, metrics and measures, tools, etc., the Task Force was convinced that the major problems with military software development were not technical problems, but management problems. The report called for no new initiatives in the development of the technology, some modest shift of focus in the technology efforts underway, but major reexamination and change of attitudes, policies, and practices concerning software acquisition.</p>
Dec'00	DSB	<p>Task Force on Defense Software 36 pp + 10 pp SI; 6 major recommendations</p> <p>The Task Force determined that the majority of problems associated with DOD software development programs are a result of undisciplined execution. Accordingly, the Task Force's recommendations emphasized a back-to-the-basics approach. The</p>



Date	Org	Short title/ Summary of contents
		Task Force also noted that numerous prior studies contain valid recommendations that could significantly and positively impact DOD software development programs. The fact that the majority of these recommendations have not been implemented should lead to efforts designed to understand the inhibitors preventing these recommendations from being enacted.
2004	RAND	<p>Attracting the Best: How the Military Competes for Information Technology Personnel 149 pp; no explicit recommendations</p> <p>Burgeoning private-sector demand for [information technology] (IT) workers, escalating private sector pay in IT, growing military dependence on IT, and faltering military recruiting all led to a concern that military capability was vulnerable to a large shortfall in IT personnel. This report examined the supply of IT personnel compared to the military's projected future manpower requirements. It concluded that IT training and experience, augmented by enlistment bonuses and educational benefits as needed, seemed sufficient to ensure an adequate flow of new recruits into IT.</p> <p>However, sharp increases in military IT requirements had the potential to create difficulties.</p>
Feb'08	NCMA	<p>Generational Inertia: An Impediment to Innovation? 7 pp; no explicit recommendations</p> <p>This article cites data to the effect that approximately 50% of the acquisition workforce is within 5 years of retirement. Rather than being a problem, the article feels that retirement of senior contracting specialists could effectively lead to acquisition reform: "Senior contracting specialists' resistance to change and indifference to professional development is the elephant the room that acquisition reformers are unwilling to acknowledge."</p>
Mar'09	DSB	<p>Task Force on Department of Defense Policies and Procedures for the Acquisition of Information Technology 68 pp + 2 pp dissent + 15 pp SI; 4 major recommendations with 13 sub recommendations</p> <p>The primary conclusion of the task force is that the conventional DOD acquisition process is too long and too cumbersome to fit the needs of the many IT systems that require continuous changes and upgrades. The task force recommended a unique acquisition system for information technology.</p>
2010a	NRC	<p>Achieving Effective Acquisition of Information Technology in the Department of Defense 164 pp + 16 major recommendations</p> <p>This study board was asked to assess the efficacy of the DOD's acquisition and test and evaluation (T&E) processes as applied to</p>



Date	Org	Short title/ Summary of contents
		<p>IT. The study concluded that the DOD is hampered by “a culture and acquisition-related practices that favor large programs, high-level oversight, and a very deliberate, serial approach to development and testing (the waterfall model).” This was contrasted with commercial firms, which have adopted agile approaches that focus on delivering smaller increments rapidly and aggregating them over time to meet capability objectives. Other approaches that run counter to commercial, agile acquisition practices include “the DOD’s process-bound, high-level oversight [that] seems to make demands that cause developers to focus more on process than on product, and end-user participation often is too little and too late.”</p>
2010b	NRC	<p>Critical Code: Software Producibility for Defense 148 pp + 15 major recommendations</p> <p>This study was charged to examine the nature of the national investment in software research and ways to revitalize the knowledge base needed to design, produce, and employ software intensive systems for tomorrow’s defense needs. The study notes the continued reliance by the DOD on software capabilities in achieving its mission and notes that there are important areas where the DOD must push the envelope beyond mainstream capability. In other areas, however, the DOD benefits by adjusting its practices to conform to government and industry conventions, enabling it to exploit a broader array of more mature market offerings.</p>
Jul’16	CRS	<p>The Department of Defense Acquisition Workforce: Background, Analysis, and Questions for Congress 14 pp; no explicit recommendations</p> <p>The increase in the size of the acquisition workforce has not kept pace with increased acquisition spending, which has signified an increase not only in the workload but also in the complexity of contracting work. This report summarized four Congressional efforts aimed at enhancing the training, recruitment, and retention of acquisition personnel.</p>
Dec’16	CNA	<p>Independent Study of Implementation of Defense Acquisition Workforce Improvement Efforts 147 pp + 30 pp SI; 21 major recommendations</p> <p>This report examines the strategic planning of the Department of Defense regarding the acquisition workforce (AWF). The study found significant improvements in several areas that “not only reversed the decline in AWF capacity from the 1990s, but also reshaped the AWF by increasing the number of early and mid-career personnel.”</p>



Date	Org	Short title/ Summary of contents
Feb'17	SEI	<p>DOD's Software Sustainment Study Phase I: DOD's Software Sustainment Ecosystem 101 pp; 5 major recommendations</p> <p>Since the time in the early 1980s when software began to be recognized as important to the DOD, software sustainment has been considered a maintenance function. After almost four decades, the DOD is also at a tipping point where it needs to deal with the reality that software sustainment is not about maintenance, but rather it is about continuous systems and software engineering for the life cycle to evolve the software product baseline. This report recommends changing that paradigm to enable the innovation needed to address a rapidly changing technology environment, specifically through investments in human capital, better performance measurement of software sustainment, and better visibility for the software portfolio.</p>
Mar'17	BPC	<p>Building a F.A.S.T. Force: A Flexible Personnel System for a Modern Military 82 pp + 15 pp SI; 4 major themes with 39 recommendations</p> <p>This study describes today's DOD personnel system as out of step with contemporary needs and issues: "the current system is typically poorly coordinated, lacks accountability, is unable to quickly obtain specialized talent, and fosters a groupthink mentality within the force." It concludes that an effective personnel system has to build a force that is adaptable to new threats as they arise and technically proficient (among other characteristics).</p>
Feb'18	DSB	<p>Design and Acquisition of Software for Defense Systems 28 pp + 22 pp SI; 7 (high-level) recommendations + ~32 sub recommendations</p> <p>The Task Force assessed best practices from commercial industry as well as successes within the DOD. Commercial embrace of iterative development has benefited bottom lines and cost, schedule, and testing performance, while the Department and its defense industrial base partners are hampered by bureaucratic practices and an existing government-imposed reward system. The Task Force concluded that the Department needs to change its internal practices to encourage and incentivize new practices in its contractor base. The assessment of the Task Force is that the Department can leverage best practices of iterative development even in its mission-critical software systems.</p>
2018	2016 NDAA	<p>Section 809 Panel—Streamlining and Codifying Acquisition 1,275 pp; 93 recommendations</p> <p>The Section 809 Panel was established by Congress in the FY 2016 NDAA to address issues with the way the DOD buys what it</p>



Date	Org	Short title/ Summary of contents
		needs to equip its warfighters. The panel published an Interim Report and a three-volume Final Report, containing a total of 93 recommendations aimed at changing the overall structure and operations of defense acquisition both strategically and tactically. Some changes hold potential for immediate effect, such as those that remove unnecessary layers of approval in the many steps contracting officers and program managers must take and those that remove unnecessary and redundant reporting requirements. Other changes require a large shift in how the system operates, such as buying readily available products and services in a manner similar to the private sector and managing capabilities from a portfolio, rather than program, perspective.
Apr'19	DIB	<p>Software Is Never Done; Refactoring the Acquisition Code for Competitive Advantage (this document) 78 pp + 207 pp SI; 4 main lines of effort, 10 primary and 0x10 additional recommendations</p> <p>In this report, we focus on three overarching themes: (1) speed and cycle time are the most important metrics for managing software; (2) software is made by people and for people, so digital talent matters; and (3) software is different than hardware (and not all software is the same). We provide a set of major recommendations that focus on four main lines of effort: (A) refactoring statutes, regulations, and processes specifically for software—including acquisition, development, assurance, deployment, and maintenance—to remove hardware centric bottlenecks while providing more insight and better oversight; (B) creating and maintaining interoperable (cross-program/cross-Service) digital infrastructure to enable continuous and rapid deployment, scaling, testing, and optimization of software as an enduring capability; (C) creating new paths for digital talent and increasing the level of understanding of modern software within the acquisition workforce; and (D) changing the practice of how software is procured and developed by adopting modern software development approaches.</p>

Note. DSB = Defense Science Board ; NCMA = National Contract Management Association; NRC = Nuclear Regulatory Commission; CRS = Congressional Research Service; CNA = Center for Naval Analysis; BPC = Building Partner Capacity; NDAA = National Defense Authorization Act

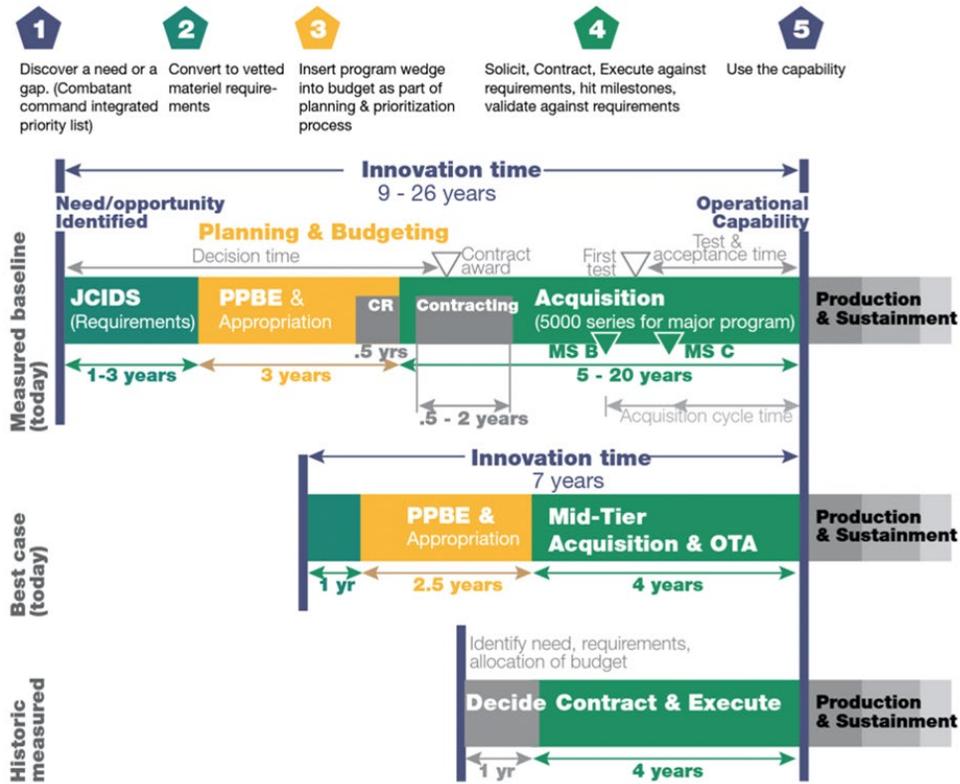
The topic of software has made such an impact within the DOD that the 2018 Nation Defense Strategy highlights the need to shift focus away from developing new technology specific for DOD purposes towards integrating commercial technology and adapting it to warfighter needs (White House, 2018). The constituents of this pilot studied



the Hudson Institute Center for Defense Concepts and Technology report, which presented a historic basis for single appropriation in acquisition. A 2021 report has a visual detailing the processes governing the DOD’s model for delivering capability process that has a timeline for Major Capability Acquisition, a best case for a new capability utilizing the MTA framework, and a historical baseline from DOD acquisition practices in the 1950s (Greenwald & Patt, 2021, p. 41). Figure 7 illustrates the Planning, Programming, and Budgeting System (PPBS) / Planning, Programming, Budgeting, and Execution (PPBE) processes, and the JCIDS requirements processes did not exist in 1961 and 2003 respectively (Greenwald & Patt, 2021, p. 40). The requirements of each of those processes restrict flexibility on a program’s ability to move funds. As seen on the measured baseline line, the average innovation time is between 9 and 26 years. That timeline is 2 to 5 times greater than the historical average of 5 years. Additionally, more stringent and timely contracting processes have been implemented since that time, and the processes were measured in months instead of years as it is today. Industry and the DOD’s adversaries do not seem to be having the same delay in responsiveness in software acquisition (McQuade et al., 2019, p. v). James Vincent, a senior reporter for the technology centered newsletter, *The Verge*, highlighted this in his 2017 article centered around artificial intelligence and its repercussions affecting world powers,

Our adversaries are already doing this. China actively leverages its private industry to develop national security software (particularly in AI), recruits top students under the age of 18 to work on “intelligent weapons design,” and poaches U.S. software talent directly from the United States. In Russia, Vladimir Putin has told students, that “artificial intelligence is the future, not only for Russia, but for all humankind. . . . Whoever becomes the leader in this sphere will become the ruler of the world. (Vincent, 2017)





Processes governing DoD's model for delivering capability delivery process: contemporary baseline, best case, and historical.

Figure 7. DOD Process Changes over Time. Source: Greenwald & Patt (2021, p. 40).

The DOD is looking to mitigate their software problem by taking a deeper look into how the JCIDS, PPBE, and DAS can be more effectively integrated (DOD, 2021a, p. 5). To do this, the DOD must ascertain some key software considerations. They must look at the Big “A” and their processes, congressional oversight, and software as its own entity. The acquisition process (DAS) and the budget process (PPBE) need to align. The AAF has allowed flexibility in acquisition processes and has allowed for a more timely delivery of capabilities. The PPBE process has not implemented a process and still is tailored towards hardware procurement. Software should not be treated as hardware; it is constantly evolving, and the speed at which it evolves mandates a different approach (DOD, 2021a, p. 6). Current practices in congressional oversight are also ill-suited for software acquisition tracking. Their current structure for budget requests and reporting systems are



hindering the evolving nature that software operates in (DOD, 2021a, p. 6). The BA-08 program is looking to explore reform in the PPBE process by evaluating the benefits, disadvantages, and unknowns of using a single appropriation for software acquisition efforts within the DOD.

After considering the extensive reporting on the issues plaguing software acquisition, Section 872 of the National Defense Authorization Act (NDAA) for FY2018 directed the secretary of defense “to task the Defense Innovation Board (DIB) to undertake a study on ‘streamlining’ [the Department’s] software development and acquisition regulations” (NDAA for Fiscal Year 2018, 2017). The 2019 DIB SWAP report’s main finding was focused on the budget process and appropriation adjustments. It recommended that the DOD “create a new appropriation category for software capability delivery that allows (relevant types of) software to be funded by a single budget item, with no separation between Research, Development, Test and Evaluation (RDT&E), production and sustainment” (McQuade et al., 2019, p. 37). The DOD has identified some software acquisition challenges that could potentially be resolved by a single appropriation. The first is related to capability delivery. The April 2021 report provided by OUSD (A&S) stated, “agile practices require programs and teams to be responsive to emerging needs, but negative repercussions like this can occur when those needs do not align neatly to the funding allocated for the year” (DOD, 2021a, p. 8). The second is related to accessing enabling technologies. The April 2021 report further expressed,

Programs report difficulty in funding infrastructure, cloud services, and other enabling technologies necessary to support modern software development because of appropriations challenges. As a result, appropriation types can prevent access to needed infrastructure and capabilities for timely acquisition of software capability. (DOD, 2021a, p 8)

This pilot program is a means to examine the benefits, disadvantages, and unknowns of utilizing a single appropriation for software acquisition efforts within the DOD. This program should not be viewed as a silver bullet for solving the software problem within the PPBE process. The pilot tests single appropriation for software acquisition by utilizing existing RDT&E appropriation (DOD, 2021a, p. 8).



