FY 2021 Annual Report on Cost Assessment Activities

March 2022

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Director, Cost Assessment and Program Evaluation

March 2022

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FOREWORD

In an environment of growing threats, competing priorities, and fiscal pressures, the Department of Defense (DoD) must spend DoD resources on the right things, in the right amounts, at the right time. The DoD cost analysis community plays a critical role in this environment by preparing cost estimates that support the resource allocation, acquisition, and requirements generation processes. The cost analysis community consists of approximately 2,000 government analysts supporting an annual budget of more than $775 billion, including the acquisition of more than 300 major weapons systems and information systems.

This Annual Report on Cost Assessment Activities describes the cost-estimating and analysis activities of the office of Cost Assessment and Program Evaluation (CAPE) that have been conducted in partnership with the military department cost agencies and other organizations throughout DoD. These activities include independent cost estimates and analyses that support sound, unbiased cost estimating throughout the acquisition process. In addition, CAPE has worked with other stakeholders in the cost analysis community to improve analytical skills, competencies, tools, and data in support of cost assessment. The cost analysis community has also worked with the Defense Acquisition University (DAU) and other educational institutions to strengthen the education and training of the cost assessment workforce. Overall, this collective effort has provided formal strategic direction for the entire cost analysis community, as stated in written policy and procedures.

DoD, in response to legislation enacted in the past few years, has implemented major changes in defense acquisition management through the newly available Adaptive Acquisition Framework pathways to achieve the objectives of technological superiority and innovation, system affordability, and the more rapid development and fielding of new capabilities. CAPE and the military department cost agencies have expanded the guidance for the DoD cost analysis community to respond to the new framework to ensure that rigorous cost estimating and cost data collection are maintained for all of the possible acquisition strategies.
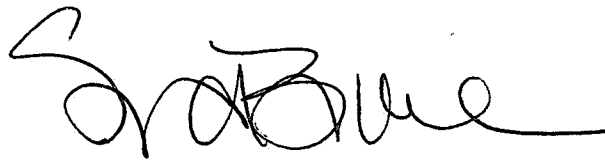
For more than a decade, the cost analysis community has invested in the Cost Assessment Data Enterprise (CADE). CADE is a network-enabled, authoritative data system used to collect actual cost information provided directly from internal contractor business systems in modern data formats; to maintain the quality and curation of this data, which is used to prepare cost estimates; and to store this data and make it easily available for use by DoD personnel in all three military departments and the defense agencies on a worldwide, 24/7 basis. The DoD cost analysis community continues to prepare cost estimates during the COVID-19 pandemic through teleworking as needed and appropriate. This effort is largely enabled by the secure, high-quality, authoritative, network-enabled data sources provided by the CADE system. A dedicated CADE training team provides virtual training courses and events for government and industry throughout each year.

The cost analysis community now seeks to extend this success through the development of a new network-based, enterprise-level data system for Operating and Support cost information—the Enterprise Visibility and Management of Operating and Support Cost (EVAMOSC) system—to

be better able to track and assess sustainment costs and improve cost estimation over a system's life cycle.

The cost analysis community is also dealing with challenges in workforce management. This is due to significant increases in workload—resulting from the addition of the new acquisition pathways and additional congressional requirements, such as expanded cost data collection and cost analyses to support weapon system sustainment reviews—without commensurate increases in resources. The current focus for the leadership in CAPE and the military departments is coping with this imbalance and appropriately prioritizing the activities of the limited resources of the cost analysis community.

Although the DoD cost analysis community has made significant progress, there is more work to be done. The guiding vision for this work is the need to maintain independent, rigorous, and objective cost and schedule estimates, paired with thorough assessments of risk, based on solid analytic methods, tools, and data. This annual report provides a summary of our activities to date, and our plans for the future, in achieving this vision.

Susanna V. Blume
Director
Cost Assessment and Program Evaluation

CHAPTER I. INTRODUCTION

The Director of CAPE (DCAPE) is the principal official for independent cost estimation and cost analysis, ensuring that DoD cost estimation and cost analysis processes provide accurate information and realistic estimates of cost for the acquisition programs of the Department.

In fulfilling this responsibility, CAPE engages in the following activities:

- Prescribes policies and procedures for the conduct of cost estimation and other cost analyses in DoD
- Conducts independent cost estimates (ICEs) and other independent cost analyses
- Reviews all cost estimates and cost analyses conducted in connection with major acquisition programs
- Conducts cost analyses of major programs to be procured using multiyear contract authority
- Prescribes policies and procedures for the reporting and collection of actual cost data and other related information for acquisition programs
- Provides leadership in the education and training of the DoD and other United States Government cost analysis communities
- Issues guidance relating to the full consideration of life-cycle management and sustainability costs in major acquisition programs

The organization of this year's Annual Report on Cost Assessment Activities is as follows:

- Chapter II provides an overview of cost analysis in DoD. It describes the types and purposes of cost analysis organizations throughout the Department and explains the procedures for preparing cost estimates that support the defense acquisition process. This chapter also introduces the main DoD systems that collect actual data and information on the contract and government costs of programs. Some of the key points in this chapter are:

  - **DoD Cost Organizations.** Cost organizations are embedded throughout the Department: at the Office of the Secretary of Defense (OSD), at the headquarters of the military departments and defense agencies, and at field-level acquisition organizations. These organizations conduct a wide range of cost estimation and analysis activities. Each cost organization serves a unique role but also contributes to the collective efforts of the cost analysis community as a whole.

  - **Procedures for Cost Assessments.** CAPE is responsible for nine major documents that provide guidance to DoD organizations concerning cost assessment policy and procedures. These documents are:

    - DoD Directive (DoDD) 5105.84, *Director of Cost Assessment and Program Evaluation (DCAPE)*

    - DoD Instruction (DoDI) 5000.73, *Cost Analysis Guidance and Procedures*

- DoD Manual (DoDM) 5000.04, *Cost and Software Data Reporting (CSDR) Manual*

- *Operating and Support Cost-Estimating Guide*

- *DoD Cost Estimating Guide*

- *Inflation and Escalation Best Practices for Cost Analysis Analyst Handbook*

- *Analysis of Alternatives Cost Estimating Handbook*

- DoDI 7041.04, *Estimating and Comparing the Full Costs of Civilian and Active Duty Manpower and Contract Support*

- DoDI 7041.03, *Economic Analysis for Decision-making*

The first seven documents are the primary vehicles for implementing the cost assessment provisions associated with defense acquisition programs. The CAPE efforts to publish procedures for all cost assessment activities are now mainly complete. All nine documents are now in compliance with the OSD standard to be reviewed annually or updated within a 10-year period.

The policies and procedures for cost assessment for Major Defense Acquisition Programs (MDAPs) and other acquisition pathways are provided in DoDI 5000.73. Specific topics include processes and timelines for cost assessment activities supporting milestone reviews, cost analysis in support of the decision to release a request for proposal for development, formal cost positions and full funding commitments, cost estimates for multiyear procurement contracts for major programs, and cost estimates for contract negotiations.

- **Cost Assessment Data Enterprise.** CAPE has partnered with the military department cost agencies to implement the CADE vision of a centralized data warehouse and virtual library for the DoD government cost analysts, providing authoritative cost, acquisition, and technical data sources that are easily searchable and retrievable in a secure environment.

- Chapter III summarizes the Department's fiscal year (FY) 2021 cost estimation and cost analysis activities associated with MDAPs and other acquisition programs. These activities inform acquisition decision authorities at milestone reviews and at other acquisition decision points. The number of cost assessment activities shown below do not include any cost assessment activities associated with classified programs, which are not discussed in this unclassified report. This chapter also summarizes the degree to which DoD cost estimation and assessment activities in FY 2021 complied with established procedures. In addition, this chapter discusses the overall quality of and any consistent differences in methodology among the cost estimates. Some of the notable highlights in this chapter are:

- **Cost Assessment Activities**

- ➢ CAPE provided four ICEs that supported reviews where the Under Secretary of Defense for Acquisition and Sustainment (USD(A&S)) was the Milestone Decision Authority (MDA).

- ➢ CAPE provided eight ICEs and reviewed one military department ICE that supported milestone or other reviews where the Component Acquisition Executive (CAE) was the MDA.

- ➢ The military departments provided 13 ICEs that supported sustainment reviews of major weapon systems.

- ➢ CAPE independently estimated the cost savings for two cases of multiyear procurement contracts for major programs.

- o **Assessment of Compliance, Quality, and Differences in Methodology**. The cost assessment activities in FY 2021 complied with the established procedures described in Chapter II. The quality of the cost estimates produced by both CAPE and the military departments has continued to improve, largely due to better data and training for the cost analysis community. Cost estimates have also improved due to increased rigor and more disciplined processes. An annual CAPE analysis compares the CAPE ICEs and the Component Cost Positions (CCPs). This year's analysis found that the difference between the two estimates since the enactment of the Weapon Systems Acquisition Reform Act (WSARA) in 2009 has narrowed significantly relative to the previous period between 1999 and the enactment of WSARA. This narrowing is a direct result of improvements in the systematic collection of actual cost information over time and the improved availability of this information to all parties in the cost analysis community, as discussed later in this report. In addition, the annual number of Nunn-McCurdy unit cost breaches after the enactment of WSARA remains low relative to the period before WSARA.

- o **Other Cost Assessment Activities**

- ➢ CAPE prepared an ICE for the CVN 78 Gerald R. Ford class aircraft carrier.

- ➢ CAPE prepared an independent assessment of the Army life-cycle cost estimate for the Optionally Manned Fighting Vehicle, a Middle Tier of Acquisition-Rapid Prototyping (MTA RP) program.

- ➢ CAPE provided a report to the congressional defense committees with an assessment of the remaining life-cycle costs of aircraft inducted through the F/A-18E/F Super Hornet Service Life Modification (SLM) process and new aircraft. This report was directed by the House Committee on Appropriations.

- ➢ CAPE provided a report to the congressional defense committees with a cost assessment of the Constellation Class Frigate. This report was directed by the Consolidated Appropriations Act, 2021.

- ➢ CAPE provided a report to the congressional defense committees with a non-advocate review of the Air Force business case analysis regarding the Digital

Century Series aircraft acquisition strategy. This report was directed by the National Defense Authorization Act (NDAA) for FY 2021.

- Chapter IV describes the status of several ongoing initiatives that are intended to improve and modernize the cost assessment and cost-estimating functions of the Department. These initiatives address a wide range of issues and concerns, including leadership for the cost analysis community as a whole, cost-estimating policies and procedures, cost tools and data systems, and education and training opportunities for the DoD cost analysis community. Some of the notable highlights in this chapter are:

  o **Policies and Procedures.** CAPE completed a major revision of DoDM 5000.04, *Cost and Software Data Reporting Manual*, that serves as the primary requirements document for the implementation of the Cost and Software Data Reporting system.

  o **Enhanced Cost Data Collection**. Feedback from government users has identified desired improvements to the cost data being collected and has noted gaps in coverage where important cost data are not being collected. CAPE and the military department cost agencies have established several initiatives to address these concerns and to increase efficiency through better business processes and the use of advancements in information systems technology. These initiatives include the following:

    ➢ CAPE has issued guidance concerning cost data collection and reporting from DoD acquisition programs that will allow DoD to assess the effects of the COVID-19 pandemic on contractor cost, performance, and schedule. CAPE will use this information to assess the effects of COVID-19 on contractor performance.

    ➢ Cost data reporting has been modernized by enabling the cost-effective submission of low-level cost data, called the Cost and Hour Report (FlexFile), directly from the contractors' accounting systems. The transition from the legacy cost reports to FlexFile reports is now underway.