Using a single appropriation tactic, the DOD is looking to gain a deeper knowledge of current appropriation laws, regulations, and policies and how they are providing a hindrance to software and digital technology capability deliveries (DOD, 2021a, p. 9). Specifically, the pilot aims to understand

- Current interpretations and application of the Financial Management Regulation (FMR)—Research, Development, Test and Evaluation (RDT&E), Procurement, and Operations and Maintenance (O&M) as applied to software;
- Impact of current appropriation law, regulation, and policy;
- Programs that are most impacted with correlating trends and characteristics;
- Impact of a single appropriation;
- Additional reporting to be included to support a single appropriation; and
- Identify other pilots or initiatives to evaluate current appropriation law, regulation and policy. (DOD, 2021a, p. 9)

Figure 8 details the initial timeline of the BA-08 program.

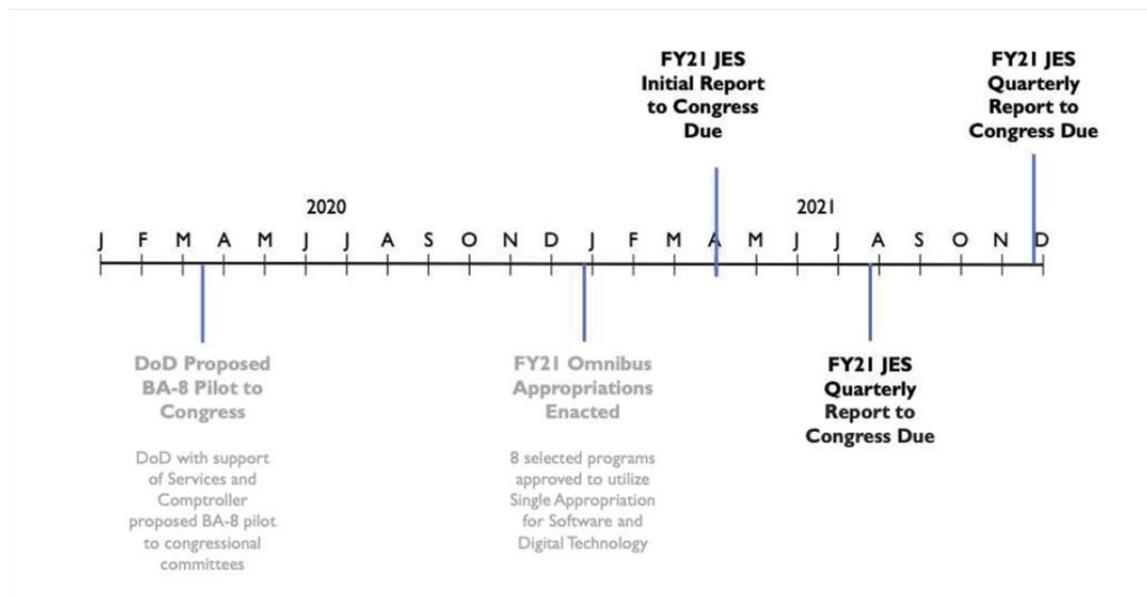


Figure 8. Initial Timeline of the BA-08 Program. Source: DOD (2021a, p. 10).



The pilot program used data from eight congressionally approved FY2021 BA-08 programs and eight comparable FY2021 traditional appropriation programs. The programs can be found in Tables 5 and 6. The FY2021 Joint Explanatory Statement (JES) required the “identification of eight similar programs, with representations from each Service, funded through traditional appropriation legislation to assess currently for comparison; and a plan to assess each pilot program against their own historical performance when funded through traditional appropriation legislation” (DOD, 2021a, p. 11).

Table 5. Congressionally Approved FY2021 BA-08 Programs. Source: DOD (2021a, p. 11).

	Component / Service	Program
1	Air Force / Space Force	Space Command and Control (Space C2; i.e., Kobayashi Maru)
2	Army	Defense Cyber Operations (DCO)
3	Defense Counterintelligence and Security Agency (DCSA)	National Background Investigation Services (NBIS; formerly under the Defense Information Systems Agency [DISA])
4	DISA	Global Command and Control System–Joint (GCCS-J)
5	Navy	Maritime Tactical Command and Control (MTC2)
6	Navy	Risk Management Information (RMI)
7	Office of the Secretary of Defense (OSD)	Acquisition Visibility
8	OSD	Algorithmic Warfare Cross Functional Team (AWCFT; i.e., Project Maven)

Table 6. FY2021 Traditional Appropriation Programs. Source: DOD (2021a, p. 12).

	Component / Service	Program
1	Air Force	Air Force Integrated Pay and Personnel System (AFIPPS)
2	Air Force	Mission Planning System F-22 Modernization Program
3	Army	Accessions Information Environment (AIE)
4	Army	Unified Network Operations (UNO)



	Component / Service	Program
5	Defense Health Agency (DHA)	Joint Operational Medicine Information Systems (JOMIS)
6	Office of the Secretary of Defense (OSD)	Joint Artificial Intelligence Center (JAIC)
7	Navy	Electronic Procurement System (ePS)
8	Navy	Navy Cyber Situational Awareness (NCSA)

The pilot effort, in conjunction with Congress and the DOD, developed broad metrics to be collected to support their goal to validate or invalidate the statement “that current appropriation law, regulation, and policy are limiting the ability to rapidly deliver valuable software and digital technology capabilities” (DOD, 2021a, p. 9). Table 7 shows these metrics.

Table 7. Metrics. Source: DOD (2021a, p. 12).

Current Processes, Policy, and Law	Impact of current appropriation law, regulation, and policy
	Current application of the appropriations—RDT&E, Procurement, and O&M
Program Characteristics	Programs that are most impacted, with correlating trends and characteristics.
Impact of Single Appropriation	Data collected both on programmatic and funding processes and impact to capability delivery

Table 8 is the collection data to support a baseline prior to the BA-08 initiative. OSD(A&S) worked with the funded programs to collect these data prior to funding allocation (DOD, 2021a, p. 13).



Table 8. Data Collection Template for Current Pilots. Source: DOD (2021a, p. 13).

Areas of Inquiry	Rationale for Collection	Intended Use
Length of Time Program Has Been Using Multiple Appropriations	To understand the time span where potential funding challenges with using multiple appropriations have existed.	Provides context for the length of the problem and informs how we characterize the pervasiveness of the issues with Congress.
Attempt to Consolidate to Use of a Single Appropriation Previously?	To understand if the program has attempted to take corrective action before BA-08 existed as an option.	Provides context and information on ways programs tried to solve the problem and were unsuccessful using existing budget processes.
Pros to Using Multiple Appropriations	To understand any demonstrated benefits to operating in the current model.	Provides context for showing the complete picture and potentially acknowledging some benefits with the current system.
Cons to Using Multiple Appropriations	To understand any demonstrated issues with operating in the current model.	Provides supportive evidence for the use of BA-08 and potentially informs follow-on actions such as establishing a software appropriation.
Frequency of Reprogramming Actions Due to Having to Balance Multiple Appropriations	To understand the efforts the program has to take to properly resource the software effort to deliver user's prioritized needs.	Informs the response to Congress on why greater flexibility is needed when resourcing agile software programs.
Has Program Needed BA-08 Reprogramming Plus-Ups to Support New Activities? Was Funding Obtained?	To understand (for BA-08 pilots in execution) if additional funding was needed and if it was able to be obtained.	Informs findings on the potential impacts of having a small subset of programs using a separate appropriation and any hurdles to reprogramming in the BA-08 account.
Contracting Strategy Details	To understand how contracts are structured when dealing with multiple appropriations.	Informs the ways that programs might contractually mitigate the impacts of multiple appropriations or provides



Areas of Inquiry	Rationale for Collection	Intended Use
		evidence of the inefficiencies.
Impact of Multiple Appropriations on Planning	To understand if/how the use of multiple appropriations makes it harder to properly plan for future releases due to the PPBE lag.	Informs whether the use of BA-08 helps solve the perceived problem that having to anticipate years in advance the requirements that will be executed in the future is inherently challenging.
Impact of Multiple Appropriations on Execution (Work Replan Due to Funds)	To understand if/how the use of multiple appropriations drives additional work replanning due to not having the right funding to meet user prioritized needs.	Informs whether the use of BA-08 helps solve the perceived problem that requirement changes or reprioritization drives changes in the type of funding needed to meet user needs.
Differing User Bases by Appropriation?	To understand if appropriations are provided by different user bases such as O&M by a [combatant command] (COCOM) and RDT&E by an HQ sponsor.	Informs whether a consolidated appropriation has potential to drive second order effects in how programs are resourced.
Work Forced to Remain in Backlog Longer Than Desired Due to Appropriation Issues?	To understand if programs retain higher prioritized requirements in the backlog due to unavailability of a particular appropriation.	Informs a key finding for BA-08, which is if appropriation definitions are causing the warfighter to not receive the needed capabilities at the earliest opportunity.
Any Operational Impact Noted Due to Backlog Issues?	To understand, if a backlog item was retained due to appropriation issues, what the potential operational impact was as a result (if known).	Informs a key finding for BA-08, which is how the operational community is impacted by the use of multiple appropriations.
Any Contract De-Obligation Actions Driven by Multiple Appropriations?	To understand if contract de-obligation actions were taken as a result of funding put on a contract not being able to be utilized in the necessary	Informs whether allocated resources were effectively used and if inherent inflexibilities drove programs to not use



Areas of Inquiry	Rationale for Collection	Intended Use
	time frame. Focus is on the potential limitations of O&M funding.	planned funding in year of execution.
Are Local BFM Policies That Provide Guidance on Differentiating Work for Multiple Appropriations?	To understand if there are any local policies or interpretations that drive how a program plans its software beyond that provided in the FMR.	Informs the internal work that the DOD might have to address in addition to the statutory constraints to improve overall flexibility for agile software programs.
Do You View Those Policies As Overly Restrictive in Using O&M (if Applicable)?	To understand if there are any local policies or interpretations that appear more restrictive than the FMR that creates execution impacts when using multiple appropriations.	Informs the internal work that the DOD might have to address in addition to the statutory constraints to improve overall flexibility for agile software programs.
Have Multiple Appropriations Driven Execution Issues That Drove Reductions During Budget Reviews (e.g., Spring Program Reviews)?	To understand if programs are experiencing under-execution issues due to having to manage multiple appropriations and if that results in reductions during budget reviews.	Informs the potential inefficiencies of having to use multiple appropriations in the execution of an agile program and the knock-on resourcing impacts.
Execution Data Review Cycle (How Often Are Budgets Reviewed?)	To understand how often budgets are formally reviewed for potential in-year or out-year adjustments.	Provides context to the understanding the potential inefficiencies of having to manage multiple appropriations.
Are Their Different Budget Review Processes for RDT&E/Procurement and O&M?	To understand the budget review process differences between the multiple appropriation accounts.	Provides context for how the different appropriations are managed and how it can impact software resourcing.
BA-08 Budget Exhibits Preparation (Complicated/Easy)	To understand if development of the BA- 8 budget exhibits was intuitive or if there were complications that should be considered.	Informs a more tactical issue of ensuring that use of BA-08 or a future software appropriation is not overly complicated in developing budget justifications.
Any Recommendations For Easing Any Burdens?	To understand any tactical-level adjustments	Provides insight into potential working-level



Areas of Inquiry	Rationale for Collection	Intended Use
	that can be made to the current process to ease any burdens.	issues that can be addressed by OSD A&S or Comptroller.
Short Summary of Any Under-Execution Budget Issues Related to Funding With Multiple Appropriations	To understand any other issues not captured in previous questions that potentially drive under-execution.	Provides deeper insight into how BA-08 may help resolve the issue of funds not being fully utilized due to managing multiple appropriations.
Expected/Realized Benefits of Using BA-08	To gain the program's view of how BA-08 may help them manage their programs more efficiently and effectively.	Informs recommendations to Congress and provides justification for continued use of BA-08 or a software appropriation.
Expected/Realized Issues in Using BA-08	To gain the program's view of how BA-08 may drive new issues in the management of their software efforts.	Informs recommendations to Congress and provides fuller context of the benefits or issues with use of a single appropriation.
Product Delivery Lead Time (Assume 30 Days in a Month)	To understand the impact of appropriations on the software development performance.	Provides insight into the effectiveness of using a single appropriation and informs the recommendations provided to Congress.
Release Frequency to Operational Environment (Assume 30 Days in a Month)	Same as Above	Same as Above
Deployment Frequency to Production (Operations) (Assume 30 Days in a Month)	Same as Above	Same as Above
Mean Time to Restore (MTTR; Hours)	Same as Above	Same as Above
Change Fail Percentage	Same as Above	Same as Above

The DOD is looking to mitigate the software acquisition problem within the department. The BA-08 pilot only targets changes in the PPBE process. The DOD has multiple initiatives ongoing or completed to combat the issue. Table 9 highlights some of these initiatives (DOD, 2021a, p. 13-14).



Table 9. NDAA Title VIII Sections: Acquisition Policy Acquisition Management and Related Matters. Source: DOD (2021a, p. 13-14).

Initiative	Description	Current Status
FY2018 NDAA Section 873	Pilot Program to Use Agile or Iterative Development Methods to Tailor Software-Intensive Warfighting Systems and Defense Business Systems	Pilot Ongoing
FY2018 NDAA Section 874	Software Development Pilot Program Using Agile Best Practices	Pilot Completed
FY2018 NDAA Section 875	Pilot Program for Open Source Software	Pilot Ongoing
FY2020 NDAA Section 800	Authority for Continuous Integration and Delivery of Software Applications and Upgrades to Embedded Systems	Report Completed; Implementation Ongoing
FY2020 NDAA Section 862	Software Development and Software Acquisitions Training and Management Plan	Report Completed; Implementation Ongoing

Under Secretary of Defense for Acquisition and Sustainment Ellen Lord stated,

As we reorganize the way we do business, the thread that runs through all of our programs and all that we do is software. . . . I believe that we need to catch up with the private sector, and make sure we are using contemporary software development processes. (DOD, 2021a, p. 14)

The BA-08 pilot, as well as the many other initiatives the DOD is implementing, is trying to put the DOD on par with its adversaries when it comes to software capability delivery (DOD, 2021a, p. 14).

B. DEPARTMENT OF DEFENSE SOFTWARE AND DIGITAL TECHNOLOGY PILOT PROGRAMS WHITE PAPER, JUNE 2021

The purpose of the white paper titled *Department of Defense Software and Digital Technology Pilot Programs* was to highlight the key points and background of the BA-08 pilot; discuss pros, cons, and unknowns; and take a look at the long-term goal of the pilot.



Further, it describes the DOD’s FY2022 proposal for the eight programs currently in the BA-08 pilot as well as the requirements for eight additional nominated programs for FY2022 (DOD, 2021b, p. 1).

The paper reiterates the origins of the pilot. The BA-08 pilot is a direct result from the “new appropriation category” recommendation that was published in the DIB’s SWAP report in 2019 (DOD, 2021b, p. 1). The language in Section 8066 of the DOD Appropriations Bill has been updated to reflect the allowance of software development, procurement and modification, and O&M using RDT&E for those pilot programs specified in BA-08. In summary, the pilot must follow RDT&E appropriation rules, the budget justification must use existing RDT&E budget exhibits, the pilot is codified as an interim change in the FMR, and the DOD must be transparent in reporting to address concerns revolving around avoiding colors of money constraints (H.R. Rep. No. 117–388, 2022). The pilot’s use of RDT&E funding is a temporary measure to collect data and “test whether the use of a single appropriation category enables modern software development practices” (DOD, 2021b, p. 1). The long-term goal is to create a new appropriation if the pilot is successful.

The 2019 DIB SWAP report was the major study that propelled the initiation of this pilot. Within the study, the DIB argued that

speed increases security. . . . the DOD must operate within its adversaries’ digital OODA (“Observe, Orient, Decide, Act”) loop. Much like today’s consumer electronic companies, the Department needs the ability to identify and mitigate evolving software and digital threats and to push continuous updates to fielded systems in near real-time.

Colors of money doom software projects. The reasons for specific congressional guidance on how money is spent make sense. But because software is in continuous development (it is never “done”), colors of money tend to doom programs. We need to create pathways for “bleaching” funds to smooth this process for long-term programs. (McQuade et al., 2019, p. 15)

Current law, regulations, and policies are providing a hindrance to continuous delivery of software capabilities and warfighter readiness. This is due to the DOD’s treatment of software as if it were similar to hardware regarding the acquisition life cycle.



Software development is expected to be dynamic with multiple versions and revisions. Unlike hardware, software development should be worked simultaneously during different phases of the project. A project that is software intensive can span across multiple fiscal years. During that time, the available technology will adapt, and acquisition efforts must allow baseline adjustment for that adaptation. Because of its dynamic nature, it is difficult to satisfy cost, schedule, and performance expectations of developing software, especially when the limitations of confidence are tight. The pilot aims to allow for budgeting practices to more closely align with the dynamic nature of software.

Service and component acquisition executives, acquisition and financial management staff, and the offices of the Under Secretary of Defense for Acquisition and Sustainment (USD[A&S]) and Comptroller (OUSD[C]) were involved in pilot program selection. The following criteria are a direct excerpt from the white paper:

- Nominated programs had to be fully funded; this could not be a get-well opportunity;
- Nominated programs had to have a moderate to high degree of success, based on criteria developed for Section 873/874 Agile Pilots. The criteria, modeled on those developed by the Software Engineering Institute (SEI) Federally Financed Research and Development Center (FFRDC), encompass issues such as mission, program and acquisition strategy, organizational culture for Agile adoption, project and customer environment, system attributes and technology environment;
- The portfolio should include both weapons systems and Defense Business Systems, to provide an adequate sample set;
- Preference was given to programs already participating in the Agile pilot programs, to further support piloting Agile approaches and leverage investments already made in monitoring and analysis. (DOD, 2021b, p. 3)

This white paper provided descriptions for each of the eight current programs accepted in the pilot, as well as the eight proposed programs for FY2022. The following descriptions are a direct excerpt from the white paper.

The eight continuing FY2021 pilot programs were

1. Risk Management Information (RMI) (Navy): RMI will synthesize incident reporting data into useful products for improving risk and safety conditions by consolidating



existing legacy and core safety programs and risk management systems, applications, and data.

2. Maritime Tactical Command and Control (MTC2) (Navy): MTC2 will deliver battle management aids (BMAs) to dynamically plan, direct, monitor and assess maritime operations.
3. Space Command and Control (Space Force): Space C2 (aka Kobayashi Maru) provides military commanders the ability to make timely, strategic decisions; take tactical actions to meet mission goals; and counter threats to U.S. space assets.
4. National Background Investigation Services (NBIS) (DCSA): NBIS will automate many tasks that are currently done manually by researchers, field investigators and support personnel.
5. Global Command and Control System–Joint (GCCS-J) (DISA): GCCS-J fuses select C2 capabilities into a comprehensive, interoperable system by exchanging imagery, intelligence, status of forces and planning information.
6. Algorithmic Warfare Cross Functional Team (AWCFT) Project Maven (OUSD(I)): Project Maven is the DOD’s pathfinder Artificial Intelligence effort, focusing on Intelligence, Surveillance & Reconnaissance (ISR) capabilities.
7. Defensive Cyber Operations (DCO) (Army): DCO delivers software to proactively defend and enable the Army’s networks to operate unfettered from cyber threats.
8. Acquisition Visibility (OUSD(A&S)): This software capability provides the Department the ability to establish and record cost, schedule and performance baselines for programs and makes the data available for data analytics and reporting. (DOD, 2021b)

The eight proposed FY2022 pilot programs were

1. Air & Space Operations Center (AOC) (Air Force): The AOC weapon system (AN/USQ-163 FALCONER) is the operational level warfighting command center for air and space forces. The Falconer AOC is the senior element of the Theater Air Control System (TACS) and provides centralized command, planning, direction, control, and coordination of air, space and information operations.
2. Defense Enterprise Accounting and Management System (DEAMS) (Air Force): DEAMS supports all Air Force Major Commands, U.S. Space Force, and Unified Commands where the Air Force is the executive agent. It



manages the control, execution, and reporting of the Air Force General Fund and the U.S. Transportation Command Working Capital Fund, and supports Defense Finance and Accounting Service (DFAS) services provided to Air Force customers.

3. Joint Artificial Intelligence Center (JAIC) (DISA): JAIC will transform the DOD by accelerating the delivery and adoption of AI to achieve mission impact at scale. The goal is to use AI to solve large and complex problem sets that span multiple services; then, ensure the Services and Components have real-time access to ever-improving libraries of data sets and tools.
4. Navy Next Generation Enterprise Network (NGEN) (Navy): NGEN represents the future vision of the shore-based enterprise network for the Department of the Navy (DON) and is the follow-on to Navy-Marine Corps Internet (NMCI).
5. 5-8) Strategic Mission Planning Execution System (Air Force): a test to determine the advantages of managing 4 software projects within a single program element. Projects include Global Adaptive Planning and Collaborative Information Environment (GAP CIE); Integrated Strategic Planning & Analysis Network (ISPAN); Nuclear Planning and Execution System (NPES); and National Leadership Command Capability Decision Support System. (DOD, 2021b, pp. 4–6)

The aforementioned programs report metrics, both financially quantitative and qualitative, to help the DOD determine the benefits of a single appropriation for software acquisition efforts. These financial measures will include contract funding modifications, reprogrammings, the impact of funding changes on program execution, and other acquisition issues associated with traditionally appropriated programs. The DOD identified advantages to this pilot in regard to pursuing single appropriation for software acquisition efforts. The DOD believes that the proposal limits potential candidates to programs that will likely have moderate to high success in the program (DOD, 2021b, p. 3). The pilot also relies on existing legislation for RDT&E appropriations, instead of establishing new legislation for a new appropriation. The pilot can also address shortfalls in the RDT&E \$10 million below threshold reprogramming (BTR) limit, instead of pillaging funding from another pilot program. The pilot will also provide transparency utilizing RDT&E's existing R-2a exhibit (DOD, 2021b, p. 7).



Additionally, the DOD identified a significant disadvantage within the BA-08 pilot. The DOD understands the risk that contracting officers, general counsels, and comptrollers, who were “long trained to never use RDT&E funding for procurement or O&M efforts, may take an overly conservative approach to pilot program execution” (DOD, 2021b, p. 7). The DOD does not anticipate this as a long-term problem since this is isolated to the programs participating in the pilot, and there is “no intent to try and move ALL software funding to a single appropriation category in the future” (DOD, 2021b, p. 7).

**C. REPORT TO CONGRESS JOINT EXPLANATORY STATEMENT
ACCOMPANYING THE DEPARTMENT OF DEFENSE
APPROPRIATIONS ACT, 2021 (PUBLIC LAW 116-260) INITIAL
REPORT FOR SOFTWARE AND DIGITAL TECHNOLOGY PILOT
PROGRAM, OCTOBER 2021**

The Consolidated Appropriations Act of 2021 was accompanied by a Joint Explanatory Statement that discussed software and digital technology pilot programs. The requirements for each report are as follows:

This report shall include, at a minimum: quantitative and qualitative metrics; identification of eight similar programs, with representations from each Service, funded through traditional appropriation legislation to assess currently for comparison; and a plan to assess each pilot program against their own historical performance when funded through traditional appropriation legislation. (DOD, 2021c, p. 17)

The report included Table 10, which is a summary and description of the congressionally approved FY2021 BA-08 programs, FY2021 traditional appropriation programs, and FY2022 proposed BA-08 programs.



Table 10. Current Programs Involved in the BA-08 Pilot. Source: DOD (2021c, p. 5).

Group	Description	Currently Utilizing BA-08 Funding
Congressionally Approved FY2021 BA-08 Programs	Eight programs approved by Congress to utilize BA-08 through enactment of FY2021 Omnibus Appropriations Act.	Yes
FY2021 Traditional Appropriation Programs	Eight programs selected by the DOD to support the FY2021 Joint Explanatory Statement accompanying the FY2021 Appropriations Act requirement.	No (will retain traditional funding)
FY2022 Proposed BA-08 Programs	Eight programs proposed by the DOD to utilize BA-08 starting in FY2022. Submitted with FY2022 President’s Budget pending congressional approval.	No (proposed for future BA-08 funding)

The report also included updated tables reflecting the current programs enrolled in BA-08 (Table 11), FY2022 proposed programs (Table 13), as well as a new table that includes information regarding the required traditional appropriation programs for comparison (Table 12).

Table 11. Congressionally Approved FY2021 BA-08 Programs. Source: DOD (2021c, pp. 5–6).

Component / Service		Program
1	Air Force / Space Force	Space Command and Control (Space C2; i.e., Kobayashi Maru)
2	Army	Defense Cyber Operations (DCO)
3	Defense Counterintelligence and Security Agency (DCSA)	National Background Investigation Services (NBIS; formerly under the Defense Information Systems Agency [DISA])
4	DISA	Global Command and Control System–Joint (GCCS-J)



Component / Service		Program
5	Navy	Maritime Tactical Command and Control (MTC2)
6	Navy	Risk Management Information (RMI)
7	Office of the Secretary of Defense (OSD)	Acquisition Visibility
8	OSD	Algorithmic Warfare Cross Functional Team (AWCFT; i.e., Project Maven)

Table 12. FY2021 Traditional Appropriation Programs. Source: DOD (2021c, p. 6).

Component / Service		Program
1	Air Force	Air Force Integrated Pay and Personnel System (AFIPPS)
2	Air Force	Mission Planning System F-22 Modernization Program
3	Army	Accessions Information Environment (AIE)
4	Army	Unified Network Operations (UNO)
5	Defense Health Agency (DHA)	Joint Operational Medicine Information Systems (JOMIS)
6	Office of the Secretary of Defense (OSD)	Joint Artificial Intelligence Center (JAIC)
7	Navy	Electronic Procurement System (ePS)
8	Navy	Navy Cyber Situational Awareness (NCSA)

Table 13. FY2022 Proposed BA-08 Programs. Source: DOD (2021c, p. 7).

Component / Service		Program
1	Air Force	Air & Space Operations Center (AOC)
2	Air Force	Defense Enterprise Accounting and Management System (DEAMS)
3	Air Force	Integrated Strategic Planning and Analysis Network (ISPAN) Increment 5*
4	Air Force	ISPAN Global Adaptive Planning & Collaborative Information Environment (GAP CIE)*
5	Air Force	Nuclear Planning and Execution System (NPES) Recap*
6	Air Force	National Leadership Command Capability Decision Support System*



Component / Service		Program
7	Office of the Secretary of Defense (OSD)	Joint Artificial Intelligence Center (JAIC)
8	Navy	Next Generation Enterprise Network (NGEN)

Note. * = These four programs were submitted as separate Budget Program Activity Code (BPAC) under Strategic Mission Planning and Execution System Program Element (PE)

This report is the first instance of qualitative data presented.

Chapter III focused on the reports that provide background and purpose to the BA-08 pilot program. This chapter informs the process in which the main thesis questions can be evaluated. These questions include the following: Does realigning funding for a manageable acquisition path for continuous delivery of capability? Are current software acquisition practices providing a hindrance to continuous delivery of capability? (Bianco & Hujber, 2023). This data will be analyzed in Chapter IV.



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IV. ANALYSIS

The BA-08 Pilot Program is the DOD’s attempt to address recommendations to mitigate the software problem the Department faces today. As part of the program requirements, the pilot must submit quarterly reports with qualitative and quantitative results so Congress can judge the effectiveness of single appropriation for software acquisition initiatives. The BA-08 Program team provided several reports that detail the purpose of the program, and the background on how it was implemented. The chosen reports for this section go into detail about the pilot’s qualitative and quantitative data and address the research questions posed.

A. REPORT TO CONGRESS JOINT EXPLANATORY STATEMENT ACCOMPANYING THE DEPARTMENT OF DEFENSE APPROPRIATIONS ACT, 2021 (PUBLIC LAW 116-260) INITIAL REPORT FOR SOFTWARE AND DIGITAL TECHNOLOGY PILOT PROGRAM OCTOBER 2021

This report analyzed qualitative data for the eight programs utilizing the BA-08 pilot in FY21. The programs looked at initial findings relating to software licenses, software subscriptions, software services, lowering barriers to small business, user responsiveness, work optimization, budget planning risk, and team focus. The DOD used these findings to determine how traditional “appropriation laws, regulations, and/or policies limit the ability to rapidly deliver valuable software and digital technology capabilities” (DOD, 2021c, p. 7).

The DOD established the Enterprise Software Initiative (ESI) mission in 2009 “to save time and money on commercial software, IT hardware, and services” (DOD, 2022b). The DOD is committed to utilizing commercial software when applicable, and according to the Federal Acquisition Regulation (FAR), it is the preferred contracting approach. (DOD, 2021c, p. 8). FAR Part 12 “implements the Federal Government’s preference for the acquisition of commercial items” outlined in title 41 U.S. Code § 3307 (Acquisition.gov, 2023). ESI utilizes a team of experts and consolidated requirements to establish “a unified contracting and vendor management strategy across the entire



department” with its participating IT providers (DOD, 2022b). Despite this strategy, programs participating in the BA-08 program have reported “challenges with procuring software licenses, subscriptions, and services when navigating multiple contracts, as preferred above in a modular contracting strategy, and determining the correct appropriation” (DOD, 2021c, p. 8). For example, license severability can raise issues with appropriation depending upon the type of license (DOD, 2021c, p. 9). According to CHIPS, the Department of the Navy’s Information Technology Magazine, “severability clauses keep the rest of an agreement in force when one provision is removed because it has been determined to be unenforceable” (Department of Defense ESI, 2014). The type of funding required to obtain a license that includes a subscription and technical support may be different than funding required to obtain a license with variable services and fluctuating support (DOD, 2021c, p. 8). This differentiation between appropriation types is a limiting factor in the DOD’s software problem. Programs participating in the BA-08 program have reported “greater flexibility because the program is less constrained by legal interpretations addressing otherwise applicable fiscal law” (DOD, 2021c, p. 9).

In addition to license type and severability, program phase can affect appropriation type for software licenses, subscriptions, and services (DOD, 2021c, p. 8). Appropriation is determined by factoring if a program has fielded an initial or full operational capability (IOC/FOC), or which stage (development, production, or sustainment) the program is in (DOD, 2021c, p. 9). This determination directly stems from the Financial Management Regulation (FMR), which states that “the correct appropriation for budgeting an IT effort is dependent on the activity, and the underlying tasks that make up the IT effort . . . an IT effort may require funding for more than one appropriation” (DOD, 2021d, p. 131 [I-38]). Additionally, in the FMR, RDT&E appropriations are further described as “all developmental activities involved in bringing a program to its objective system are to be budgeted in RDT&E” (DOD, 2021d, p. 131 [I-38]). Procurement appropriations are described in the FMR as “acquiring and deploying a complete system with a cost of \$250,000 or more . . . complete system cost is the aggregate cost of all components (e.g., equipment, integration, engineering support and software) that are part of, and function together, as a system to meet an approved documented requirement” (DOD, 2021d, p. 131



[I-38]). Operations and Maintenance appropriations are described as “expenses incurred in continuing operations and current services are budgeted in the O&M appropriations . . . modernization costs under \$250,000 . . . one-time projects such as developing planning documents and studies” (DOD, 2021d, p. 131 [I-38]). The stage of the program changes throughout its life cycle, and current process would require the programs to have multiple appropriation types throughout the life cycle to comply with the FMR. Programs participating in the BA-08 program have reported “program phase is irrelevant, eliminating the complication of having to align software licenses, subscriptions, and services to a pre-defined program phase” (DOD, 2021c, p. 9) which can aide in the effort to ensure rapid capability delivery.