    ➢ CAPE has extended the requirement for cost data reporting to all of the new acquisition pathways over specified dollar thresholds. Cost data reporting has also been extended to non-traditional contractors and government-performed efforts that support acquisition programs. This approach will help ensure that cost data collection will support rigorous cost estimates for the full spectrum of acquisition programs.

  o **EVAMOSC**. Due to recent statutory requirements, CAPE now has a requirement to develop a comprehensive, enterprise-wide operating and support (O&S) cost data system, which is known as EVAMOSC, that will allow DoD to better track and assess system O&S costs and improve cost estimation over a system's life cycle.

  o **Cost Analysis Education and Training**. CAPE and the military department cost agencies have continued to review the entire DAU curriculum and the course content supporting professional certification in cost estimating. Education and

training specific to CADE and its supporting cost data has been developed for incorporation into the curricula at DAU and other educational institutions. In addition, CAPE has established a dedicated CADE training team that has provided numerous virtual training and outreach activities to government organizations and defense industry contractors throughout the country in 2021. CADE users, most of whom now frequently work from home, also have access to modern on-line training and to several user guides.

The report also includes the following appendices that provide background information relevant to cost assessment activities.

- Appendix A enumerates the cost analysis organizations in the Department.
- Appendix B describes MDAP unit cost reporting and unit cost breach thresholds.
- Appendix C describes additional CAPE guides and handbooks that support the DoD cost analysis community.
- Appendix D enumerates recent CAPE policy memos that pertain to cost data reporting.
- Appendix E provides additional information on CADE and DoD cost data collection systems.
- Appendix F describes recent legislative changes to defense acquisition statutory requirements and related acquisition and cost assessment policy and procedures.
- Appendix G provides additional information on CAPE efforts to support training and education for the DoD cost analysis community.

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CHAPTER II. OVERVIEW OF COST ANALYSIS IN DOD

This chapter provides an overview of the current organizations, policies, procedures, and supporting data systems for cost estimation and analysis in place throughout DoD.

Cost Analysis Organizations in DoD

Cost organizations are distributed throughout DoD: at OSD, at the headquarters of the Components (i.e., military departments and defense agencies), and across DoD field organizations. Each cost group serves a unique purpose and function but also complements the family of cost organizations supporting the defense acquisition process and the broad and diverse operations of the Department. This diversity helps foster best practices and teamwork within the cost analysis community. Appendix A provides more details on the roles and missions of the various DoD cost analysis organizations.

At the OSD level, CAPE is the principal office for independent cost estimation and cost analysis. In addition, CAPE is responsible for ensuring that the cost estimation and cost analysis processes of DoD provide accurate information and realistic estimates of cost for the major acquisition programs of the Department. CAPE provides policy for and oversight of DoD cost assessment activities. CAPE may also provide ICEs for acquisition programs under certain circumstances explained later in this chapter, or it may review a Component ICE under other circumstances.

The headquarters for each military department has its own cost agency or other organization. These organizations provide senior decision-makers with a wide variety of cost and economic analyses to support acquisition, programming, and budget decisions. These analyses may address individual weapon systems, or in some cases, may address broader issues such as force structure or installations. The military department cost agencies or other organizations may provide policy guidance that is unique to each of the Components. In some circumstances, these cost-estimating agencies may provide ICEs for acquisition programs managed by their Component. The military department cost agencies or other organizations function independently from their acquisition organizations because they reside in the financial management organizations of their military departments and are outside their military department's acquisition chain of command.[1]

There are also many field-level cost organizations. These organizations provide resources to support higher headquarters' cost estimates and analyses, and they support day-to-day operations of program offices and similar entities. Examples of such activities include evaluation of contractor proposals and should-cost reviews; support to competitive source selections; cost estimates to support the programming and budgeting processes; and cost estimates used in specific analytic studies, such as systems engineering design trades or Analyses of Alternatives (AoAs). Field-level and program office members of the cost analysis community workforce often

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[1] The Department of the Navy (DoN) restructured its cost-estimating organizational structure in 2020 and it is different than the other military departments. These changes are described in Chapter IV.

possess important specialized cost and technical experience unique to specific systems or commodity groups, such as satellites, submarines, or tactical missiles.

Cost Assessment Procedures

DoDD 5105.84, *Director of Cost Assessment and Program Evaluation (DCAPE)*, was most recently approved on August 14, 2020, and serves as the CAPE charter. The directive defines overall CAPE roles, responsibilities, and authorities in the Planning, Programming, Budgeting and Execution, acquisition, and requirements processes. Regarding cost assessment, this directive establishes DCAPE as the principal official for independent cost estimation and cost analysis for DoD acquisition programs.

Specific guidance on prescribed policy and procedures for cost assessment is provided in DoDI 5000.73, *Cost Analysis Guidance and Procedures*. The instruction is the primary vehicle for implementing the cost assessment provisions that are in statute throughout DoD. In particular, this instruction provides guidance to the military departments and defense agencies concerning the preparation, presentation, and documentation of life-cycle cost estimates for acquisition programs. This instruction also assigns roles and responsibilities and describes the processes and timelines for various cost assessment activities.

The latest version of the instruction was issued in March 2020. The revision added procedures and timelines for the new acquisition pathways created by statute and DoD acquisition policy. These pathways were introduced in DoDI 5000.02, *Operation of the Adaptive Acquisition Framework*, that was issued in January 2020. These pathways provide options for program managers and senior acquisition officials to develop acquisition strategies that match the characteristics of the capability being acquired. The adaptive acquisition pathways are shown in Figure 1.
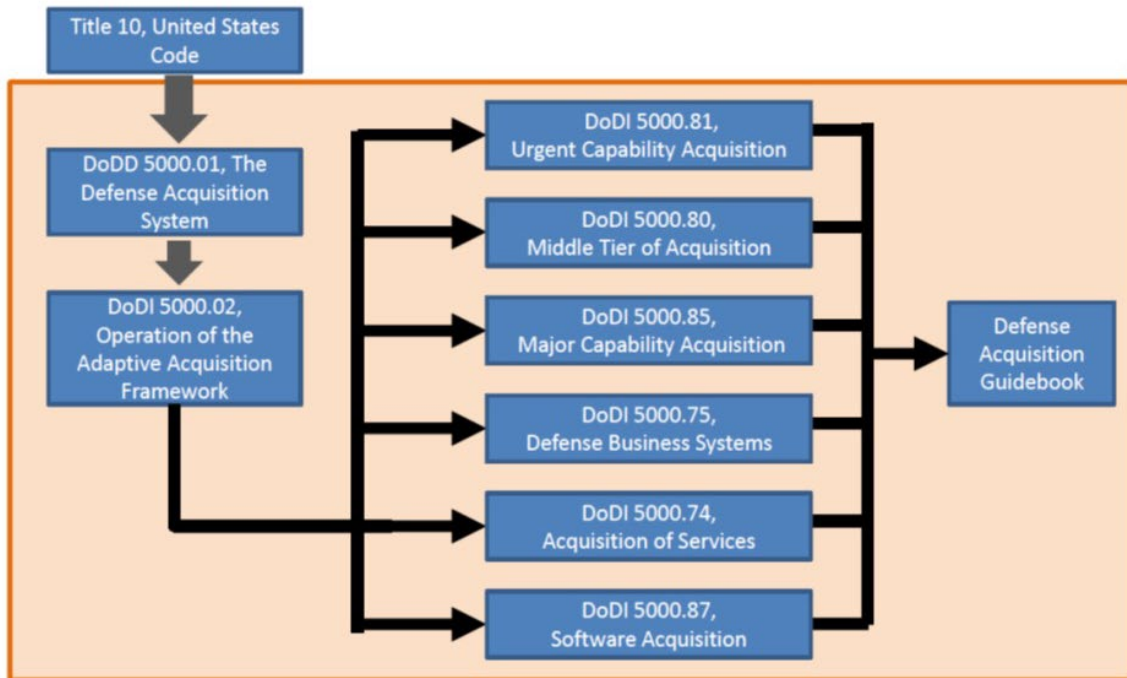
Figure 1. Adaptive Acquisition Framework Pathways

The directives and instructions are available on the Executive Services Directorate website at https://www.esd.whs.mil/DD/.

Major Capability Acquisitions

The term "Major Capability Acquisition" refers to MDAPs (i.e., Acquisition Category (ACAT) I programs), major systems (i.e., ACAT II programs), and other capabilities developed by the major capability acquisition pathway.

As required by Section 3221 (Independent Cost Estimation and Cost Analysis) of Title 10, United States Code (hereafter cited in this report as 10 U.S.C. § 3221), CAPE prepares ICEs and conducts cost analyses for pre-MDAPs[2] and MDAPs for which the USD(A&S) is the MDA:

- Before any Milestone A determination or Milestone B certification under 10 U.S.C. § 4251/4252 (Determination Required Before Milestone A Approval/Certification Required Before Milestone B Approval).
- Before any decision to enter low-rate initial production (LRIP) or full-rate production (FRP).
- For any certification for critical unit cost (Nunn-McCurdy) breaches under 10 U.S.C. § 4376 (Critical Cost Growth in Major Defense Acquisition Programs). Appendix B describes the procedures for MDAP unit cost reporting and the criteria for a critical unit cost breach.

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[2] A pre-MDAP is an acquisition program that has yet to reach Milestone B, but is judged likely to reach MDAP status at that time.

- At any other time considered appropriate by DCAPE or upon the request of USD(A&S) or other senior leaders of the Department.

When the MDA is delegated to the Component for milestone and other acquisition reviews, CAPE either (1) reviews the ICE prepared by the military department cost agency (or defense agency equivalent), reviews the CCP, reviews the funding position selected by the MDA, and provides a written summary of its review and findings to the MDA; or (2) prepares the ICE when considered appropriate by DCAPE or upon the request of USD(A&S) or the MDA; or (3) works with the military department cost agency to collaboratively develop the ICE. In those cases where CAPE prepares the ICE, the military department cost agency (or defense agency equivalent) conducts its own cost analyses in accordance with DoD Component policy. These cost analyses typically consist of a program office estimate and a Component cost estimate. The Component cost estimate may consist of a military department cost agency (or defense agency equivalent) estimate, independent assessment of the program office estimate, or some other similar cost analysis.

In addition, for MDAPs, there may be a cost analysis in support of a decision to release the Request for Proposal (RFP) for development. CAPE may (1) prepare an ICE or other cost analysis, (2) review and approve a military department (or defense agency equivalent) ICE or cost analysis, or (3) delegate responsibility for the cost analysis to the military department or defense agency.

Component Cost Position and Full Funding Commitment

CAPE policy for MDAPs requires the Component to establish a formal position on the estimated cost of the program and to commit to fully fund the program in the Future Years Defense Program (FYDP). The Component establishes a documented CCP for all MDAPs prior to the Milestone A, B, and C (or LRIP) reviews and the FRP decision. The CCP is derived from the Component cost estimate and the program office estimate in accordance with Component policy. The CCP is signed by the DoD Component Deputy Assistant Secretary for Cost and Economics (or defense agency equivalent) and includes a date of record. For the Department of the Navy, which no longer has a Deputy Assistant Secretary for Cost and Economics position, a CCP instead is co-signed by the Deputy Assistant Secretary of the Navy for Management and Budget and the Deputy Assistant Secretary of the Navy for Acquisition Policy and Budget.

CAPE policy for major acquisition programs also requires the MDA to certify that the program is or will be fully funded. Following the meeting of the Defense Acquisition Board (DAB) or Component equivalent, the MDA will document this decision in an Acquisition Decision Memorandum (ADM) that certifies that the Component will fully fund the program to either the CCP or the ICE in the current FYDP or will commit to full funding of the CCP or ICE during the preparation of the next FYDP. A full funding certification statement in the ADM is required at the Milestone A, B, and C (or LRIP) reviews and the FRP decision.

Sustainment Reviews

Recent legislation requires that each military department conduct a sustainment review of each major weapon system (i.e., a weapon system acquired as an MDAP) every 5 years after

declaration of Initial Operational Capability (IOC). Each sustainment review includes an ICE for the remainder of the life cycle of the program. In DoDI 5000.73, there are three options for the preparation of the ICE: CAPE may choose to (1) prepare the ICE, or (2) review and approve a military department or defense agency equivalent ICE, or (3) delegate responsibility for the ICE to the Component. In any case, the ICE will be briefed at the sustainment review, and a copy of the ICE report will be provided to CAPE for archival in CADE.

Cost Estimates for Contract Negotiations

Title 10 U.S.C. § 3226 (Estimates for Program Baselines and Analyses and Targets for Contract Negotiation Purposes) requires that for MDAPs, cost estimates developed for baselines and other program purposes are not to be used for the purpose of contract negotiations or the obligation of funds. Section 3226 also states that cost analyses and targets developed for the purpose of contract negotiations and the obligation of funds will be based on the government's reasonable expectation of successful contractor performance in accordance with the contractor's proposal and previous experience.

In the defense acquisition process, the MDA formally approves a cost estimate that serves as the program baseline and the basis for program funding. However, program managers are expected to strive for lower costs where possible and should take initiatives to identify and achieve savings below budgeted most-likely costs. In particular, should-cost reviews can be used during proposal evaluations and contract negotiations (particularly for sole source procurements) throughout program execution, including sustainment, to evaluate the economy and efficiency of a contractor's operations and processes.

In addition, the CSDR reports described later in this chapter have been used to provide insight and support multiple studies throughout the DoD cost and acquisition communities concerning contract profits and fees for both prime contractors and major subcontractors. Acquisition professionals can review this information to assess the extent that realized profits and fees for completed acquisition programs have been compatible with current guidelines contained in defense policy and regulations, and use that information in negotiations concerning ongoing acquisition programs.

Middle Tier Acquisitions (MTAs)

One new acquisition pathway was established by Section 804 (Middle Tier of Acquisition of Rapid Prototyping and Rapid Fielding) of the NDAA for FY 2016. This pathway provided the Department with new authority to establish a "middle tier" of acquisition programs intended to be completed within 5 years from the start of the MTA program. The MTA process provides two possible acquisition paths: (1) rapid prototyping (prototypes with innovative technologies), and (2) rapid fielding (new or upgraded systems with minimal development). For the rapid prototyping path, the objective is to field a prototype that meets defined requirements that can be demonstrated in an operational environment and provide a residual operational capability within 5 years from the program start date. For the rapid fielding path, the objective is to complete fielding of the program within 5 years from the program start date. MTA programs fall between "urgent acquisitions" that are generally completed within 6 months to 2 years, and "traditional" acquisition programs that last much longer than 5 years.

Programs in this middle tier follow streamlined procedures and are exempt from the traditional requirements and acquisition processes. Section 804 also requires that the USD(A&S) guidance for MTA establish a process for transitioning successful prototypes to production and fielding under the rapid fielding pathway or the traditional acquisition process. This guidance was provided in DoDI 5000.80, *Operation of the Middle Tier of Acquisition (MTA)*, issued in December 2019. This instruction directs that DoD Components will develop processes for (1) the merit-based selection of approved requirements to meets needs communicated by the Joint Chiefs of Staff and the Combatant Commanders, (2) the development of an acquisition strategy that addresses security, schedule and production risks, (3) a full funding strategy that is based on a cost estimate, and (4) the development of a test strategy for demonstrating and evaluating the performance of the proposed products and technologies.

CAPE established new procedures for cost estimates for MTA programs in the recent revision to DoDI 5000.73. For the rapid prototyping programs, CAPE or the responsible military department cost agency (determined on a case-by-case basis) will prepare an estimate of life-cycle costs for programs likely to exceed MDAP dollar thresholds.[3] For the rapid prototyping programs below the MDAP dollar thresholds, cost estimates will be prepared in accordance with guidance issued by the responsible military department cost agency. For the rapid fielding programs, CAPE or the military department cost agency will prepare an estimate of life-cycle costs for programs likely to exceed MDAP or major system dollar thresholds.[4] For either case, CAPE and the director of the responsible military department cost agency will determine the organization responsible for the life-cycle cost estimate for an MTA program after the decision is made to pursue a program using the MTA pathway. Specific procedures and timelines for MTA cost estimates are provided in DoDI 5000.73.

Other Acquisition Pathways

For Defense Business Systems, CAPE may conduct a cost estimate at DCAPE's discretion. For all other cases, the military department cost agency or defense agency equivalent will conduct cost analyses or delegate this responsibility to another organization. Cost analyses will be conducted for each phase of the business capability acquisition cycle in order to support authority-to-proceed decision points.

For contracted services, CAPE may conduct a cost estimate at DCAPE's discretion. All other cost estimates for contracted services will be conducted in accordance with the policies and procedures issued by the relevant military department cost agency or defense agency equivalent.

For software acquisition, CAPE will conduct an ICE for programs likely to exceed MDAP or major system thresholds before the program enters the execution phase. CAPE may, at its

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[3] An MDAP is a program with expenditures expected to exceed $525 million (FY 2020 constant dollars) for research, development, test, and evaluation, or $3.065 billion (FY 2020 constant dollars) for procurement.

[4] A major system is a program other than an MDAP with expenditures expected to exceed $200 million (FY 2020 constant dollars) for research, development, test, and evaluation, or $920 million (FY 2020 constant dollars) for procurement.

discretion, delegate the authority for the cost estimate to the military department cost agency or defense agency equivalent. Estimates for software programs that do not exceed the major system threshold will be conducted according to the policies and procedures issued by the relevant military department cost agency or defense agency equivalent.

Cost assessment procedures for Defense Business Systems, contracted services, and software acquisitions are new and will need to be validated or refined based on lessons learned from actual experience.

Missile Defense System Programs

The programs of the Missile Defense Agency are exempt from the traditional DoD acquisition processes and procedures. Instead, in March 2020, the Deputy Secretary of Defense issued Directive-type Memorandum 20-002, *Missile Defense System Policies and Governance*. This memorandum establishes policy, assigns responsibilities, and prescribes procedures for missile defense system programs. In this memorandum, for each missile defense system program, DCAPE (1) develops an ICE before the product development decision or the production decision, and (2) identifies and recommends to the Deputy Secretary of Defense sources of funding at a funding level consistent with the CAPE ICE. The Director of the Missile Defense Agency develops a life-cycle cost estimate and an affordability analysis that are provided to DCAPE before the product development decision for each missile defense system program.

Role of the Independent Cost Estimate

Acquisition programs are supported by ICEs at milestone reviews and other program decision points. In practice, an ICE for a program is conducted by using a combination of historical data and precedence, results of extensive site visits, and the actual performance of that program to date. It is a careful and comprehensive analysis that looks at all aspects of a program, including risks.

At a minimum, the purpose of the ICE is to allow decision makers to ensure that (1) current program cost estimates are reasonable, considering cost, schedule, and technical risks, (2) initial program baselines established for cost and schedule are realistic and achievable, (3) subsequent program baselines remain realistic, and (4) sufficient funding is available in the FYDP to execute the program without significant adjustments to the program's budgets. However, CAPE's experience is that the ICE should also support much broader program decisions. The ICE should include a discussion of risks, the potential impact of risks on program costs and schedule, and approaches to mitigate risks. The ICE can also provide decision makers with insights concerning:

- Unique challenges of each program and options available to address them
- Balanced requirements based on trade-offs between cost, capabilities, and schedule
- Alternative acquisition and contracting strategies to improve ways to do business
- Options to achieve better program outcomes as circumstances change or unexpected events occur

Multiyear Procurement Contracts

Title 10 U.S.C. § 3507 (Multiyear Contracts … Defense Acquisitions of Weapon Systems) establishes several criteria that must be satisfied and certified by the Secretary of Defense prior to the award of a multiyear contract in an amount equal to or greater than $500 million (then-year dollars) for a defense acquisition program. Some of these criteria (concerning substantial savings, realistic cost estimates, and availability of funding) must be supported by a CAPE cost analysis of the proposed multiyear procurement (MYP) strategy and contract structure, which includes a comparison of the estimated costs of multiyear versus annual contract awards.

For each MYP candidate, CAPE provides a preliminary cost analysis of the potential cost savings that could be obtained through an MYP contract compared to a baseline of annual procurement contracts. This analysis supports a DoD decision to seek a multiyear request to Congress for a specific authorization by law to carry out the MYP strategy. Following congressional approval (in the NDAA and the Department of Defense Appropriations Act) for the use of the MYP strategy, the Component and the contractor negotiate and finalize the MYP contract terms. At this point, CAPE updates its previous cost analysis to incorporate the most recent cost information, including actual cost data and experience to date, as well as an evaluation of cost realism in the contractor's proposal. The updated cost analysis is provided in time to support a DoD notification to the four congressional defense committees of the intent to award the multiyear contract. This notification, by law, must be provided at least 30 days before the contract award.

Foreign Military Sales

In a few cases, cost estimates are made for programs that have plans or the potential for foreign military sales (FMS). FMS cases have significant possible benefits in lowering the costs of programs to the United States, since the procurement of additional systems will lead to unit cost reductions for all parties. In some cases, the foreign country may also contribute to the recoupment of previous development costs. However, quantifying these benefits in cost estimates can often be challenging due to the complexities of issues such as coproduction, tie-ins with U.S. MYP contracts, and forecasting the effects on contractor business bases and rates. For example, a significant portion of the MYP savings for aircraft programs resulted from higher FMS after a U.S. MYP contract award. Nevertheless, assessing the implications of FMS provides a better understanding of the complete costs for the United States. This assessment includes working with the defense contractors to collect cost data for FMS efforts to provide the requisite insights. In recent years, CAPE has made considerable progress in improving cost analysis community tools, methods, and policies for cases involving FMS.

Additional Guidance and Procedures for Cost Assessment Activities

CAPE provides additional guidance on DoD cost assessment activities through additional instructions and guides. These supplemental publications are discussed in Appendix C. In recent years, CAPE has also issued several policy memos that pertain to cost assessment and cost data reporting. These policy memos are listed in Appendix D.

CADE and DoD Cost Data Collection Systems

The Role of the Cost Assessment Data Enterprise

CAPE has partnered with the military department cost agencies and USD(A&S) staff to implement the CADE vision of the government cost analyst's centralized data warehouse and virtual library, which houses seamless, integrated, authoritative data sources that are easily searchable and retrievable. CADE provides immediate analyst access to the complete range of available cost and related data. CAPE has also worked with USD(A&S) to capitalize on the acquisition data and reports already collected in the various acquisition information systems and to integrate them with the cost data to provide the government analyst with a full view of a weapon program or portfolio. Additionally, CADE includes a document repository to house ICEs; CCPs; Cost Analysis Requirements Descriptions (CARDs); CAPE briefings to the DAB and other acquisition decision-making groups; and other documents and briefings. These documents are stored in the portion of the CADE library accessible only to government personnel.

CADE not only stores authoritative cost, acquisition, and technical data; it also provides the analyst with a modern data warehouse environment where the data are easily searched and displayed in an integrated web-based application. The data are easily transferred from machine to machine for analysis. The interface for the analyst is the Data and Analytics Home Page, which is displayed in Figures 2 and 3.

Welcome to CADE: Data and Analytics
The Authoritative Source for Defense Cost Data

Search for CSDR Data

CSDR Browse

Browse CSDR submissions with enhanced searching down to the WBS. Download 1921 / FF / SRDR files and export CCDR data.