Under traditional acquisition practices, the timing of licensing procurement also dictates the appropriation type required for purchase (DOD, 2021c, p. 10). Currently, “any new licenses must be bought initially on a three-year term using Procurement funds with Operations and Maintenance (O&M) funds required for any follow-on license renewals” (DOD, 2021c, p. 10). This causes issues when programs are lacking funds in either category and cannot provide advancements in capability not due to a lack of funding, but rather a lack of correct appropriation type (DOD, 2021c, p. 10). Programs participating in the BA-08 program have reported the ability “to buy whatever license is deemed best for the mission or development activity and can be tailored for whatever duration is required” (DOD, 2021c, p. 10). This ability allows available funding to be appropriated regardless of if the license is new or a follow-on.

How the DOD currently manages commercial vendor license, subscriptions, and services in regard to appropriation type adds layers of complexity that “make it more challenging to be responsive to the warfighter, deliver at the speed of relevancy, and meet program expectations” (DOD, 2021c, p. 10). Programs participating in the BA-08 program have reported the ability to “acquire hardware, software, infrastructure, cloud services, tools, and rapid prototyping services that would ordinarily require a mix of RDT&E, Procurement, and O&M . . . this can provide an increased security posture to programs providing the opportunity to seamlessly procure updated software to address security vulnerabilities” (DOD, 2021c, p. 10). The ability to quickly utilize software to compete



with our adversaries is a matter of national security; BA-08 allows participating programs an avenue to protect and mitigate those vulnerabilities by implementing single appropriation which negates the logistics of switching between multiple appropriations.

The DOD is committed to partnering with small business and according to the U.S. Small Business Administration, the DOD allocates “23% of the total value of all prime contract spending is required to be awarded to eligible small businesses” (US Small Business Administration, 2022). The use of modular contracting provides smaller businesses a greater opportunity to participate in DOD solicitations. Under the modular contracting construct, an acquisition of a software system may be divided into several smaller acquisition increments that:

1. Make individual contracts easier to manage individually than would be possible with one comprehensive acquisition.
2. Address complex IT objectives incrementally to increase the likelihood of achieving workable systems or solutions to attain those objectives.
3. Provide for delivery, implementation, and testing of workable systems or solutions in discrete increments. Each comprises a system or solution that does not depend on subsequent increment to perform its principal functions.
4. Provide an opportunity for subsequent increments to take advantage of any evolution in technology or needs during implementation and use of the earlier increments.
5. Reduce the risk of potential adverse consequences for the overall project by isolating and avoiding custom-designed system components. (DOD, 2021c, p. 11)

Traditional acquisition practices with appropriation differentiation complicate contracts and require “the use of multiple Contract Line Item Numbers (CLINs), CLIN deviations, or task orders to appropriately fund the work . . . the overhead of managing these more complex contracts with potentially duplicative deliverables can make participation by small businesses less compelling” (DOD, 2021c, p. 11). Programs participating in the BA-08 program have reported that the removal of these obstacles through the BA-08 program single appropriation type “increases the opportunity for small and disadvantaged businesses to participate in software efforts of multiple sizes and scopes” (DOD, 2021c, p. 11). The dynamic nature of software also creates complications



when structuring CLINs and task orders to match work phases and their corresponding appropriation types (DOD, 2021c, p. 13). This required match limits flexibility within the contract itself and does not adhere to the inherent dynamic essence of software. Programs participating in the BA-08 program have reported that the program “minimizes these objections and allows a program to pursue the best contract types to meet the program objectives, maximize competition, and deliver more rapidly” (DOD, 2021c, p. 14). Throughout the duration of the contract, available technology will adapt and it is important that our acquisition efforts allow for that adaptation.

As mentioned in Chapter II, the DOD is using modern software development methodologies to increase warfighter readiness and responsiveness for capabilities (DOD, 2021c, p. 11). The 2019 DIB SWAP study highlights the importance of treating software differently than hardware—that includes how we acquire it (McQuade et al., 2019). Software development is expected to be dynamic, with multiple versions and revisions. Unlike hardware, software development should be worked simultaneously on different phases of the project (USAF, 2008, p. 7). The 2019 DIB SWAP concluded, “our ability to identify and respond to these new threats will be based on our ability to develop and push new software-defined capabilities to meet those threats on time scales that greatly outpace our adversaries’ ability to do so” (McQuade et al., 2019). Programs participating in the BA-08 program have reported the ability to “accelerate prototypes and proof of concepts into operations much more quickly—in months versus years. This was largely facilitated due to the elimination of the budgetary distinctions between a sustainment or modernization activity” (DOD, 2021c, p. 12). The BA-08 appropriation structure helps the programs participating to use best practices that align with industry and keep the warfighter current.

Software initiatives are facing challenges with appropriation roadblocks when determining distinctions between multiple appropriations for software features due to the FMR’s distinction between expense and investment (DOD, 2021c, p. 12). The FMR states that the primary distinction between using RDT&E and O&M for software development is whether the effort is intended to reach “objective system performance,” or whether it is “iterations on the basic release and not involving significant performance improvements or



extensive testing” (DOD, 2021d, p. 37-38). Programs participating in the BA-08 program have reported that using traditional methods cause “significant challenges in this area when managing a backlog of software features that required the use of multiple appropriations” (DOD, 2021c, p. 12). Figure 9 demonstrates these backlogs.

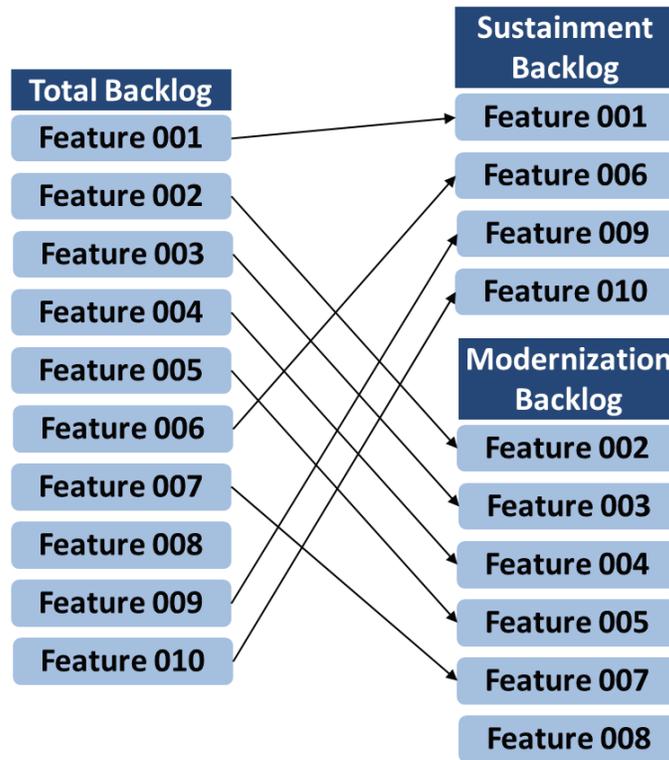


Figure 9. Total Single Backlogs vs. Multiple Backlogs. Source: DOD (2021c, p. 13).

Figure 9 exhibits maps between multiple backlogs are not always clear between different phase types which directly correlate to appropriation type. Under the current process, some backlogs need to be deferred until correct appropriation is available to support. Programs participating in the BA-08 program have reported that they have been able to “address warfighter priorities by working more flexibly across both ‘sustainment’ tasks, which were often limited by O&M fund allocation, and ‘modernization’ tasks, which were impacted by RDT&E funds availability” (DOD, 2021c, p. 12). This allows for

continuation of work if funds are available since appropriation types no longer is a limiting factor.

The use of multiple appropriations for software intensive programs introduces a budget planning risk. As discussed in the background and literature review sections, the dynamic nature of software comes with multiple revisions and versions, and the ability to be responsive to those changes and optimize the funding and time spent on developing the capability as well as contract overhead is limited with traditional appropriations (DOD, 2021c, p. 14). This specific risk is heightened when a program is more immersed in Agile and DevSecOps practices since requirements are not fully defined upfront (DOD, 2021c, p. 14). Funding shortfalls in the mandated appropriation due to changing requirements often lead to reprogrammings, delays, and capability shortfalls (DOD, 2021c, p. 14).

When a software program needing multiple appropriations simultaneously advocates for funding in the different boards and forums, they often face obstacles. For example, the investment community is focused on modernization and expects programs to articulate precisely what advancements will be made to warrant the RDT&E and Procurement funds requested. Meanwhile, the sustainment community expects clarity on how the O&M funds will be used to maintain the system. (DOD, 2021c, p. 14)

Programs participating in the BA-08 program have reported that the program “solves all of these challenges by eliminating the need to satisfy the unique perspectives and simplifying affordability determinations” (DOD, 2021c, p. 14). As reported, the use of single appropriation alone has a direct positive impact on budget planning risk and allows for resources to be diverted elsewhere.

The stated issues found in traditional appropriation programs are managed by teams composed of program managers, contracting personnel, financial managers, engineers, and other acquisition professionals. These teams must work cohesively to direct the capability through its acquisition life cycle by “completing and updating acquisition documentation, awarding and monitoring contracts, addressing technical risks and issues, ensuring compliance across a range of functions, supporting oversight and reporting mechanisms, continuously engaging with the user community, responding to leadership or congressional requests, and ensuring adequate resources are available to execute the program” (DOD,



2021c, p. 15). Complications that arise from shortfalls within an appropriation act like a domino effect and cause the whole team to shift focus away from their area of expertise to manage the backlog (DOD, 2021c, p. 15). This can be seen with multiple contracts for different appropriations needing technical team input for evaluations, time spent with justifications for reprogrammings, and other efforts to maintain the balance of funds within the program (DOD, 2021c, pp. 15–16). Programs participating in the BA-08 program have reported “that the ability to move seamlessly between sustainment and modernization activities has helped reduce the time spent on requesting, processing, and managing multiple reprogramming actions. This time was then better spent managing the program, optimizing performance, mitigating risks, and maximizing warfighter deliveries” (DOD, 2021c, p. 16). Program managers, contracting personnel, financial managers, engineers, and other acquisition professionals are able to focus on traditional roles instead of diverting their time and effort to multiple contracts due to appropriation type limitations.

In the conclusions of this report, the DOD stated that the initial impact of the BA-08 program has been positive on the eight programs that are utilizing the single appropriation method. The recommended next steps are to continue analysis and data collection to provide quantitative data to complement the qualitative data collected during this report.

Figure 10 represents a summation of the October 2021 report that highlights the disconnect between best practices in software development and the ability to balance and deliver utilizing multiple appropriations. This disconnect directly correlates to the question of how the DOD’s current software acquisition practices hinder the goal of continuous delivery of capability.



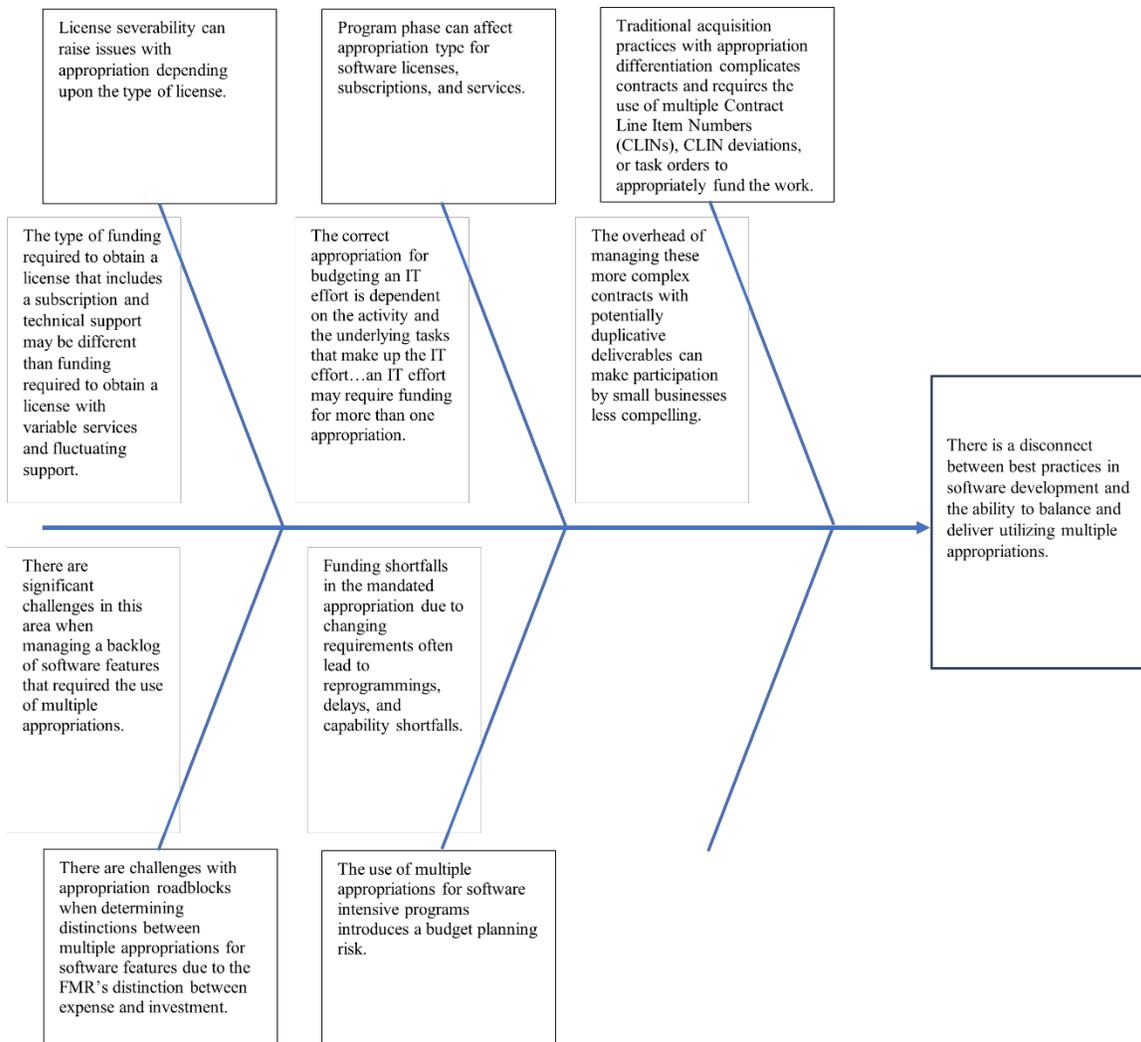


Figure 10. Fishbone Diagram Summarizing the Disconnect between Best Practices in Software Development and the Ability to Balance and Deliver Utilizing Multiple Appropriations

One of the research questions for this capstone applied project (CAP) was exploring if realigning funding to a single appropriation provides a more manageable acquisition path for continuous delivery of capability. The DOD's report detailed multiple hindrances to continuous capability while utilizing traditional appropriation, so we infer that a more manageable approach would introduce mitigations to current practices involving appropriation and how it relates to software licenses, software subscriptions, software services, lowering barriers to small business, user responsiveness, work optimization, budget planning risk, and team focus.