Quick Downloads

Bulk download all CSDR submission files for a given Service or Commodity. Provides fast access to common CSDR Browse queries.

Additional Data

CADE Library

Business Base Data
1921-3 and FPR

ACDB Inventory

Other Libraries ▼

Figure 2. CADE Data and Analytics Home Page

Data by Program

View all available data for a given program, including SAR data, CARDs, associated documents, and planned and scheduled CSDR submissions by contract.

| Search Programs ▼ | GO |

Advanced Program Search

★ My Favorite Programs

Service Libraries

ARMY (JIAT)   NAVY (CCRL)   AIR FORCE

Figure 3. CADE Data and Analytics Home Page (cont.)

The home page supports analysts by offering two modes to access data. The first mode supports queries for CSDR and other data in the CADE data warehouse or library across multiple programs. Queries can be made by service or weapon system commodity type. For either mode, the data are easily transferred from machine to machine for analysis. A step-by-step guide for using the home page is provided in a Data and Analytics User Guide. The second mode supports analyst queries by individual program. This mode provides a history of program information (including acquisition cost and quantity, schedule events, and unit procurement cost) as reported in the program Selected Acquisition Reports (SARs) over the years. This mode also allows access to the CSDR by contract and report type for each program, and also allows access to CARDs and other library documents and other files for each program.

In addition, CADE provides the analyst with a collection of downloadable software tools. Another CADE feature is the Endorsed Datasets, Tools, and Models Hub (DTMHub), which allows organizations to endorse and share their datasets, tools, and models with the cost analysis community. Users can search for items of interest by organization, keyword, branch of service, or commodity (such as aircraft or ship). Alternatively, users can access a specific application and download items and user guides.

Recent enhancements to CADE, including new library features, are described in Chapter IV.

DoD Cost Data Collection

As noted earlier, CAPE is responsible for prescribing policy and procedures for the reporting and collection of actual cost data that are used throughout the cost analysis community. Systematic and institutionalized cost data collection and validation is critical to the preparation and support of credible cost estimates. The CSDR system serves as the primary source of cost data for major contracts and subcontracts associated with MDAPs and certain other acquisition programs. Procedures and implementation guidance for the CSDR system are provided in DoDM 5000.04, *Cost and Software Data Reporting (CSDR) Manual*. As discussed in Chapter IV, this manual was recently updated to provide implementation details concerning the latest cost data collection and reporting requirements that were issued in the March 2020 revision to DoDI 5000.73.

The three Visibility and Management of Operating and Support Costs (VAMOSC) systems (one system for each military department) collect historical O&S costs for major fielded weapon systems. Chapter IV describes a major enterprise-wide upgrade to the VAMOSC systems known as EVAMOSC.

Appendix E provides additional details concerning all of the cost data collection systems.

CHAPTER III. DOD COST ASSESSMENT ACTIVITIES IN FY 2021

This chapter summarizes DoD cost estimates and cost analyses that were made in FY 2021 to support MDAP milestone and other acquisition reviews, multiyear procurements, and other cost analyses. This summary does not include cost estimates or cost analyses made in support of classified programs, which are not discussed in this unclassified report. This chapter also provides some observations regarding compliance with policy and procedures, quality of the cost estimates over time, and differences between the CAPE and Component cost estimates.

MDAP Milestone or Other Review Cost Assessment Activities

Table 1 summarizes the four cost assessment activities in FY 2021 that supported milestone or other reviews of MDAPs where the MDA was USD(A&S). For each MDAP with a milestone review or other event, Table 1 identifies the program name and acronym, the responsible Component, the source and approval date of the supporting cost estimate(s) or analyses presented to the MDA, and the review event being supported.

Table 1. Cost Assessment Activities in FY 2021 for MDAP Milestone or Other Reviews Subject to USD(A&S) Decision

Program Name	Acronym	Component	Cost Assessment Activity	Activity Date	Supported Event	Event Date
Integrated Air and Missile Defense	IAMD	Army	CAPE Independent Cost Estimate	18-Dec-20	Milestone C	11-Jan-21
			Army Cost Position	16-Nov-20		
Next Generation Interceptor	NGI	Missile Defense Agency	CAPE Independent Cost Estimate	25-Feb-21	Technology Development Decision	23-Mar-21
			Missile Defense Agency Independent Cost Estimate	15-Dec-20		
Long Range Standoff Weapon	LRSO	Air Force	CAPE Independent Cost Estimate	24-May-21	Milestone B	30-Jun-20
			Air Force Cost Position	3-May-21		
Standard Missile-3 Block IIA	SM-3 IIA	Missile Defense Agency	Cape Independent Cost Estimate	9-Sep-21	Initial Production Decision	9-Sep-21
			Missile Defense Agency Cost Position	8-Jul-21		

NGI and SM-3 IIA are Missile Defense Agency programs, and so are exempt from the traditional DoD acquisition process. For these programs, the CAPE ICEs were provided to an oversight body known as the Missile Defense Executive Board chaired by USD(A&S). In the case of NGI, the ICE was required by Section 1647 of the NDAA for FY 2021 to inform the contract awards for the NGI design.

Table 2 summarizes the nine cost assessment activities in FY 2021 that supported milestone or other reviews of MDAPs when the MDA was the CAE. For each MDAP with a milestone review or other event, Table 2 identifies the program name and acronym, the responsible Component, the source and approval date of the supporting cost estimate(s) or analyses presented to the MDA, and the review event being supported.

Table 2. Cost Assessment Activities in FY 2021 for MDAP Milestone or Other Reviews Subject to CAE Decision

Program Name	Acronym	Component	Cost Assessment Activity	Activity Date	Supported Event	Event Date
F-15 Eagle Passive/Active Warning and Survivability System	F-15 EPAWS	Air Force	CAPE Independent Cost Estimate	10-Nov-20	Milestone C Decision Point 1	1-Dec-20
			Air Force Cost Position	23-Oct-20		
Amphibious Combat Vehicle Family of Vehicles	ACV FoV	Navy	CAPE Independent Cost Estimate	8-Dec-20	Full-Rate Production Decision	8-Dec-20
			Navy Cost Position	3-Nov-20		
Next Generation Jammer – Low Band	NGJ-LB	Navy	CAPE Independent Cost Estimate	11-Dec-20	Milestone B	8-Dec-20
			Navy Cost Position	23-Nov-20		
Common Infrared Countermeasures	CIRCM	Army	CAPE Review and Assessment	15-Apr-21	Full-Rate Production Decision	29-Apr-21
			Army Cost Position	8-Apr-21		
			Army Independent Cost Estimate	5-Apr-21		
B-52 Radar Modernization Program	B-52 RMP	Air Force	CAPE Independent Cost Estimate	19-May-21	Milestone B	10-Jun-21
			Air Force Cost Position	13-May-21		
Next Generation Jammer – Mid Band	NGJ-MB	Navy	Cape Independent Cost Estimate	26-May-21	Milestone C	28-Jun-21
			Navy Cost Position	10-May-21		
Handheld, Manpack, and Small Form Fit Radio	HMS	Army	Cape Independent Cost Estimate	29-Jul-21	Full-Rate Production Decision	19-Aug-21
			Army Cost Position	20-Jul-21		

Table 2. Cost Assessment Activities in FY 2021 for MDAP Milestone or Other Reviews Subject to CAE Decision (cont.)

Program Name	Acronym	Component	Cost Assessment Activity	Activity Date	Supported Event	Event Date
Advanced Anti-Radiation Guided Missile – Extended Range	AARGM - ER	Navy	CAPE Independent Cost Estimate	24-Aug-21	Milestone C	2-Sep-21
			Navy Cost Position	22-Jun-21		
Precision Strike Missile Program	PrSM	Army	CAPE Independent Cost Estimate	27-Sep-21	Milestone B	27-Sep-21
			Army Cost Position	17-Sep-21		

Remarks about Specific Programs

The F-15 EPAWSS is using a tailored acquisition strategy that splits Milestone C into two decision points: the first is for the approval of the hardware procurement, and the second (to be made at a later date) is for approval of the hardware installations on the operational aircraft.

Independent Cost Estimates for Sustainment Reviews

As noted in Chapter II, each sustainment review for a major weapon system is required to be supported by an ICE for the remainder of the life cycle of the program. For FY 2021, CAPE elected to delegate responsibility for all ICEs to the Components. CAPE will assess these ICEs in terms of analysis methods and data completeness, and determine whether the CAPE guidance for the delegation of the sustainment review ICE will need to be modified in the future. Table 3 summarizes the 13 ICEs prepared for sustainment reviews in FY 2021.

Table 3. ICEs in FY 2021 for Sustainment Reviews

Program Name	Component	ICE Date	Review Date
Bradley Fighting Vehicle M2A3/M3A3	Army	4-Jan-21	2-Feb-21
Ch-47F Block I	Army	8-Mar-21	6-Apr-21
MaxxPro Family of Vehicles	Army	19-Mar-21	20-Apr-21
Guided Multiple Launch Rocket System	Army	8-Jun-21	18-Aug-21
C-130J	Air Force	10-Jun-21	17-Aug-21
F-15E	Air Force	10-Jun-21	17-Aug-21
F-16C/D	Air Force	10-Jun-21	17-Aug-21
KC-135	Air Force	10-Jun-21	17-Aug-21
MQ-9A	Air Force	10-Jun-21	17-Aug-21
B-1B	Air Force	14-Jun-21	17-Aug-21
B-2A	Air Force	14-Jun-21	17-Aug-21
B-52H	Air Force	14-Jun-21	17-Aug-21
E-3	Air Force	14-Jun-21	17-Aug-21

Although CAPE did not review and comment on each sustainment ICE individually, CAPE provided an overall assessment of the ICEs to the Army and Air Force at the end of the fiscal year. It was noted that, in some cases, there is a gap in cost reporting for contractor logistics support. Although progress in this area has been made for many programs, others lack the cost reporting granularity to help improve cost estimation for sustainment of fielded and future programs.

The Navy paused sustainment reviews in FY 2021, but these reviews will resume in FY 2022.

CAPE Cost Analysis for Multiyear Procurement

As noted in Chapter II, CAPE prepares a preliminary independent estimate of savings for a proposed MYP strategy and contract structure to support the Department's certification to the

Congress of significant savings and other criteria, and updates the estimate of savings (after MYP approval from the Congress) prior to the award of a multiyear contract. Table 4 summarizes the two preliminary estimates of MYP savings made in FY 2021.

Table 4. Cost Analyses in FY 2021 for Multiyear Procurement Contract Awards

Program Name	Acronym	Component	Cost Assessment Activity	Activity Date
H-60 Black Hawk	UH-60M/HH-60M	Army	CAPE Preliminary Estimate of Savings for MYP Contract	25-May-21
AH-64E Apache	AH-64E	Army	CAPE Preliminary Estimate of Savings for MYP Contract	2-Jun-21

CAPE estimates that using an MYP for these two programs will provide significant savings to DoD. These preliminary estimates of savings were consistent with historical aircraft and missile MYP experience. The historical experience for MYP savings (relative to Single-Year Procurement (SYP)) for 19 aircraft, missile and ship MYP contracts from 2010 to 2021 is shown in Table 5.

Table 5. CAPE Estimated MYP Savings – Aircraft, Missile and Ship Contracts

Program	CAPE SYP Estimate $B	Savings – CAPE SYP vs. Negotiated Price (%)	Savings – CAPE SYP vs. Negotiated Price (Then-Year $B)
F-18 MYP 3	$5.88	10.2%	$0.60
H-60 Airframe MYP 8	$8.95	18.1%	$1.62
H-60 Avionics	$1.55	19.4%	$0.30
CH-47F MYP 2	$4.22	19.2%	$0.81
V-22 MYP 2	$7.24	11.6%	$0.84
E-2D MYP 1	$5.22	15.9%	$0.83
C-130 MYP 2	$6.00	11.5%	$0.69
DDG 51 MYP 3	$7.22	9.0%	$0.65
VCS SSN 774 MYP 3	$21.85	20.0%	$4.37
AH-64E MYP 1	$3.14	10.5%	$0.33
H-60 Airframe MYP 9	$3.72	13.7%	$0.51
V-22 MYP 3	$4.35	12.4%	$0.54
F-18 MYP 4	$3.77	10.3%	$0.40
DDG 51 MYP 4	$10.29	6.9%	$0.71
E-2D MYP 2	$3.88	10.0%	$0.37
SM-6 MYP 1	$3.11	10.3%	$0.69
C-130 MYP 3	$3.94	10.9%	$0.43
SM-3 Block IB MYP 1	$2.42	13.2%	$0.32
VCS SSN 774 MYP 4	$26.47	6.8%	$1.8

The MYP savings for these aircraft and missile contract awards have ranged from 10 to 19 percent. The MYP savings for the ship contract awards range from roughly 7 to 20 percent. Although the ship MYP savings tend to be less in percentage terms, they are nevertheless significant in absolute dollar terms. The overall total savings for all of these contracts is estimated to be $16.4 billion (then-year dollars).

Assessment of Compliance, Quality, and Differences in Methodology

Compliance with Policy and Procedures

All of the events noted in Table 1 through Table 4 were supported by the appropriate cost estimates or analyses that complied with the requirements of statute and the established cost assessment procedures described in Chapter II. In particular, each MDAP milestone or other acquisition review decision (noted in Table 1 and Table 2) was supported by (1) a CCP, and (2) an ICE prepared by the CAPE or the appropriate military department cost agency. Each major weapon system sustainment review (noted in Table 3) was supported by a military department ICE. In addition, for each potential MYP contract award (noted in Table 4), CAPE provided a

preliminary estimate of MYP cost savings. Information about the compliance of CSDR data reporting is provided in Appendix E.

Quality of the Cost Estimates

The overall quality of the cost estimates prepared by each of the military departments has continued to improve due to increased rigor. As noted in Chapter II, DoD has instituted a policy—in place since 2009 for all MDAPs—requiring that a signed, dated Component Cost Estimate and a CCP be delivered to CAPE prior to delivery of an ICE, to support each milestone or other DAB review. Also, the military department's financial and acquisition leadership must provide a statement with the CCP affirming their commitment to fully fund the program during the preparation of the next Program Objective Memorandum (POM) and the President's Budget FYDP.

The quality of the cost estimates for MDAPs provided by the military departments, as well as CAPE, has also continued to improve due to better data. An increased, Department-wide emphasis by management on the importance of cost data reporting has resulted in significant increases in the quantity and frequency of cost data reports compared to the acquisition reform era of the 1990s. Figure 4 shows the annual volume of CSDR data reports for each of the major system commodities.

Figure 4. CSDR Data Collection Over Time

Note that Figure 3 shows the CSDR reporting based on the "as of" date, not the submission date. For example, a report with an as-of date of December 2020 will typically be submitted in February 2021. As a result, the last year of the figure has an apparent drop-off in reporting, because not all of the 2020 reports had been submitted by the publication date of this report.

The emphasis on better data is not limited to the volume of reports. Additional ongoing efforts to improve the content and quality of the specific data reports are described in Chapter IV.

Differences in Methodologies

Since the enactment of WSARA, differences in methodologies or approaches between the cost estimates prepared by the military departments and by CAPE have decreased over time. Generally, the approaches used by the military departments and CAPE now follow similar best practices in cost estimation: collect actual cost information from ongoing and historical programs in a product-oriented taxonomy; use that information to prepare cost and schedule forecasts for new programs or programs proceeding to the next milestone in the acquisition process; and review the actual cost information collected, as each individual program proceeds, to update and adjust the cost and schedule forecasts for the program to reflect actual experience. As discussed in the previous section, the Department's goal has been to improve the systematic collection of actual cost information over time and ensure the data are available to all DoD organizations. This approach has resulted in smaller differences between the cost and schedule forecasts of the military departments and CAPE.

An annual CAPE analysis compared the CAPE ICEs and the CCPs. This analysis found that since the enactment of WSARA, the difference between the two estimates had narrowed significantly relative to the previous period between 1999 and the enactment of WSARA. The most recent results of this comparison are shown in Figure 5.
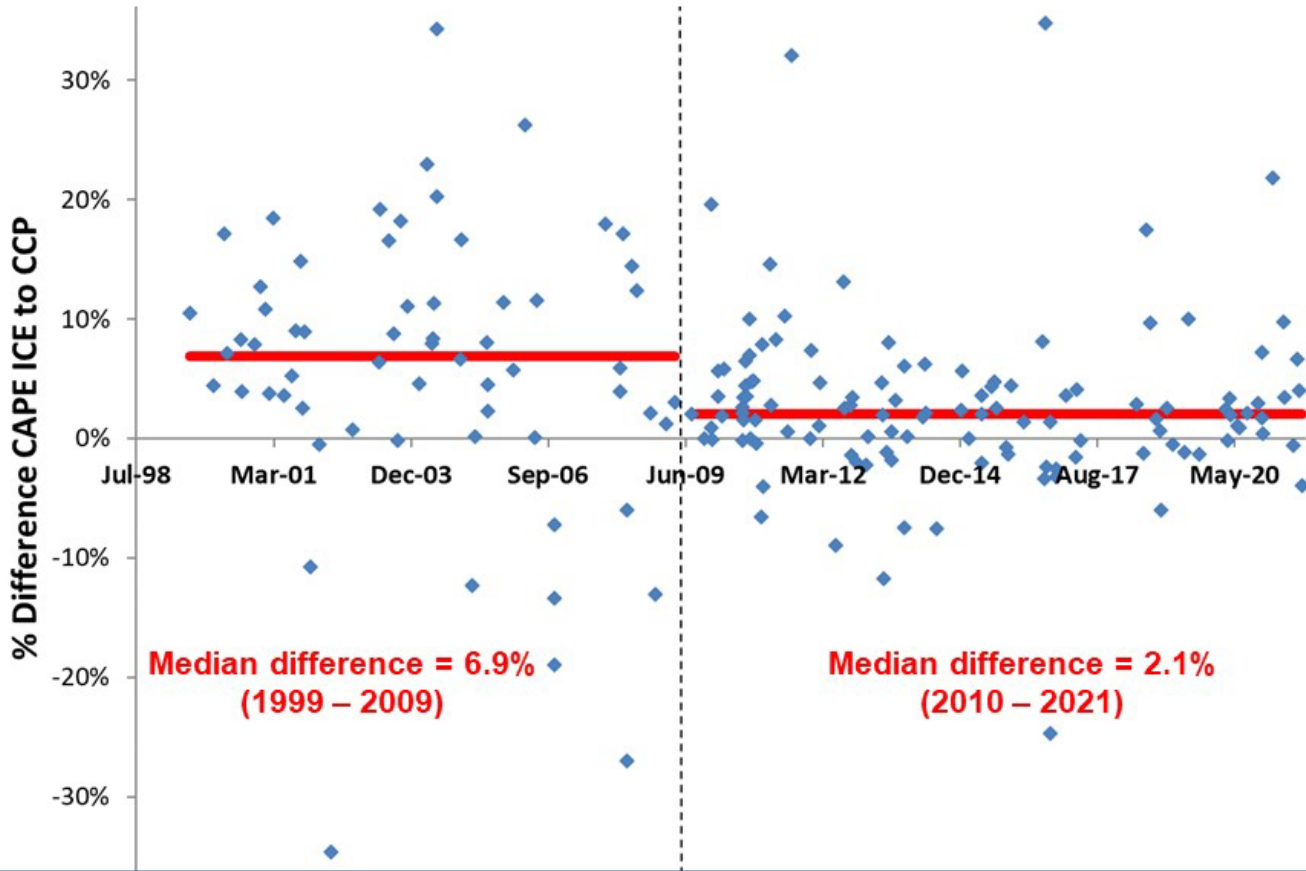
Figure 5. Comparison of CAPE ICEs to Component Cost Positions

Since the enactment of WSARA, the median difference is 2.1 percent, compared to a median difference of 6.9 percent for the previous period. In addition, the statistical variances have significantly narrowed, meaning that the post-WSARA estimates are more tightly clustered, thus reflecting that the CCPs and CAPE ICEs are now more closely aligned. Despite this narrowing of differences, a few outliers have indicated significant discrepancies (greater than 10 percent) between the CCP and the CAPE ICE. In these situations, CAPE and the military department cost agency meet to assess the reasons for the discrepancy and determine whether there are better data available to reconcile the difference. Failing that, CAPE and the military department work together to assess how costs can be controlled as the program moves forward.

Acquisition Program Cost Performance

Regarding actual cost growth, one admittedly simplistic measure of acquisition program cost performance is the annual rate of Nunn-McCurdy unit cost breaches that have occurred over time. The number of significant and critical breaches by SAR reporting year from 1997 to 2019 is displayed in Figure 6.
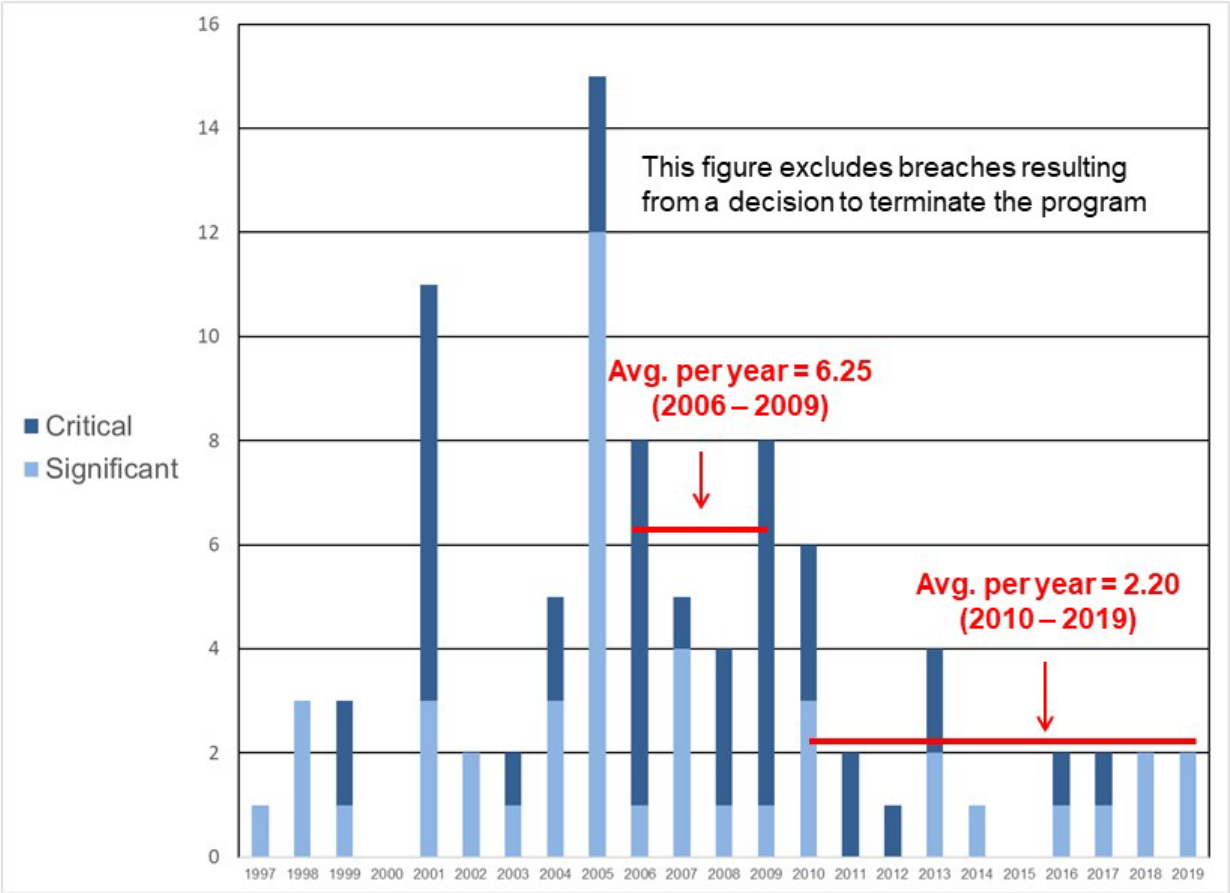
Figure 6. Number of Nunn-McCurdy Breaches by SAR Reporting Year

It is important to note that the NDAA for FY 2006 changed the criteria for a Nunn-McCurdy breach by adding a requirement to report unit-cost growth from the original program baseline as well as the current (possibly revised) baseline. This requirement caused a large spike in 2005, when 11 programs had to report preexisting significant breaches. Thus, for historical comparisons, the period before 2006 is not comparable to the period after that.