**B. REPORT TO CONGRESS JOINT EXPLANATORY STATEMENT
ACCOMPANYING THE DEPARTMENT OF DEFENSE
APPROPRIATIONS ACT, 2021 (PUBLIC LAW 116-260) INITIAL
REPORT FOR SOFTWARE AND DIGITAL TECHNOLOGY PILOT
PROGRAM JANUARY 2022**

This report analyzed data for the eight programs utilizing the BA-08 pilot in FY21. This report “provides greater detail on the overall pilot structure (Table 15), pilot timeline (Table 14), and the Department process for nomination and selection of additional programs. This report also provides a snapshot of the program demographics of programs currently impacted by BA-8 and expands on the qualitative metrics reported” (DOD, 2022a, p. 5).

Table 14. BA-08 Pilot Timeline. Source: DOD (2022a, pp. 6–7).

Date	Pilot Activity
Sept.–Dec. 2019	FY21 Pilot Nomination and Selection Process. OUSD A&S [referred to as “A&S”], OSD Comptroller [referred to as “Comptroller”], OSD Cost Assessment and Program Evaluation (CAPE), and the Military Services defined pilot and identified nine initial programs for BA-8 inclusion in FY 2021.
Mar. 2020	A&S and Comptroller met with House and Senate to outline pilot, propose nine programs, and garner support for pilot initiation in FY 2021 budget; FY 2021 Software and Digital Technology Pilot Programs White Paper provided to Congress.
Sept. 2020	A&S established pilot agreements with proposed pilots to support data collection and assigned BA-8 pilot advisors. <i>OSD BA-8 pilot advisors meet bi-monthly with each pilot program.</i>
Sept.–Dec. 2020	FY22 Pilot Nomination and Selection Process. A&S, Comptroller, CAPE and Services solicited and identified an additional eight programs across five Program Elements (PEs) for FY 2022.
Oct.–Dec. 2020	Continuing Resolution October 1–December 26, 2020; FY 2021 Consolidated Appropriations Act enacted December 27, 2020—the Explanatory Statement (ES) included a requirement to identify eight programs utilizing traditional multiple appropriations to support data analysis and quarterly reporting.
Jan.–Mar. 2021	Eight Congressionally-Approved FY 2021 BA-8 Programs began receiving BA-8 funding.



Date	Pilot Activity
May 2021	FY 2022 President’s Budget submitted to Congress; May 17, 2021 ES Initial Quarterly Report to Congress submitted which identified eight Traditional (Multiple) Appropriation Programs.
June 2021	FY 2022 Software and Digital Technology Pilot Programs White Paper provided to Congress.
Aug. 2021	August 23, 2021 the ES Interim Report to Congress submitted.
Sept.–Nov. 2021	FY23 Pilot Nomination and Selection Process. A&S, Comptroller, CAPE, and Services solicited and identified an additional seven potential programs for FY 2023. November 1, 2021 submitted combined June and October Quarterly Report to Congress.

Table 15. BA-08 Pilot Program Nomination Evaluation Areas. Source: DOD (2022a, pp. 8–9).

Areas of Inquiry	Desired Quality	Rationale for Collection/Evaluation
Number of Awarded Contracts	Multiple Contracts Awarded or Pending Award	Use of modular contracting (multiple contracts) as recommended by the Federal Acquisition Regulation (FAR) for IT programs provides greater potential for BA-8 as a means to maximize competition and contract performance.
Program Total Obligation Authority (TOA): Commercial Software Licenses and/or Services	Large Percentage of TOA	Inability to procure commercial software licenses and/or subscriptions has been identified as a challenge for software programs when navigating multiple appropriations— <i>documented by the FY 2021 BA-8 Pilots as an initial benefit of a single appropriation and in the quarterly report submitted November 1, 2021.</i>
Program TOA: Percentage of Custom Software Development	Large Percentage of TOA	Managing multiple appropriations, multiple contracts (or Contract Line Item Numbers [CLINs]) increases complexity, delays decisions, and can be limited by funding availability— <i>documented by the FY 2021 BA-8 Pilots as an initial benefit of a single appropriation.</i>
Current Average Deployment Frequency	Multiple times per year	BA-8 should provide the greatest potential benefit to those programs that deliver software capability frequently.
Time Agile Principles in Practice	A few years minimum	Programs that have adopted and matured Agile and DevSecOps practices are more



Areas of Inquiry	Desired Quality	Rationale for Collection/Evaluation
		likely beneficiaries of a single appropriation.
Initial Funding Allocation	Multiple appropriations	Preference given to those programs that have a history of managing multiple appropriations, given the improved ability to highlight potential efficiencies in using the BA-8 appropriation.
BA-8 Desired Funding Allocation	>\$20M/year	To inform enterprise-level recommendations and understand potential impacts, the focus is on pilots with larger budgets.
Software Type	Representation across the pilot programs of the multiple software types.	Employing a mix of pilots that represent different software types provides deeper insights into the potential impacts of a single appropriation and better understand the potential at scale. This includes: <ul style="list-style-type: none"> - Software running on commercial hardware, modified hardware, or cloud computing platforms; - Software developed for a defense business system as defined in section 2222 of title 10 U.S. Code ; - Embedded software (software embedded in a platform—e.g., air vehicle, ground vehicle, ship).

Figure 11 represents the eight programs currently in the BA-08 programs and their initial funding allocations in FY21 prior to realignments into a single RDT&E budget activity (DOD, 2022a, p. 10). Each of these programs, other than OSD Maven, has multiple appropriations. The programs with split blue and gray columns are traditionally funded by RDT&E and O&M funding. The program with the split blue, orange, and gray column is traditionally funded by RDT&E, Procurement, and O&M funding. The program with the blue column is traditionally funded by RDT&E funding.



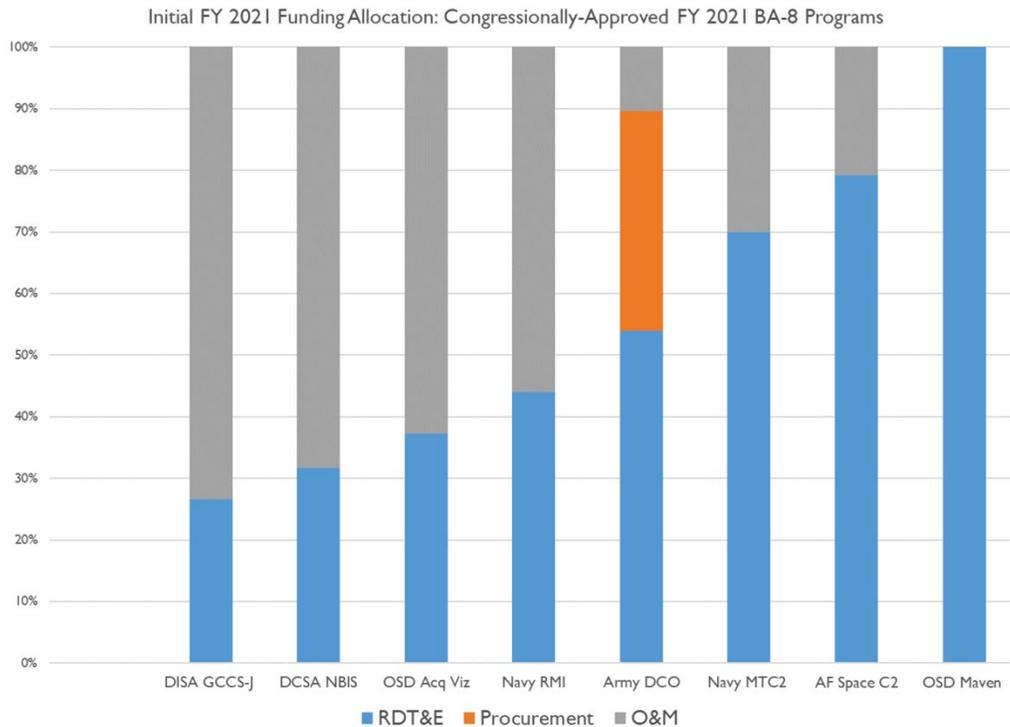


Figure 11. Initial FY 2021 Funding Allocation for Congressional-Approved FY 2021 Pilots. Source: DOD (2022a, p. 10).

Figure 12 represents five programs proposed to participate in BA-08 in FY22 and their funding allocations in FY21 prior to realignments into a single RDT&E budget activity (DOD, 2022a, p. 11). The programs with split blue and gray columns are traditionally funded by RDT&E and O&M funding. The programs with the split blue, orange, and gray column are traditionally funded by RDT&E, Procurement, and O&M funding. The DOD strongly supports the addition of programs into the pilot and will continue to request additional programs to “provide a larger data set for analysis, impact determination, and scalability” (DOD, 2022a, p. 11).



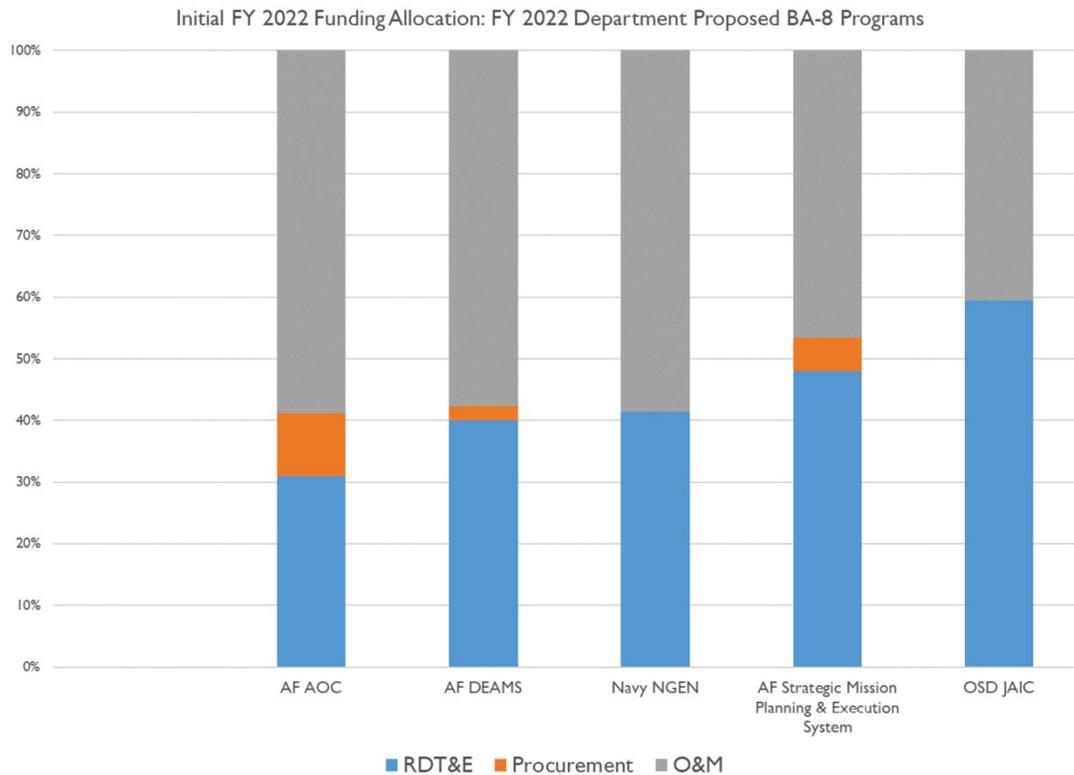


Figure 12. Initial FY 2022 Funding Allocation for Department Proposed FY 2022 Pilots. Source: DOD (2022a, p. 11).

To collect metrics and improve upon quantitative and qualitative assessments, the Office of the Undersecretary of Defense for Acquisition and Sustainment (OUSDA&S) has engaged in data collection efforts as follows:

- OSD BA-8 advisors interviewed programs individually based on the measures and metrics identified in the FY 2021 original pilot agreements.
- The OSD BA-8 team created structured interviews and data templates to standardize the information collected.
- The OSD BA-8 team created an additional data collection (see Appendix D) for the FY 2021 Congressionally-Approved BA-8 programs with a goal of quantifying BA-8 impact based on initial findings
- The OSD BA-8 team also expanded the insight questions (see Appendix E) to collect data on traditional multiple appropriation programs to serve as a baseline in comparison with the FY 2021 BA-8 Pilot Programs. (DOD, 2022a, pp. 11–12)



The October 2021 quarterly report provided qualitative data relating to software licenses, software subscriptions, software services, lowering barriers to small business, user responsiveness, work optimization, budget planning risk, and team focus. The following figures represent that reported data. Figure 13 represents the first 6 months of programs reporting the impact BA-08 has had in regard to software licenses, subscriptions, user responsiveness, budget planning risk, and team focus in comparison to their initial funding allocations prior to realignment into single appropriation (DOD, 2022a, p. 13). Based on the results presented in the figure, BA-08 introduced a major improvement in the areas of software licenses, subscriptions, user responsiveness, budget planning risk, and team focus to the programs participating with no adversity reported.

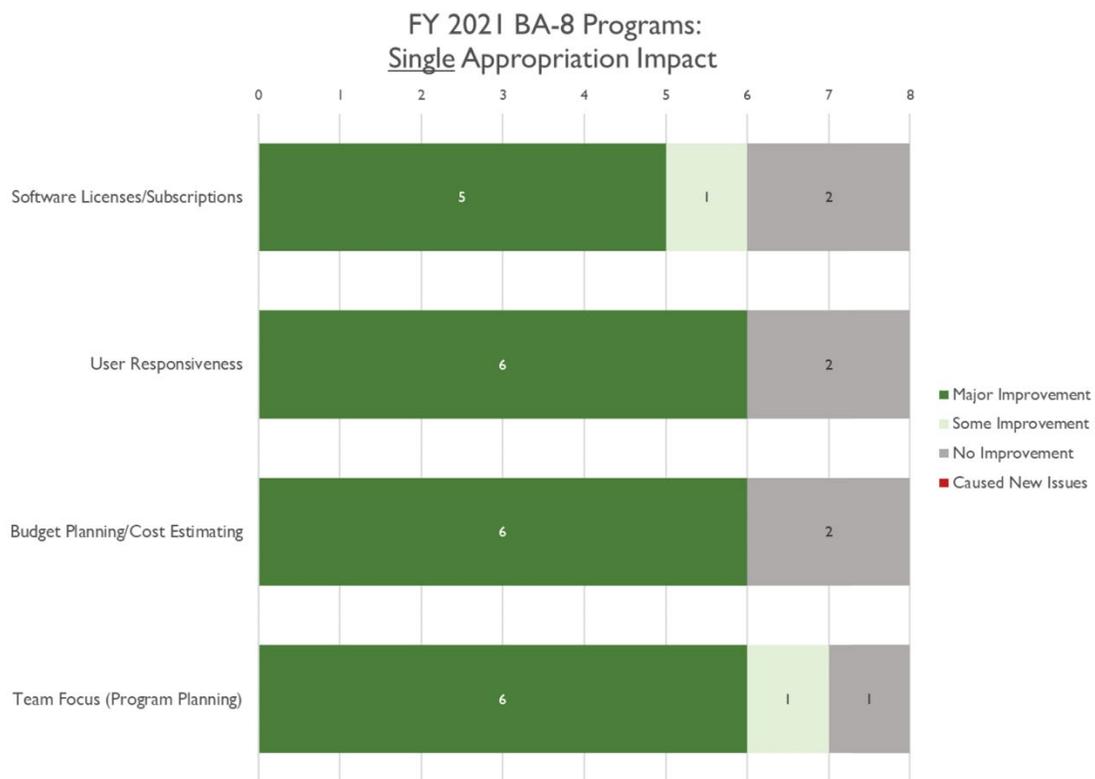


Figure 13. Single Appropriation Impact on Current FY 2021 BA-8 Programs Across Initial Findings. Source: DOD (2022a, p. 13).