For the period from 2006 to 2009, there was an average of 95 SAR reporting programs that experienced an average of 6.25 breaches per year. For the period from 2010 to 2019, there was an average of 83 SAR reporting programs that experienced an average of 2.20 breaches per year. If the number of breaches per year from 2010 to 2019 is adjusted by the difference in SAR portfolio size, the average number of breaches per year would be 2.52. Nevertheless, the number of breaches per year has declined since the enactment of WSARA in 2009.

DoD did not submit SARs in 2020 due to the transition during the change in administrations. The 2021 SARs were not available at the time of the publication of this report.

Other Cost Assessment Activities

Other Cost Estimates and Analyses

CAPE prepared a cost analysis for the CVN 78 Gerald R. Ford class aircraft carrier that provided an estimate of the potential savings of a two-ship buy proposal, where the last two ships of the class would be procured under a single contract.

CAPE prepared an independent assessment of the Army life-cycle cost estimate for the Optionally Manned Fighting Vehicle (OMFV). OMFV is an MTA RP program. The CAPE assessment identified risks and opportunities in advance of the RFP release and included alternative estimates of prototype and production manufacturing costs. The Army also conducted two life-cycle cost estimates for two other MTA RP programs: Indirect Fire Protection Increment 2 and the Future Long-Range Assault Aircraft.

CAPE prepared a report with an assessment of the remaining life-cycle costs of aircraft inducted through the F/A-18E/F Super Hornet Service Life Modification (SLM) process and new aircraft. This assessment included comparisons of procurement cost and O&S cost per flying hour. This report was required by House Report 116-453 that accompanied the FY 2021 DoD Appropriations Act.

CAPE prepared a report with a cost assessment of the Constellation Class Frigate (formerly known as FFG(X)). This cost assessment was an update to the previous CAPE ICE conducted in April 2020 in support of the Milestone B review. This update was made to assess any effects of the contract award and design changes since the Milestone B ICE. This report was required by the Joint Explanatory Statement accompanying the FY 2021 Consolidated Appropriations Act.

CAPE prepared a non-advocate review of the Air Force business case analysis regarding the Digital Century Series (DCS) aircraft acquisition strategy. This strategy plans to leverage emerging digital tools including model-based systems engineering, modular open systems architecture, agile software development, and digital test and evaluation. This strategy also

intends to increase aircraft acquisition cadence—the time between successive aircraft series—and to decrease the operational service life of procured aircraft. The Air Force business case analysis is a cost-benefit analysis of the DCS strategy. CAPE was required to provide a review of this business case analysis by Section 801 of the NDAA for FY 2021.

The DoD submarine industrial base (SIB) is currently experiencing a generational increase in demand with concurrent production of the Virginia Class Submarine (VCS) and the top-priority Columbia Class (CLB) program. CLB is currently in the early stages of production and will strain the SIB, challenging both programs to meet schedule requirements if DoD does not take action now. The desired state of the SIB is to be able to produce and deliver one CLB and two VCS boats per year, often referred to as "1 + 2." CAPE and the Navy completed an analysis of the SIB to support the FY 2023 Program and Budget Review (PBR). CAPE identified six lines of investment that will support improvements in SIB delivery rates to reach the desired state in time for the beginning of serial CLB production in FY 2026: Supplier Development, Shipbuilder Infrastructure, Strategic Outsourcing, Workforce Development, Government Oversight, and Technology Opportunities. DoD included additional investment in the PBR to directly impact improvements in the SIB.

CAPE delegated responsibility for ICEs to the Air Force for two Software Acquisition Pathway programs: Joint Cyber Command and Control (JCC2) and Space Command and Control (C2).

DoD Cost Analysis Symposium

For several decades, CAPE and its predecessor organization have sponsored an annual DoD Cost Analysis Symposium, known as DoDCAS, with attendees drawn primarily from government and private-sector cost research and analysis organizations. DoDCAS provides a valuable forum for the education, training, and improvement of communication within the DoD cost analysis community. The presentations at DoDCAS facilitate discussion, instruction, and debate concerning cost-estimating methods and models, data collection, and contemporary issues of interest to the DoD cost analysis community. In this way, the event leverages the knowledge and experience of the community to increase individual and collective expertise in cost estimation and analysis. DoDCAS also provides members of the DoD cost analysis community the opportunity to hear the insights of senior DoD and other government officials on important topics.

Obviously, the ongoing COVID-19 pandemic has prevented DoD from holding a traditional symposium event. In the long term, the hope is to resume the symposium when it is safe to do so and DoD guidance allows it.

In the interim, CAPE held a Cost and Technical Virtual Focus Group meeting, which provided a forum with broad participation from government and industry. This 2-day event provided updates on the FlexFile initiative, policy, COVID-19 cost reporting, and other relevant topics. There were a series of industry and government panels to address specific topics and concerns across the community. Following each panel there was a community feedback forum to address any issues or concerns raised by the attendees.

CAPE also chairs a Cost Integrated Process Team (CIPT), a forum to facilitate information exchange among the government and industry cost communities to improve cost data collection,

reporting, analysis, and estimating throughout the acquisition life cycle. The 2021 CIPT was attended (virtually) by industry representatives from nearly 40 corporations across multiple sectors, including ground combat vehicle, shipbuilding, and aerospace manufacturers, as well as representatives from the military department cost agencies. Topics included DoD's new Software Acquisition Pathway; an update on the CAPE-led cost-estimating and analysis data tools Tiger Team; an examination of cost drivers for ground, surface, and airborne radar systems; and an update on cost reporting policies. CAPE also completed follow-up one-on-one discussions with major suppliers to address company-specific questions and concerns.

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CHAPTER IV. THE LOOK FORWARD

CAPE has worked with the military department cost agencies and other organizations to strengthen the institutions of the DoD cost analysis community. However, work continues toward meeting the evolving needs of the Department and new legislative requirements. This chapter discusses the ongoing status of future plans for several key initiatives that make up this reform effort.

Cost Leadership Forum

The CAPE Deputy Director for Cost Assessment has held periodic meetings (known as the Cost Leadership Forum) with the leaders and senior staff of the military department cost agencies to discuss issues of common interest to the cost analysis community. The intent of these meetings is to establish greater collaboration among CAPE and the military department cost organizations by sharing analytic best practices. In addition, these meetings will help develop a collective vision of the community's path forward for the next 5 years in meeting agreed-to strategic objectives, improving cost analysis, and improving business processes. Currently, the Cost Leadership Forum meets virtually on a monthly basis. In addition, key members of the Forum serve as the CADE Board of Directors, which also meets monthly. CAPE also co-chairs the Collaborative Cost Research Group that coordinates cost research activities.

Policies and Procedures

For several years, CAPE and the military department cost agencies have worked together to update cost assessment policies and procedures to keep them up to date and responsive to evolving legislative requirements. Appendix F describes recent legislative changes to statutory requirements for defense acquisition that have been addressed in acquisition and cost assessment policy and procedures.

Update to the Cost and Software Data Reporting Manual

DoDM 5000.04, *Cost and Software Data Reporting Manual*, serves as the primary requirements document for the implementation of the CSDR system to ensure reported data is accurate and consistent. This manual was updated and reissued in May 2021. The primary purpose of the update was to provide implementation details concerning the latest cost data collection policies and requirements that were issued in the March 2020 revision to DoDI 5000.73. This update incorporates previous requirements that were issued in earlier CAPE policy memos and provides for the expansion of CSDR reporting from new sources, including government-performed efforts, Indefinite Delivery/Indefinite Quantity contracts, ACAT II programs, and MTA and other programs. The manual also provides the most recent guidance on FlexFile reporting.

Additional discussion concerning the status of FlexFile reporting and the expansion of CSDR reporting from new sources is provided later in this chapter.

Analysis of Alternatives Cost Estimating Handbook

The AoA Cost Estimating Handbook has been prepared to guide cost analysts responsible for life-cycle cost estimates supporting AoA studies. The handbook provides an introduction and references to the existing material pertaining to life-cycle cost estimates, but also provides new original material concerning issues on the comparative cost analyses unique to AoAs, such as the Fully Burdened Cost of Fuel. A draft of this handbook was issued in August 2021 and was finalized in January 2022 after review and comment from the cost analysis community and other stakeholders.

This handbook is available on the CAPE public website (https://www.cape.osd.mil) at "Public Reports."

Changes to the Department of Navy Cost Organization

In March 2019, the Navy reorganized its cost analysis community and moved many responsibilities and resources away from the Navy cost agency (Naval Center for Cost Analysis, or NCCA) and to the cost organizations of the Navy major system commands. In particular, the Navy removed responsibility for MDAP cost estimates from NCCA and renamed the group Naval Cost Division (NCD)/FMB-6.

Prior to February 2020, CAPE was in the process of negotiating a memorandum of agreement (MOA) with the Navy to have cost personnel from Navy organizations detailed to CAPE temporarily to work on CAPE-led teams preparing ICEs, specifically for Navy and Marine Corps programs. The draft agreement, which was never completed and signed, included provisions for Navy personnel to travel and work in CAPE spaces in the Pentagon for the duration of each detail. Unfortunately, with the U.S. onset of COVID-19 in early 2020 and the immediate implementation of DoD risk management measures, certain provisions in the original draft agreement were not feasible.

CAPE is still very interested in working with Navy to augment CAPE teams responsible for developing the ICEs for Navy and Marine Corps programs, and in improving the breadth and depth of experience levels of Navy personnel responsible for developing cost estimates. As a result, CAPE and Navy agreed to implement a first pilot demonstration by having personnel from the NAVAIR cost team in Patuxent River, Maryland participate on the CAPE team developing the Milestone B ICE for the Next Generation Jammer (NGJ) – Low Band (LB) program. This ICE was completed on November 30, 2020, and forwarded to the Navy on December 11, 2020.

This pilot program was executed in accordance with the spirit of the prior draft agreement but with specific implementation differences. For example, Navy personnel were not resident in CAPE spaces as part of their details as originally envisioned. Instead, nearly all of the interactions and meetings of the NGJ-LB CAPE ICE team occurred in virtual environments—including classified meetings. Also, both CAPE and Navy personnel shared access to the same data sources for developing cost estimates. The team also used a collaboration software tool for the exchange of cost models and other large files.