Figure 14 shows what the baseline programs using traditional appropriation programs estimated would improve if they realigned to single appropriation (DOD, 2022a, p. 13).

Based on the results presented in the figure, BA-08 funding introduced some improvements in the areas of software licenses, subscriptions, user responsiveness, budget planning risk, and team focus to the programs if they adopted single appropriation with no adversity anticipated.

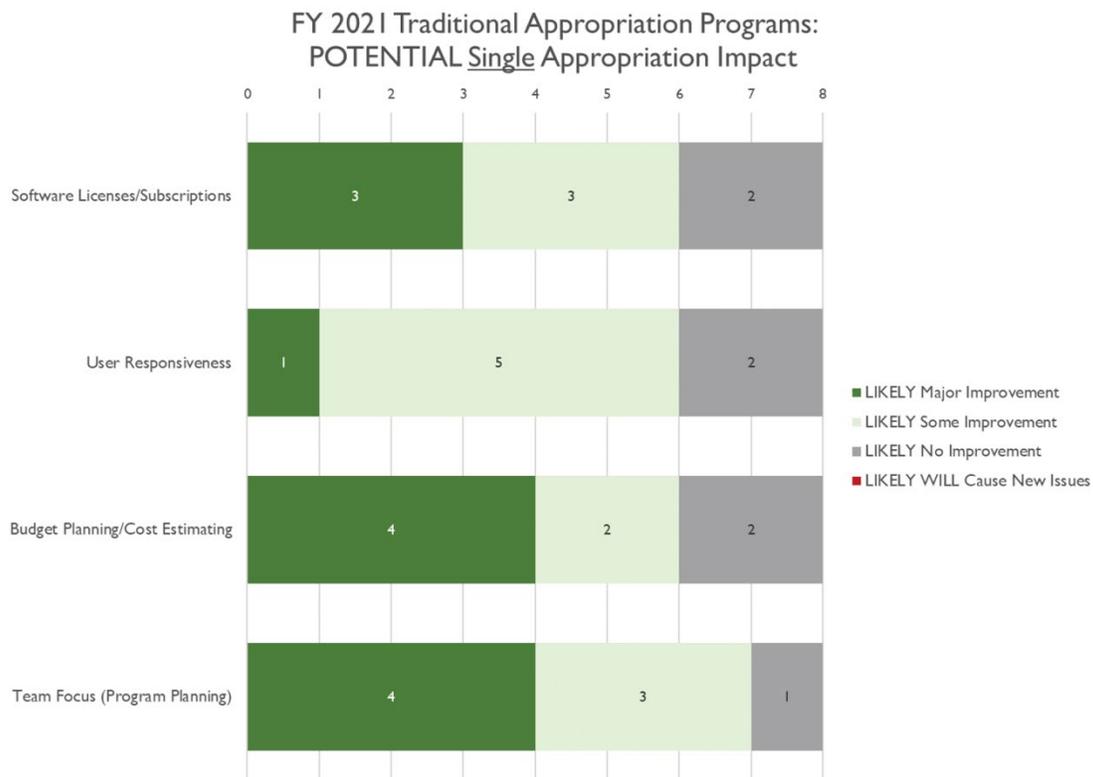


Figure 14. Potential Single Appropriation Impact on FY 2021 Traditional Appropriation Programs. Source: DOD (2022a, p. 14).



According to the metrics in Figure 13 and Figure 14, “there are tangible program-level benefits and minimal issues identified so far of a single appropriation across RDT&E, Procurement, and Operations and Maintenance (O&M)” (DOD, 2022a, p. 14).

The DOD was also able to collect some additional metrics not previously reported in the October 2021 report. Figure 15 compares annual deployment frequency utilizing multiple appropriation versus single appropriation of the eight programs participating in the BA-08 programs (DOD, 2022a, p. 14). The programs participating in the BA-08 program are deploying operational capability annually, with some deploying multiple times throughout the year (DOD, 2022a, p. 14).

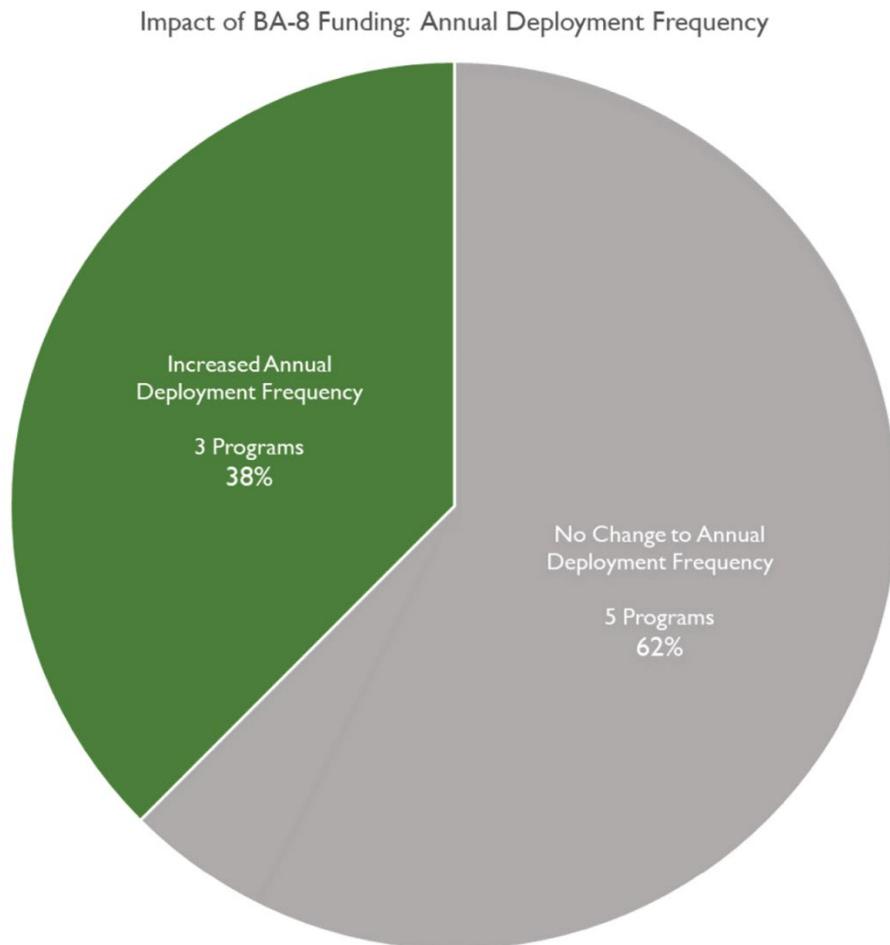


Figure 15. Deployment Frequency FY 2021 BA-8 Programs. Source: DOD (2022a, p. 15).



In addition to deployment frequency data, the DOD was able to assess cross-function team impact. Figure 16 looks at the impacts of use of single appropriation across multiple functioning roles including program management, financial management/cost estimating, contracting, and engineering (DOD, 2022a, p. 15).

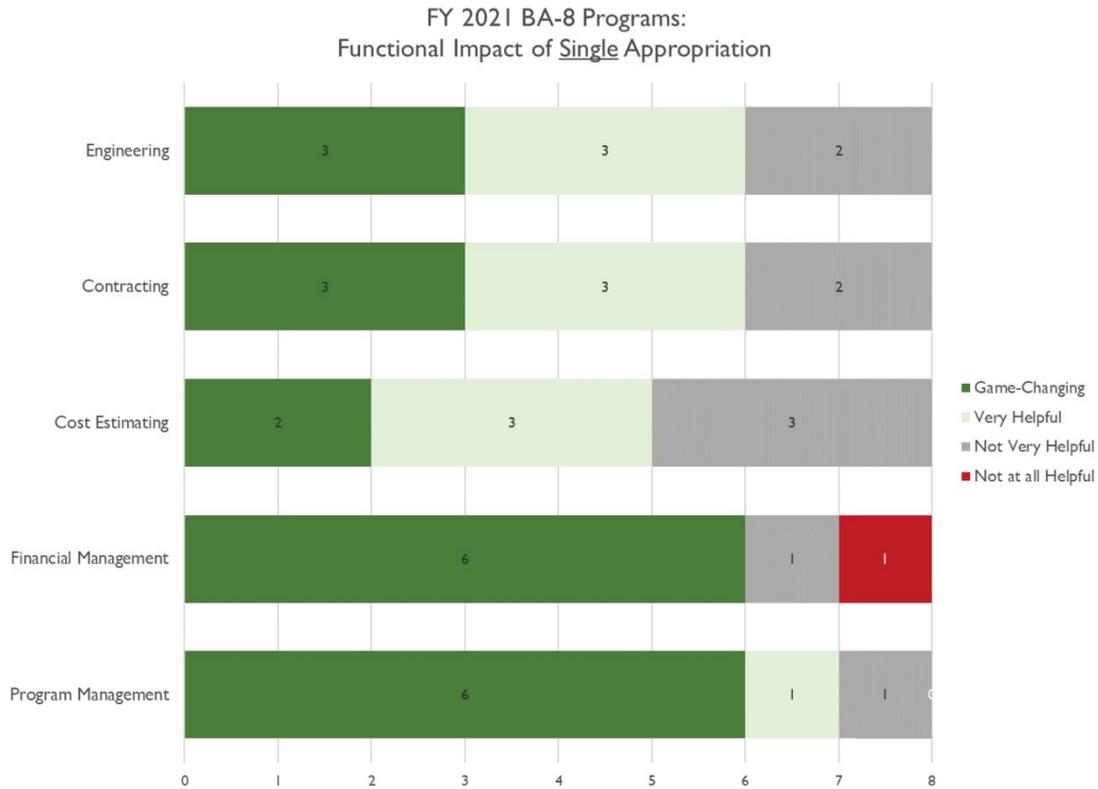


Figure 16. FY 2021 BA-8 Programs: Single Appropriation Impact Based on Functional Role. Source: DOD (2022a, p. 16).

According to the metrics in Figure 16, “BA-08 appears helpful for all five assessed functional roles, and these benefits were most impactful (game-changing) for financial and program management” (DOD, 2022a, p. 16).

Figure 17 shows what the baseline programs using tradition appropriation programs reported regarding use of multiple appropriation across multiple functioning roles



including program management, financial management/cost estimating, contracting, and engineering (DOD, 2022a, p. 16).

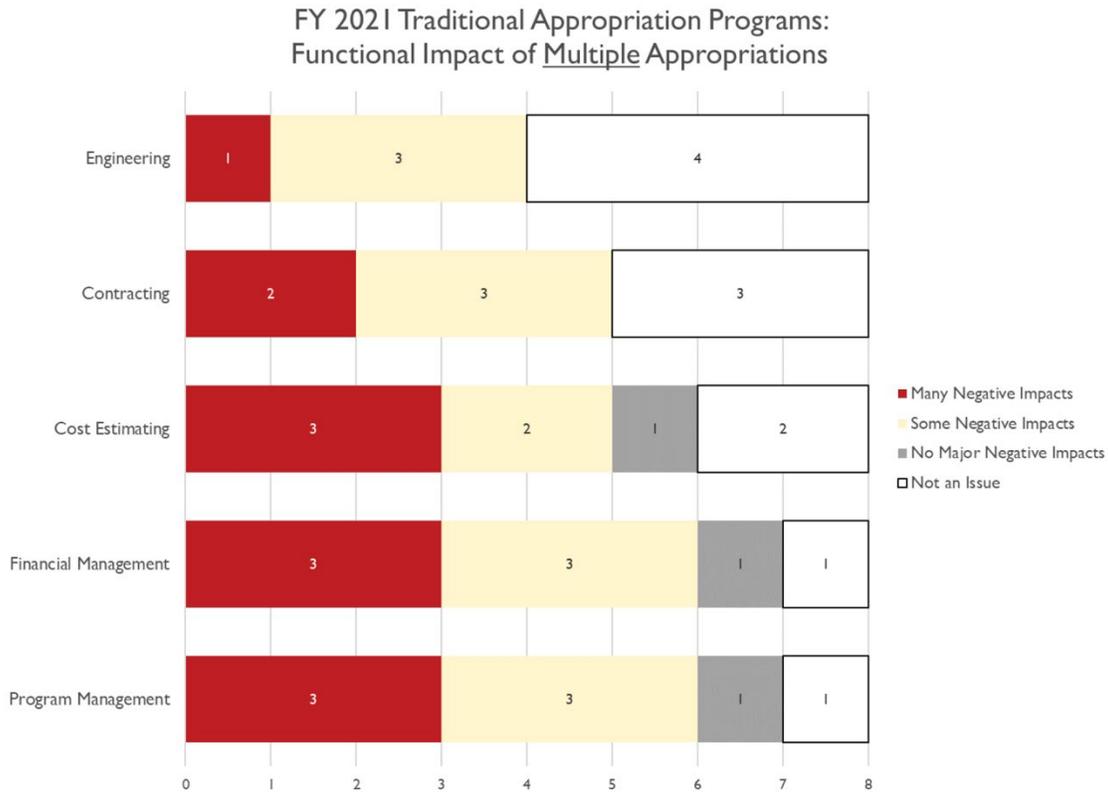


Figure 17. FY 2021 Traditional Programs: Multiple Appropriations Impact based on Functional Role. Source: DOD (2022a, p. 17).

Comparing the metrics between Figure 16 and Figure 17, “multiple appropriations appear to have an overall negative impact for most programs, while a single appropriation appears beneficial for most programs” (DOD, 2022a, p. 17).

To expand upon the presented metrics, Table 16 condenses the areas affected by the BA-08 program accompanied by a brief description on how BA-08 has reported positive benefits in those areas (DOD, 2022a, p. 18).



Table 16. Themes Identified by FY 2021 Congressionally-Approved BA-8 Programs. Source: DOD (2022a, p. 18).

Themes Identified by FY 2021 BA-08 Programs		Brief Description
1	Software Licenses, Subscriptions, and Services	BA-8 allows commercial software to be procured in the most efficient, effective, and timely way to meet program objectives, cybersecurity, and satisfy user needs.
2	Lower Barriers to Small Businesses	BA-8 promotes use of modular contracting approaches which streamlines contract structures and facilitates participation from small businesses.
3	Responsiveness to Changing User Needs Given Threats	BA-8 permits software development to be driven by current user priorities instead of budgetary classification of work: new capability, sustainment, or software fixes.
4	Budget Planning Risk Reduction	BA-8 minimizes the risk that programs predictions years into the future will not reflect unforeseen tech/threat environment changes and detailed user needs.
5	Team Focus	BA-8 eliminates non-value-added time in managing work across different budget activities—modernization (RDT&E) vs. sustainment (O&M)—instead focuses team on managing capability risk and delivering timely critical warfighter or business capabilities.
6	Facilitates Modern Software Practices	Facilitates DOD use of modern software development best practices by eliminating the artificial barriers between continuous software development/upgrades and “maintenance.”