Recent Enhancements to the Cost Assessment Data Enterprise

The CADE library feature was significantly upgraded in February 2021. This upgrade now provides CADE users with the ability to access and search related Army, Air Force, and Navy libraries, as well as other libraries typically used by cost analysts. An added security layer allows the other librarians to control or restrict document access where appropriate.

The CADE team has continued the development of a new export feature for cost data reports. The new data export feature will allow the user to encapsulate all reported cost data, across legacy cost data reports (known as the 1921 series) and FlexFile reports, in an accurate, consistent, and usable manner with the goal of improving the efficiency and download time of exports to support analysis. A beta version of this new export feature was made available in October 2021.

Enhanced Cost Data Collection

Cost Data Collection in a COVID-19 Environment

The global pandemic continues to have an undeniable impact on society as a whole and the defense industrial base in particular, with disruptions to the workforce, production activities, and supply chains. These disruptions, in turn, affect program cost, schedule, and performance. CAPE has coordinated with Assistant Secretary of Defense (Acquisition) (ASD(A)) and the Army, Navy, and Air Force Service Acquisition Executives (SAEs) to begin developing data collection guidance to understand the effects of COVID-19 on contractor performance and capture the effects to support future analyses and decision support.

On May 27, 2020, initial guidance was issued in the memorandum, "COVID-19 Cost and Performance Data Collection Guidance." This memo instructed the military departments and buying commands to engage with their respective suppliers to develop an approach for capturing the effects of COVID-19 in future CSDR deliverables. Contractors required to submit CSDR deliverables before the specific reporting guidance is issued were instructed to include relevant information on COVID-19 effects (e.g., overhead rates, material costs from suppliers, or specific Work Breakdown Structure (WBS) elements) in the remarks sections of reports. In addition, program offices should work with their contractors, suppliers, and other government activities to document the methodologies used to collect and isolate the cost and schedule impacts associated with COVID-19.

Beginning in August 2020, the reporting instructions in new and revised CSDR plans required the reporting entity to provide COVID-19 related impacts, if applicable. Specifically, the reporting entity should describe the type and timing of all impacts—to program schedule, incurred actual costs to date, forecasted at completion costs, in-process quantities, and delivered quantities—that are directly attributable to the COVID-19 pandemic.

As of September 2021, 34 percent of the reporting contracts have identified COVID-19-related impacts, including labor, travel, supply chain, and personnel protective equipment. CAPE continues to monitor this situation.

FlexFile Initiative

Until recently, cost data was collected in legacy CSDR report formats, similar to those first created in the 1960s. Some contractors had to manually allocate from their financial and other accounting systems into these formats. CAPE partnered with the military department cost agencies to commission a government team to work with industry. The goal was to improve data quality and enable the submission of monthly low-level cost data directly from contractors' accounting systems, while retaining visibility into the standard government cost elements and categories. This transformation, which is the next generation of cost data collection, will improve data quality and reporting compliance and timeliness, and, in many cases, reduce the reporting burden on contractors. This change also provides analysts with more flexibility in using the data in cost estimates. This initiative is known in the cost analysis community as the Cost and Hour Report (FlexFile).

CAPE issued a policy memo in March 2019 to mandate the use of FlexFile reporting on all new contracts beginning in May 2019. The most recent CAPE guidance on FlexFile reporting was provided in the new CSDR Manual (DoDM 5000.04) described earlier in this chapter. Training on Flexfile reporting for both government and industry personnel is now underway and is described later in this chapter.

Additional information on the FlexFile initiative is available on the CADE public website at https://cade.osd.mil/policy/flexfile.

The transition from the legacy CSDR submissions (1921 series) to Flexfile reporting is shown in Figure 7.
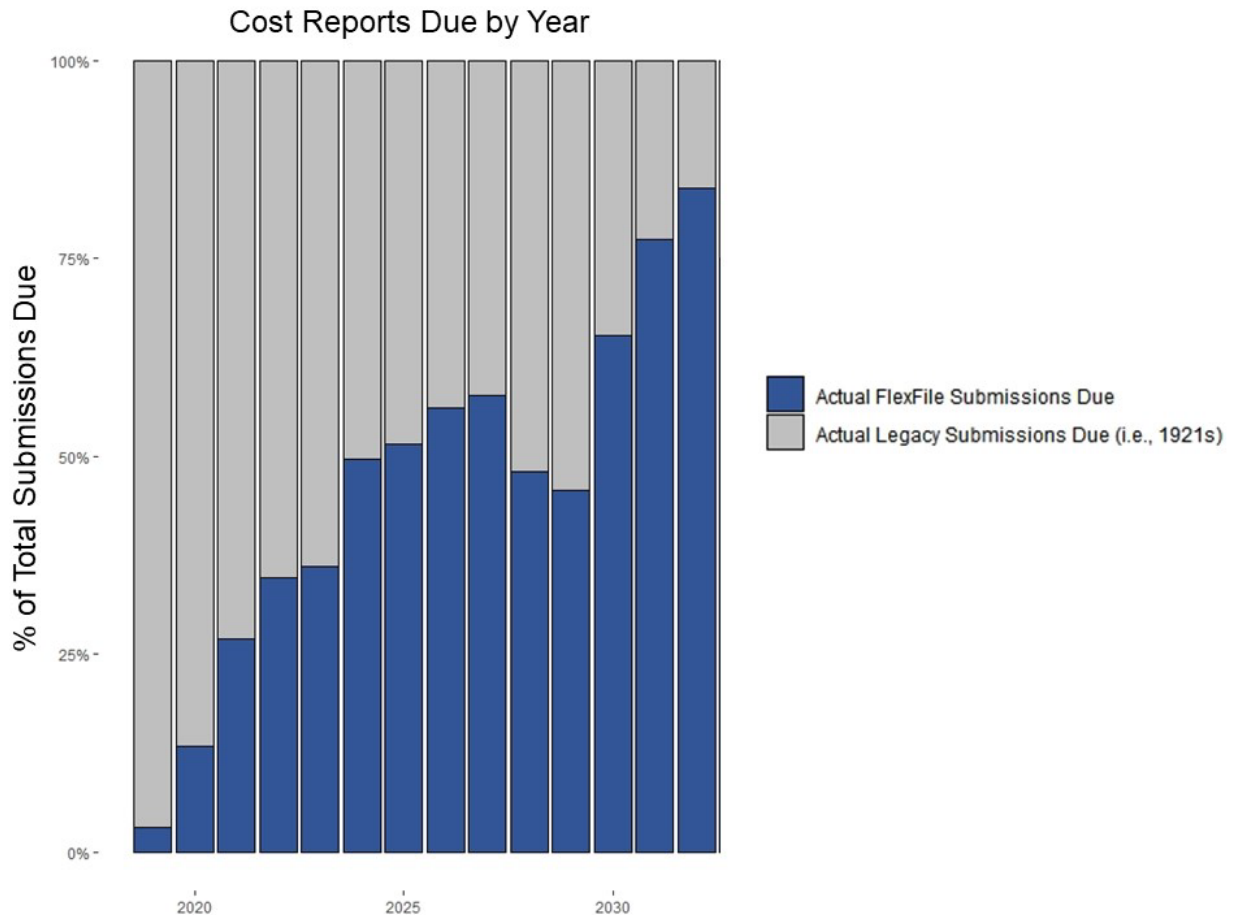
Figure 7. FlexFile vs. Legacy CSDR Submissions

The projection in Figure 7 shows submissions only for the contract efforts known at this time, and will likely change in the future.

Cost Data Collection from Non-Traditional Vendors

Section 842 of the NDAA for FY 2017 required CAPE to develop policies, procedures, guidance and a collection method to ensure that quality acquisition cost data is collected for each acquisition program with expenditures greater than $100 million (then-year dollars). Since then, CAPE has significantly expanded the range of cost data reporting beyond MDAPs to include ACAT II and MTA programs, information systems, software programs, and acquisition of services. In addition, cost data reporting is being obtained from non-traditional defense contracts such as Other Transaction Authority research and development projects or prototypes. Cost data is also being obtained using tailored formats from government entities supporting acquisition programs. These government entities include maintenance depots, test sites, arsenals, laboratories, and the Defense Logistics Agency (DLA). The impact of this expansion is shown in Figure 8.

Changing Landscape of Cost Data Collection

Summary Statistics

Pre-FY17 NDAA

- **1.5** ACQUISITION PATHWAYS COVERED
- **9** DATA DELIVERABLES COLLECTED
- **1,374** SUBMISSIONS DUE 2016

- **120** PROGRAMS REPORTING 2016
- **88** CONTRACTORS REPORTING 2016
- **1,100** DATA RECORDS PER TYPICAL COST REPORT

- ▲ **15** ACQUISITION PATHWAYS COVERED
- ▲ **15** DATA DELIVERABLES COLLECTED
- ▲ **1,990** SUBMISSIONS DUE 2021

- ▲ **221** PROGRAMS REPORTING 2021
- ▲ **182** CONTRACTORS REPORTING 2016
- ▲ **85,000** DATA RECORDS PER TYPICAL COST REPORT

Today

Figure 8. Expansion of Cost Data Collection

In 2016, cost data collection was obtained from 120 acquisition programs and 88 reporting contractors. In 2021, cost data collection was obtained from 221 acquisition programs and 182 reporting contractors and government entities.

The expansion of cost data reporting by type of acquisition program is shown in Figure 9.

Acquisition Pathways Covered

Today*

Pre-FY17 NDAA

Major Capability

- ACAT I
- ACAT II/III that support ACAT I

Major Capability
- All other ACAT II
- All other ACAT III
- ACAT IV

Business Systems
- BCAT I
- BCAT II
- BCAT III

Services
- S-CAT I-V

Urgent Capability

Software

Middle Tier
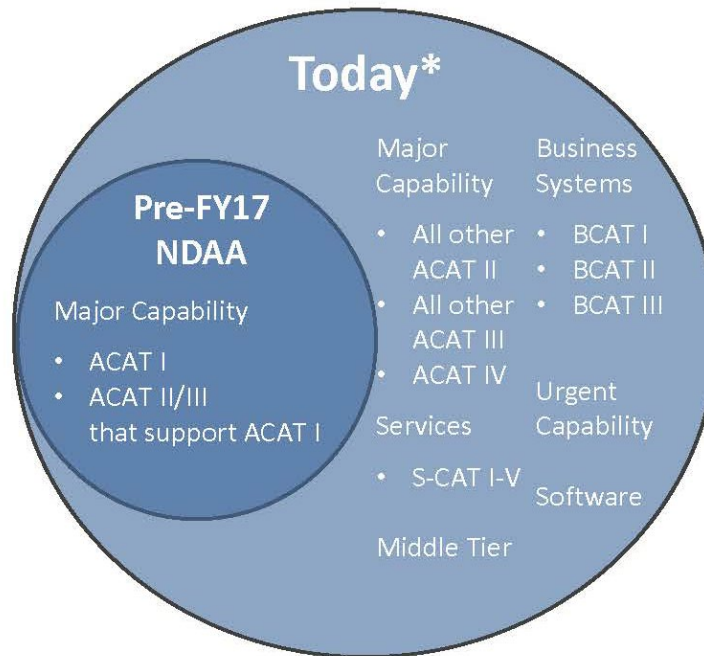
* For DoD acquisition programs over $100 million, then-year dollars

Figure 9. Cost Data Expansion by Type of Program

The expansion of cost data reporting by source is shown in Figure 10.