C. REPORT TO CONGRESS JOINT EXPLANATORY STATEMENT ACCOMPANYING THE DEPARTMENT OF DEFENSE APPROPRIATIONS ACT, 2021 (PUBLIC LAW 116-260) INITIAL REPORT FOR SOFTWARE AND DIGITAL TECHNOLOGY PILOT PROGRAM NOVEMBER 2022

At the time of this report, Congress has not approved additional programs to participate in the BA-08 pilot program. Explanatory statement language from the Senate Committee on Appropriations Subcommittee on Defense (SAC-D) states that the SAC-D will not support expanding the pilot until the Department establishes more comprehensive



quantitative metrics (DOD, 2022c, p. 5). The SAC-D quarterly reporting requirements are as follows:

1. Quantitative and qualitative metrics
2. An assessment of eight similar programs [to the BA-8 pilot programs], with representations from each service, funded through traditional appropriation legislation for comparison
3. An assessment of each pilot program against their own historical performance when funded through traditional appropriation legislation
4. An assessment of prior year BA-8 execution by activity compared to planned execution in the respective budget request. (DOD, 2022c, p. 5)

To comply with the SAC-D's requirements, the DOD provided information summarized in Tables 17 and 18 to demonstrate the benefits of BA-08 single appropriation funding and how they affect the speed and quality of software development metrics that the Department established to measure BA-08 success. These tables indicate factors other than single appropriation that have influence on the outcome of programs participating in BA-08 (DOD, 2022c, p. 6). "While one specific measure may give the impression that BA-8 is helping or not helping, it is not possible to isolate the other measures so that the impact of BA-8 can be precisely quantified" (DOD, 2022c, p. 7).



Table 17. BA-8 vs. Other Factors that Influence Software Measures (Quantitative). Source: DOD (2022c, p. 6).

Factor Influence on Measure	Product Delivery Lead Time	Release Frequency to Operational Environment	Deployment Frequency to Production	Mean Time to Restore	Change Fail Percentage
BA-8 Single Appropriation	High	Medium	Medium	Medium	Low
Total Funding	High	Medium	Medium	Medium	Medium
Developer Staffing	High	Medium	High	High	High
Developer Skill	High	Low	Low	Medium	High
Development Environment	High	Medium	Medium	High	Low
Test Facilities	High	High	High	Medium	High
Developmental & Operational Test Support	High	Low	High	Medium	Low\
Time to get Authority to Operate	Low	Medium	High	Low	N/A
Capability Complexity	High	High	High	High	High
User Ability to Accept Releases	N/A	N/A	High	N/A	N/A
Contracting Methods	Medium	Low	Low	N/A	N/A

Legend: Estimated to have the same influence as and higher influence than BA-8.



Table 18. BA-8 vs. Other Factors that Influence Software Measures (Qualitative). Source: DOD (2022c, p. 7).

Factor Influence on:	Dealing With Funding Cuts	Meeting New User Priorities	Procuring New Commercial Licenses	Reacting to Software Obsolescence Issues	User Training
BA-8 Single Appropriation	High	High	High	High	Low
Total Funding	High	High	Medium	High	Medium
Developer Staffing	Medium	High	N/A	Medium	Medium
Developer Skill	N/A	Medium	N/A	Medium	Medium
Development Environment	Medium	Medium	Medium	Medium	Low
Test Facilities	Medium	Medium	N/A	Medium	Low
Developmental & Operational Test Support	Low	High	N/A	Low	N/A
Time to get Authority to Operate	Low	High	N/A	Low	N/A
Capability Complexity	High	Medium	N/A	High	High
User Ability to Accept Releases	Low	Medium	N/A	Medium	High
Contracting Methods	Medium	Medium	Low	Medium	Low

Legend: Estimated to have the same influence as and higher influence than BA-8.

Based on the information presented in the tables, we are unable to attribute programmatic success solely to participation in the BA-08 program; however, we can confidently draw the conclusion that utilizing single appropriation introduced a major improvement in the areas of software licenses, subscriptions, user responsiveness, budget planning risk, and team focus to the programs participating.

As previously stated in the January 2022 report, the programs participating in the BA-08 program are deploying operational capability annually, with some deploying multiple times throughout the year (DOD, 2022a, p. 14). Figure 18 displays the deployment



frequency trends of the eight programs participating in the BA-08 program across fiscal years 2020 through 2022. An overall improvement can be seen across all programs from 2021 to 2022 when single appropriation was implemented (DOD, 2022c, p. 8).

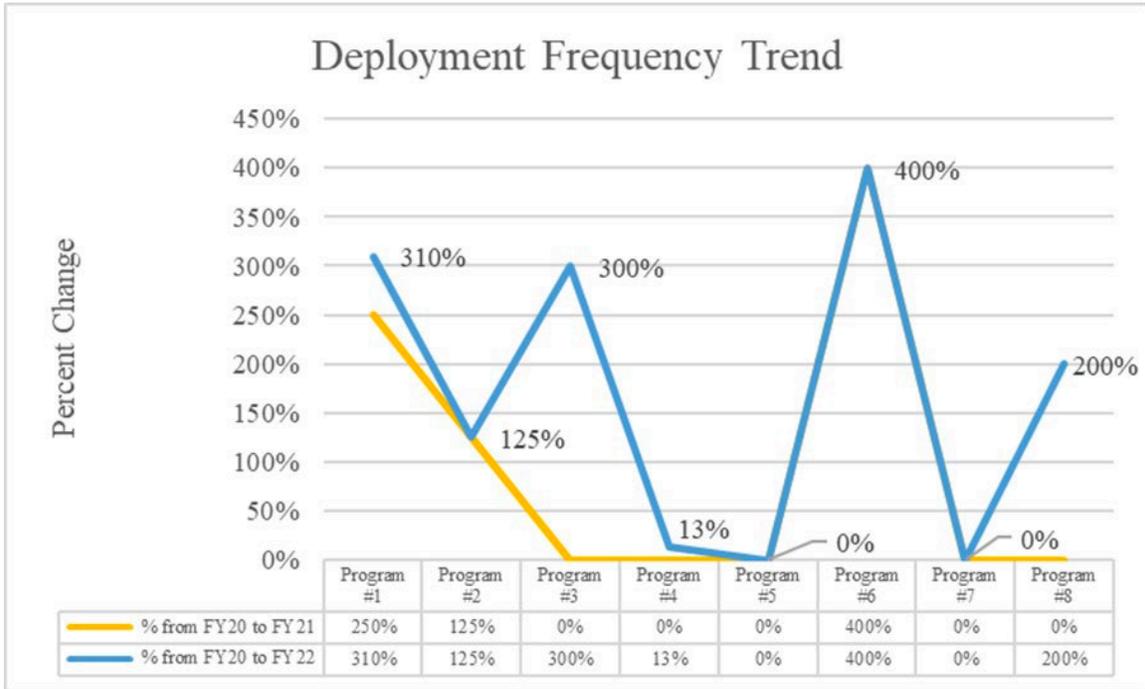


Figure 18. BA-8 Deployment Frequency Trends. Source: DOD (2022c, p. 8).

The BA-08 team asked DOD leadership across the Departments participating in the BA-08 their overall impression of how participating in BA-08 has impacted their programs (DOD, 2022c, p. 8).

The Department of the Air Force has reported positive benefits of the BA-08 programs in regard to funding and delineations, efficiency and speed of procuring software licenses, and program phase funding planning due to agile software development (DOD, 2022c, pp. 8–9).

The Department of the Navy has reported that BA-08 allows the “program manager to manage similarly to how he or she would in industry, and further aligns with other recent



congressional direction in the acquisition reform space...the software acquisition pathway” (DOD, 2022c, p. 10).

The Department of the Army has reported that BA-08 allows their program to operate in an Agile software development environment and eliminates the need to differentiate between software development and software maintenance that traditionally requires multiple appropriations (DOD, 2022c, p. 10). The Army has reported that the ability to avoid reprogrammings to keep up with the dynamic nature of software development due to multiple appropriations has allowed the program to “rapidly integrate and revolutionize critical technologies for the Army’s cyberspace warfighters” (DOD, 2022c, p. 11). The Department of the Army has reported BA-08 “enabled \$1.1M cost avoidance and responsiveness to warfighter needs” directly relating to their program (DOD, 2022c, p. 11). This information supports that realigning from multiple appropriation categories to a single line of funding provides a more manageable acquisition path for continuous delivery of capability.

**D. REPORT TO CONGRESS JOINT EXPLANATORY STATEMENT
ACCOMPANYING THE DEPARTMENT OF DEFENSE
APPROPRIATIONS ACT, 2021 (PUBLIC LAW 116-260) INITIAL
REPORT FOR SOFTWARE AND DIGITAL TECHNOLOGY PILOT
PROGRAM FEBRUARY 2023**

This report focused on Component assessments on the pilot program performance. This self-assessment was sent to each program’s acquisition chain of command and “considered prior performance of the pilot program before joining BA-08 as well as comparison to programs funded with traditional appropriations, except as noted” (DOD, 2023, p. 5).

The Department of the Air Force reported on their Space Command and Control (Space C2) program enrolled as part of the FY21 pilot. Prior to participating in the BA-08 program, the Space C2 program was funded with RDT&E, procurement, and O&M funds (DOD, 2023, p. 6). The Space C2 program underwent many changes during its implementation of single appropriation so the level of overall improved efficiency is difficult to assume it was due to BA-08 involvement, but the Air Force confidently



attributes their ability to execute funding more efficiently directly to BA-08 (DOD, 2023, p. 6). The Air Force reported that “in FY21, under BA-08 the program delivered eight applications that were operationally accepted, compared to three applications in FY20” (DOD, 2023, p. 6). The Air Force did not provide an assessment against traditional appropriation. The Air Force has reported several positive advantages stemming from BA-08 pertaining to the overall platform, data, and application layers (DOD, 2023, p. 7). The Space C2 program has reported the ability to rapidly procure both hardware and cloud services, avoid frequent reprogrammings due to legal interpretations of appropriation types, form software development teams regardless of program phase, procure needed licenses and renewals, and most notably they were able to “acquire, deploy, and obtain an Authority to Operate (ATO) and operationally accepted (OA) at U/S/TS classifications with more than 6,000 users” (DOD, 2023, p. 7).

The Department of the Army reported on their Defense Cyber Operations (DCO) program enrolled as part of the FY21 pilot. Prior to participating in the BA-08 program, the DCO program was funded with RDT&E, procurement, and O&M funds (DOD, 2023, p. 8). The DCO has reported that while participating in the BA-08 program “the DCO program team has held continuously less carryover in both RDT&E and procurement . . . reduced carryover indicates the program is able to accomplish all programmatic activities within the first year funding and reduces the risk of reprogramming to other requirements” (DOD, 2023, p. 8). Figure 19 shows DCO percentage of carryover funds from FY2018–2022 (DOD, 2023, p. 8).



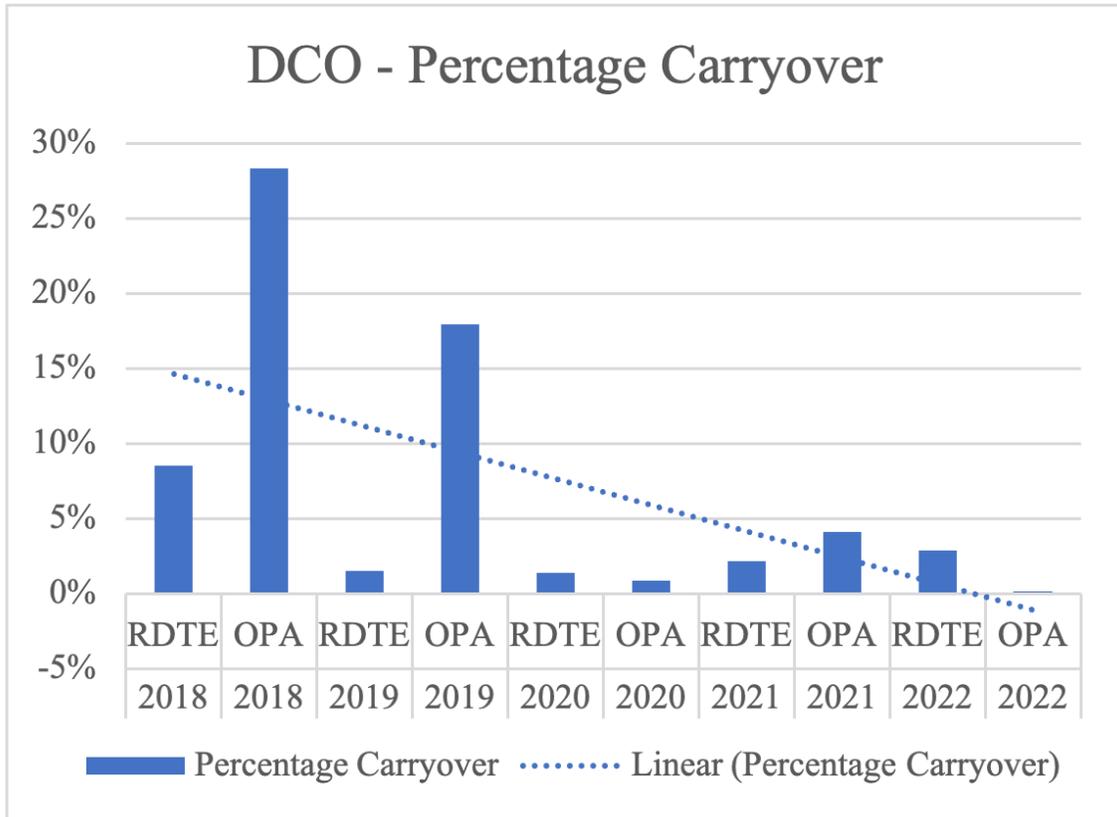


Figure 19. DCO Percentage Carryover of Funds. Source: DOD (2023, p. 8).

The DCO program has also reported an “accelerated obligation rate resulting with increased first quarter activity in FY22” as seen in Figure 20 (DOD, 2023, p. 8).



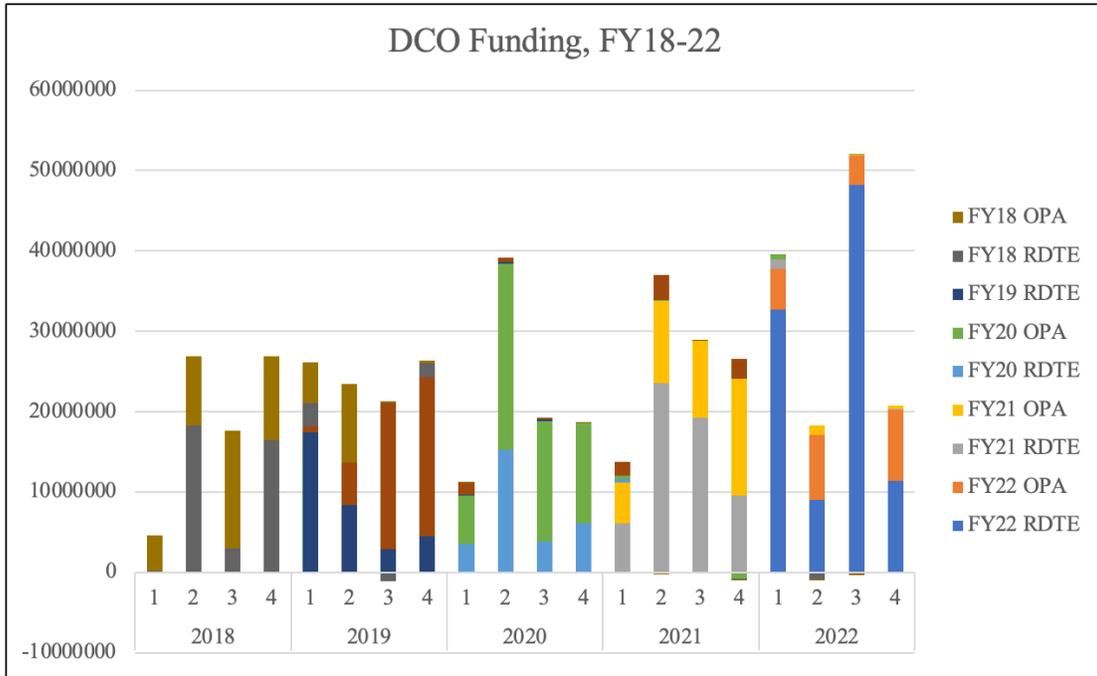


Figure 20. DCO Funding FY18–FY22. Source: DOD (2023, p. 9).

The Department of the Army provided an assessment against its traditionally funded counterpart, the Accessions Information Environment (AIE) program (DOD, 2023, p. 9). The Department of the Army reported that the AIE program had a much higher carryover rate in FY21 into FY22 but found it difficult to form an opinion on whether BA-08 would mitigate that difference in carryover rate (DOD, 2023, p. 9). Figure 21 gives a graphical representation of the AIE funding profile from FY20 through FY22 (DOD, 2023, p. 10).



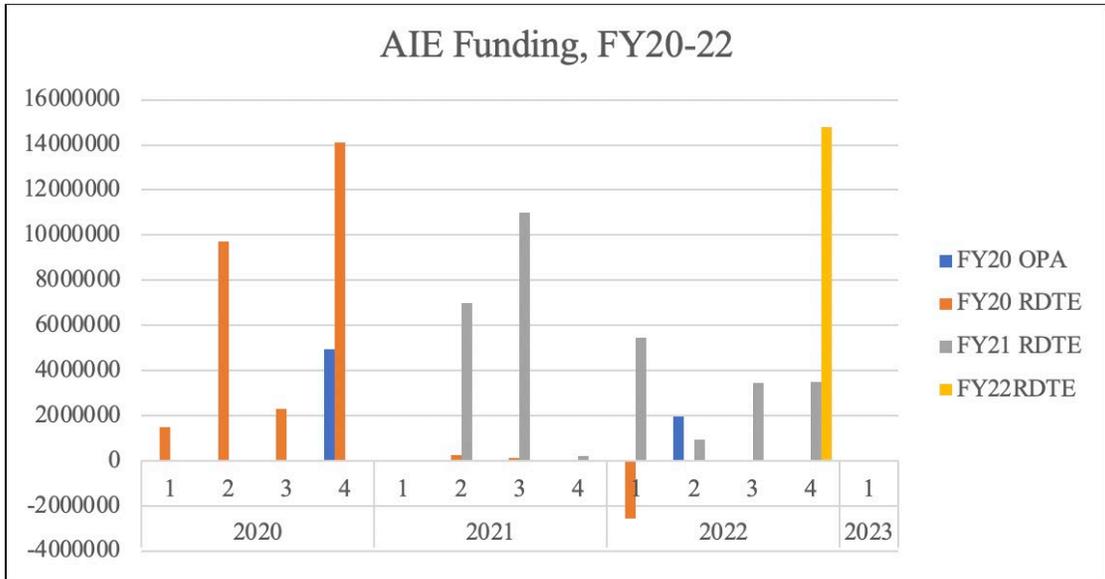


Figure 21. AIE Funding FY20–FY22. Source: DOD (2023, p. 10).

The Department of the Army also provided an assessment against the Unified Network Operations (UNO) program, another traditionally funded counterpart (DOD, 2023, p. 10). The Department of the Army reported that the UNO program has had no appropriations issue from FY19–FY22 since it is funded solely by RDT&E without being enrolled in the BA-08 program (DOD, 2023, p. 10). Figure 22 gives a graphical representation of the UNO funding profile from FY19 through FY22 (DOD, 2023, p. 10).



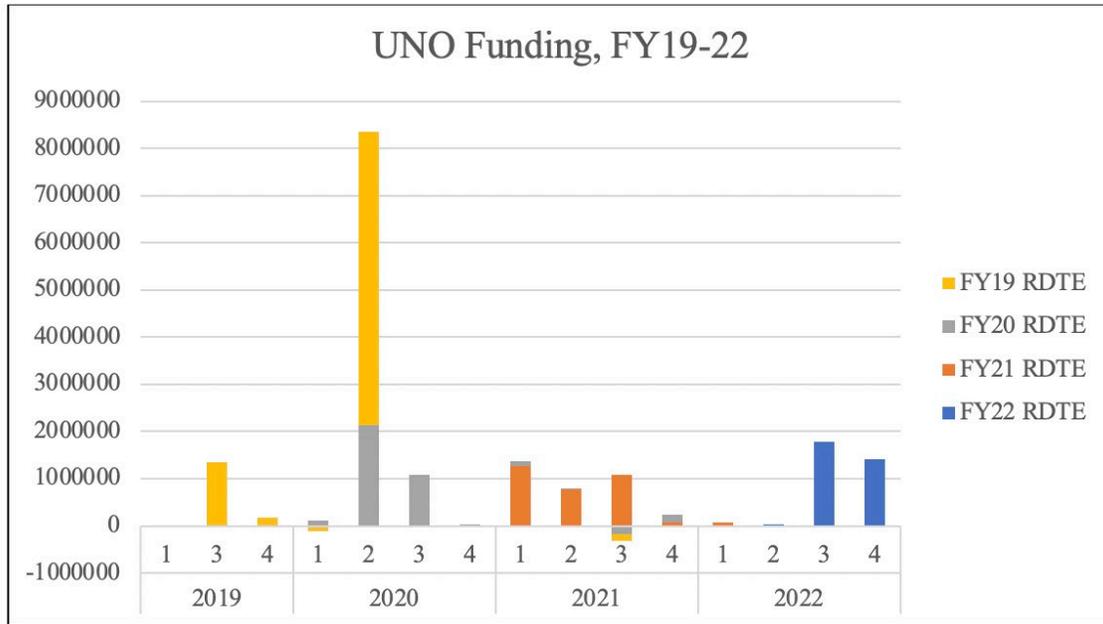


Figure 22. UNO Funding FY19–FY22. Source: DOD (2023, p. 10).

The Department of the Army has provided data in Figures 18–21 that has revealed less carryover, and an accelerated obligation rate reflected in Q1 of the FY since participating in the BA-08 program. These are reported as positive because it reduces the risk of reprogramming and shows those programs’ ability to fulfill proposed programmatic activities during that FY (DOD, 2023, p. 8).

The Department of the Navy reported on their Maritime Tactical Command and Control (MTC2) and Risk Management Information (RMI) programs enrolled as part of the FY21 pilot. The Department of the Navy reported that at this early in participation in the pilot “quantitative data is difficult to produce in year two to ‘prove the value’ of BA-08” (DOD, 2023, p. 11) and would like to participate in a larger sample size of pilots to produce “improved statistical analysis to view emerging trends” (DOD, 2023, p. 11).

The Department of the Navy has reported that since enrolling in the BA-08 program, MTC2 “has experienced efficiency in areas like funds management, which is critically important in software programs that manage backlogs; it eliminates debates on which appropriation should be used on what activity” (DOD, 2023, p. 11). The Navy did not provide an assessment against traditional appropriation for comparison.



The Department of the Navy has reported that since enrolling in the BA-08 program, RMI “removed budget planning preciseness required across multiple appropriations and allowed RMI to effectively execute agile sustainment and development efforts expeditiously based on customer priorities vs. designation of work” (DOD, 2023, p. 11). The Department of the Navy also provided an assessment against another traditionally funded counterpart, the Electronic Procurement System (ePS) program, which is funded by both RDT&E and O&M appropriations and has reported difficulty with reprogramming efforts relating to realignment of funds (DOD, 2023, p. 12). The Department of the Navy has reported that the ePS program “would greatly benefit from use of a single appropriation” (DOD, 2023, p. 12) and the since delays caused by reprogramming “could generally be recognized as ‘self-inflicted wounds,’ the usage of a single appropriation would render them moot” (DOD, 2023, p. 12).

The Office of the Secretary of Defense (OSD) reported on their Acquisition Visibility (AV) program enrolled as part of the FY21 pilot. OSD reported that the AV “program performed significantly better in FY21 than in prior FYs” (DOD, 2023, p. 12), but BA-08 “did not fundamentally change the program’s ability to operate” (DOD, 2023, p. 12). OSD also provided an assessment against another traditionally funded counterpart, the Joint Operational Medicine Information Systems (JOMIS; DOD, 2023, p. 12). This assessment did not include any recommendation on whether JOMIS would benefit from participating in BA-08 utilizing single appropriation (DOD, 2023, p. 12).

The OSD reported on their Algorithmic Warfare Cross Functional Team (AWCFT) program enrolled as part of the FY21 pilot (DOD, 2023, p. 13). The OSD reported that use of single appropriation, “the agility to transition from RDT&E to large scale research and development funding” (DOD, 2023, p. 13), and the “transition from current RDT&E contracts to procurement, or transition from RDT&E to production with rapid prototyping, likely reduces the timeline by years” (DOD, 2023, p. 13). The OSD further reported that use of single appropriation is beneficial in reducing acquisition timelines and allows for speed in delivery warfighter capabilities (DOD, 2023, p. 13). The OSD also stated that “single appropriation funding is immediately available upon a real and timely need, with the benefit of avoiding program and budget cycle requirements to change color of funding



from RDT&E to procurement” (DOD, 2023, p. 13). The OSD also provided an assessment against another traditionally funded counterpart, the Joint Artificial Intelligence Center (JAIC; DOD, 2023, p. 13). The OSD assessed that the difference in program approaches between JAIC and AWCFT provides difficulty when trying to assess on whether BA-08 would prove beneficial to the JAIC program (DOD, 2023, p. 12).

The Defense Information Systems Agency (DISA) reported on their Global Command and Control System–Joint (GCCS-J) program enrolled as part of the FY21 pilot. DISA reported that use of single appropriation through the BA-08 program “leveraged the process improvements in contracting and finance” (DOD, 2023, p. 13) and “allowed the program to increase its productivity by 125%, providing even more software capability, faster to warfighters” (DOD, 2023, p. 13). DISA also reported an increase in software releases since joining the BA-08 program (DOD, 2023, p. 14). DISA did not provide an assessment against traditional appropriation for comparison.

The Defense Counterintelligence and Security Agency (DCSA) reported on their National Background Investigation Services (NBIS) program enrolled as part of the FY21 pilot. DCSA reported that since participating in BA-08 the NBIS program “saw a five-fold increase in the number of releases” (DOD, 2023, p. 14), and a much faster lead time on ATO approvals compared to previous fiscal years (DOD, 2023, p. 14). NBIS reported that the “BA-08 has provided the flexibility, stability, and consistency required for technical deliveries” (DOD, 2023, p. 14), and that the program “has delivered eleven major releases and sixteen point releases due to managing larger contracts with numerous critical tasks with BA-08” (DOD, 2023, p. 14). DCSA did not provide an assessment against traditional appropriation for comparison.

Chapter IV analyzed the four reports received from the BA-08 project team, focusing on the quantitative and qualitative data. This chapter examined the research focus of how the PPBE process is impacted by the BA-08 program in its ability to provide a more manageable acquisition path and evaluate effectiveness with commercial versus DOD-specific capability. Chapter V focuses on findings, recommendations and next steps.



V. CONCLUSION

This chapter provides an overview of the capstone applied project, including the findings and recommendations for future steps. This research explored the following questions: Does realigning funding provide a more manageable acquisition path for continuous delivery of capability? How is the DOD's current software acquisition practices providing a hindrance to continuous delivery of capability? Is the BA-08 program most effective with commercial software, or DOD-specific capability? (Bianco & Hujber, 2023).

A. FINDINGS

To recapitulate, the following questions were explored: Does realigning funding provide a more manageable acquisition path for continuous delivery of software capability? How are the DOD's current software acquisition practices hindering continuous delivery of capability? Is the BA-08 program most effective with commercial software or DOD-specific software? (Bianco & Hujber, 2023).

This research highlighted “the disconnect between balancing multiple appropriations and the modern software development best practices” that support continuous delivery of capability that was outlined in this report (DOD, 2020b, p. 2). That representation directly correlated to the question on how the DOD's current software acquisition practices is hindering continuous delivery of capability. We provided a root cause analysis fishbone (Figure 10) that outlined the hindrances identified. Areas that were identified as affected included software licenses, software subscriptions, software services, lowering barriers to small business, user responsiveness, work optimization, budget planning risk, and team focus. Additionally, the report titled *Report to Congress Joint Explanatory Statement Accompanying the Department of Defense Appropriations Act, 2021 (Public Law 116-260) Initial Report for Software and Digital Technology Pilot Program October 2021* detailed the hindrances of continuous capability while utilizing traditional appropriation funding. The research assessed if realigning funding to a single appropriation provided a more manageable acquisition path for continuous delivery of capability with the inference that a more manageable approach would be anything that



improves upon the outlined hindrances highlighted in the root cause analysis fishbone (Figure 10). We concluded that the report findings did not present enough evidence to conclude that the improvements seen across the programs could be singularly tied to the programs' participation in the BA-08 pilot program because the majority of the programs are enrolled in additional initiatives as well. We recommend expanding the BA-08 pilot program to programs only engaging in the single appropriation approach as the difference in how it was previously managed to get more longitudinal data over time to solidify the results of overall program improvement due to participation in BA-08.

We also analyzed if the BA-08 program was most effective with the acquisition of commercial software, or with DOD-specific capability. Unfortunately, there was not enough data collected by the program to come to a conclusion on this distinction. We recommend that the BA-08 program provides more details about the commerciality of the capability the programs' participating are supporting so data can be collected to measure the effectiveness of the distinction.

By analyzing the reports submitted so far, we determined that this pilot program is providing the qualitative data needed to senior leaders of Congress but is lacking in quantitative data. To reiterate, the purpose of BA-08 pilot program is to identify if realigning funding to a single appropriation provides a more manageable acquisition path for continuous delivery of capability. By analyzing qualitative data for the eight BA-08 programs in FY21 related to software licenses, software subscriptions, software services, lowering barriers to small business, user responsiveness, work optimization, budget planning risk, and team focus, the DOD determined how policy, laws, and regulations affect software and digital technology (DOD, 2021c, p. 7).

Based on the analysis, the qualitative data suggests that the current processes hinder the ability for continuous delivery of capability. A challenge that traditional programs face is that the licenses, subscriptions, and service support may need different appropriations, causing issues with license severability (DOD, 2021c). These qualitative studies identify this challenge using the same criteria the BA-08 programs utilize.



The BA-08 pilot program is an exploration of realigning funding to see if there is a more manageable acquisition path for continuous delivery of capability by combining RDT&E appropriations with O&M and procurement appropriations. The qualitative data showed that by combining these appropriations, the obstacles faced were reduced, system security was improved, and small businesses were more accessible. The responses also showed that there was more flexibility in warfighter needs and that a faster response to those needs could be used.

B. RECOMMENDATIONS AND NEXT STEPS

From the data presented in the reports provided by the OUSD (A&S), we can infer that the initial impact of the BA-08 program has been positive on the eight programs that utilize the single appropriation method. The recommended next steps are to continue analysis and data collection to provide quantitative data to complement the qualitative data collected. Additional programs added to the pilot would also be useful in order to meet the DOD goals of determining how policy, laws, and regulations affect software and digital technology (DOD, 2021c, p. 7). The additional programs in the pilot would aid in identifying potential hindrances in policy so that when the appropriation category (instead of the budget activity in the pilot) is created, many of the issues could be worked to have solid policies, laws, and regulations.

The continued research and analysis of the BA-08 program and the variables and controls being evaluated will provide enough detail for the DOD to make an informed decision on the best way to implement a new appropriation category, which has the potential to allow a more manageable acquisition path for continuous delivery of capability in software.



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