Stakeholders Supported

Today

All Other Pos**
Maintenance Depots**
Test Sites**
Arsenals**
FFRDCs**
MDA
DARPA
DLA

Pre-FY17 NDAA

Industry
CAPE
ACAT I POs**

Service Cost Agencies
SYSCOMs
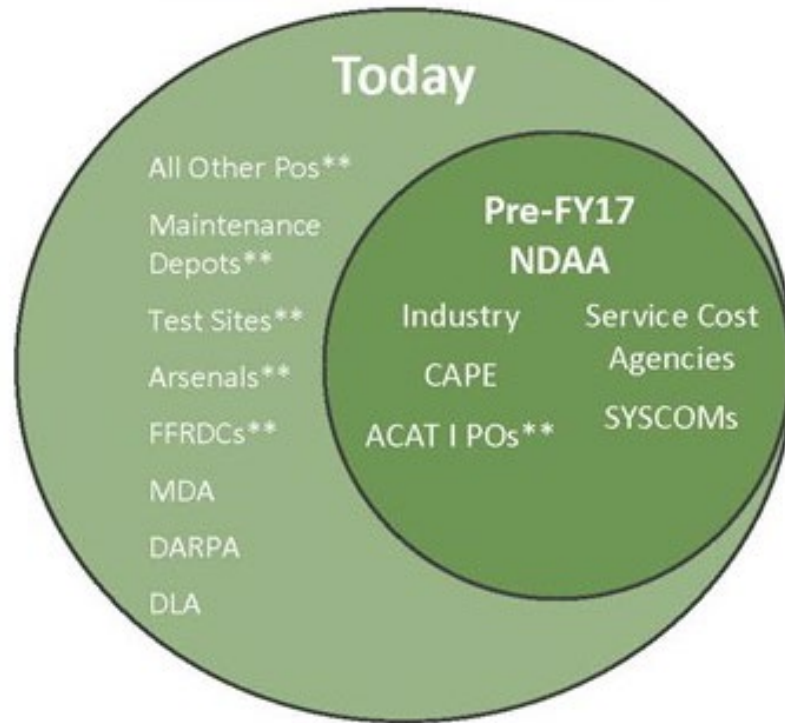
** When meeting/exceeding reporting threshold

Figure 10. Cost Data Expansion by Source

Cost Data Collection for Test and Evaluation

Section 839 of the NDAA for FY 2018 required senior officials in major test and evaluation organizations to jointly develop policies, procedures, guidance, and a method to collect consistent and high quality data on the full range of estimated and actual costs of development, live fire, and operational testing for MDAPs. In response, DoD formed a Cost of Test and Evaluation Working Group with representatives from various stakeholders in the military departments and OSD. The working group developed a template describing the needed data at an appropriate level of detail that DoD should collect and maintain electronically. The working group determined the changes to the WBS cost elements pertaining to the test and evaluation that met the intent and design of the template. These WBS changes were implemented in the revision of the DoD Standard Practice, *Work Breakdown Structures for Defense Materiel Items* (MIL-STD-881E). These changes were then incorporated into the cost data reporting procedures prescribed in DoDI 5000.73 and DoDM 5000.04 that are described in Chapter II. The new test and evaluation cost data will be archived in CADE as part of the MDAP cost data reporting process that is described in Appendix E.

EVAMOSC

Section 832 of the NDAA for FY 2019 requires DoD to:

- Develop a common data repository for all sustainment-related data
- Create and implement common data definitions, structure, and business rules for sustainment cost data
- Provide a consistent, predictable funding stream for O&S cost databases, prioritizing department-wide accessibility
- Develop a common data structure, taxonomy, and data dictionary for all three VAMOSC systems
- Establish a common logon procedure for the VAMOSC systems and CADE

As a result, CAPE now has a demanding statutory requirement and mandate to develop a comprehensive enterprise-wide O&S cost data system. The solution is known as the Enterprise VAMOSC (EVAMOSC) system.

EVAMOSC will address known deficiencies with the completeness, accuracy, granularity and reporting frequency of current O&S cost data by working with the data providers within the military departments. The development of EVAMOSC will incorporate the latest information technologies for ingesting, aggregating, standardizing, visualizing, reporting and securing large amounts of data from a wide array of systems currently serving several functional communities. These communities include financial management, logistics, maintenance, human resources, property, and acquisition. EVAMOSC will also leverage recent advancements in the DoD data landscape, such as enterprise resource planning information systems.

The initial EVAMOSC contract was awarded in September 2020 with development and deployment occurring incrementally through 2026. The first effort focused on maintenance cost data for Army systems; this effort was completed in November 2021. The second effort will focus on maintenance cost data for Marine Corps ground systems. These first two efforts will address the largest deficiencies in the completeness of current O&S cost data systems. The development will continue with the remaining O&S cost elements for Army systems and Marine Corps ground systems, followed by O&S cost data for Marine Corps aviation; Navy ships, shipboard systems, aircraft, and weapons; Air Force aircraft and weapons; and Space Force space systems.

The EVAMOSC system will improve DoD's ability to support the statutory requirement for sustainment reviews noted in Chapter II. In the near term, the initial efforts will improve the data available to support sustainment reviews for Army systems and Marine Corps ground systems. In the long term, feedback from sustainment reviews for all system types will help guide specific areas for improvement to be addressed in the complete EVAMOSC development.

As an interim measure, CAPE developed the Consolidated VAMOSC Tool that allows each service's VAMOSC data to be retrieved and analyzed in a common framework using a common tool. The first version of this tool was available in August 2019 and is applicable to Navy ships and aircraft, Air Force aircraft, and all Army weapon systems.

Cost Analysis Education and Training

Academic Degree Programs in Cost Analysis

In April 2011, CAPE supported the Navy and NPS in establishing an accredited Master's Degree Program in Cost Estimating and Analysis. This 2-year distance-learning program is a valuable element of the education of the cost analysis community and helps improve cost estimates in both DoD and the defense industrial base. The program is part-time and consists of two courses per quarter for eight quarters, with courses from cost estimating, probability and statistics, operations research, systems engineering, acquisition of defense systems, and financial management and budgeting. The program blends web-based, online instruction with video-televised classroom education and is tailored to students whose careers do not allow them to participate in a full-time, traditional, on-campus program. In the final two quarters of the program, each student works on a capstone research project sponsored by a government organization in the cost analysis community. Tuition may be paid through the Defense Acquisition Workforce Development Account. The twelfth cohort commences in March 2022 and graduates in March 2024.

The Air Force has its own master's degree program in Cost Analysis at the Air Force Institute of Technology (AFIT). This full-time in-residence graduate program is open to military and civilian personnel. The program curriculum integrates a strong foundation in quantitative concepts and techniques with specific military cost-related topics to prepare students to contribute in a variety of complex and challenging roles in the global military arena. Besides the weapon system cost sequence, the curriculum includes courses in statistics, business and economics, risk and uncertainty analysis, systems engineering, maintenance and production management, and decision analysis.

Enhanced Training and Education

For the last several years, CAPE has led the review of the curriculum associated with DAU and other courses leading to professional certification and credentials in cost estimating, as established by the Defense Acquisition Workforce Improvement Act (DAWIA). The review of the DAU curriculum has recently been subject to new policy guidance. On September 2, 2020, USD(A&S) issued a policy memorandum "Back-to-Basics for the Defense Acquisition Workforce." The purpose of the memorandum is to get "Back-to-Basics" (BtB) by streamlining the functional area framework for acquisition talent management and prioritize the limited training resources for the Defense Acquisition Workforce (AWF). The talent management framework was consolidated into various AWF Functional Areas. The BtB guidance for each functional area is to streamline and restructure certification requirements, identify prioritized credentials, and provide responsive, continuous learning. One of these functional areas is Business/Cost Estimating. To follow the BtB guidance, CAPE established a dedicated cost-estimating Tiger Team that in FY 2021 led the review that resulted in a redesign of the Business/Cost Estimating courses.

In addition, education and training specific to CADE, the utility of its data, and its functionality have been incorporated into the curricula at DAU, NPS, and AFIT. CAPE also maintains a dedicated CADE training team that provides extensive virtual training courses each year. The

team holds frequent webinars and other live events. In FY 2018, CAPE stood up CADE Learn, an online Bridge Learning Management System (LMS), a software application for the delivery of electronic educational technology (e-learning) courses. In addition, CAPE planned and executed its annual Virtual Cost and Technical Focus Group, promulgating CADE policy updates and major initiatives and increasing the awareness of over 200 leading government professionals and industry partners.

A complete description of the activities and accomplishments of the BtB cost-estimating Tiger Team and the CADE training team in FY 2021 is provided in Appendix G.

Approved Estimate—Program/Budget Review and Acquisition

The current acquisition process in the Department is event-driven and episodic in nature, and is driven primarily by key milestones and other review events identified in statute and regulation. CAPE and the military department cost agencies have moved to a more continuous approach in following and tracking program performance, updating cost and schedule estimates, and evaluating new program risks and issues as they are identified. As part of the Department's program and budget review process, CAPE—in conjunction with USD(A&S) and the military department cost agencies—reviews each major acquisition program with significant funding changes from the latest baseline or previous year's President's Budget. This review determines the source of the cost estimate supporting the revised program and ensures that the program remains fully funded.

Appendix A.

Cost Analysis Organizations in DoD

Independent Cost Assessment Organizations

Three key offices in DoD prepare ICEs for defense acquisition programs, one in OSD and two within the military departments. The office within OSD responsible for ICEs reports to DCAPE. Within the Army and Air Force, the offices report to their Assistant Secretary for Financial Management and Comptroller. The Navy uses a different structure that is described in Chapter IV.

Office of the Secretary of Defense
Deputy Director for Cost Assessment

The CAPE Deputy Director for Cost Assessment prepares ICEs for MDAPs and other acquisition programs when acquisition oversight has not been delegated to a Component. CAPE may also choose to provide an ICE for an MDAP or other acquisition program when acquisition authority has been delegated to a Component. In other cases, CAPE reviews the cost estimates and cost analyses prepared by the Component for MDAPs and other acquisition programs. The Deputy Director for Cost Assessment also provides leadership to the entire DoD cost analysis community with regard to workforce development and management, policy and procedures, cost data collection, cost analysis education and training, and cost research.

Department of the Army
Deputy Assistant Secretary of the Army for Cost and Economics

The Office of the Deputy Assistant Secretary of the Army for Cost and Economics (DASA-CE) is responsible for providing Army decision-makers with cost, performance, and economic analysis in the form of expertise, models, data, estimates and analyses at all levels. DASA-CE develops ICEs and Component cost analyses for Army systems in support of acquisition decisions and sustainment reviews. DASA-CE also chairs and oversees the Army Cost Review Board, which develops and approves the Army Cost Position for major acquisition programs and the Army Cost Estimate for MTA and Software Pathway programs. DASA-CE also reviews and validates business case analyses, economic analyses, and special cost studies of major weapon systems, force structure, and O&S costs. In addition, DASA-CE develops cost factors for installation base operations, civilian personnel, and training operating tempo to support programming and budgeting.

Department of the Navy
Naval Cost Division

NCD/FMB-6 advises the Secretary of the Navy, Chief of Naval Operations, and Commandant of the Marine Corps on cost and economic issues. In March 2019, the Navy reorganized its cost analysis community and transferred many resources and responsibilities from NCD to the cost organizations of the major system commands. This reorganization is described in Chapter IV.

Department of the Air Force

Deputy Assistant Secretary of the Air Force for Cost and Economics/Air Force Cost Analysis Agency

The office of the Deputy Assistant Secretary of the Air Force for Cost and Economics (SAF/FMC) consists of headquarters staff elements and the Air Force Cost Analysis Agency (AFCAA). SAF/FMC also serves as the Executive Director of AFCAA. SAF/FMC approves the Department of the Air Force (DAF) Service Cost Position for all major acquisition programs. AFCAA develops ICEs, non-advocate cost assessments, and recommended DAF Service Cost Positions of Air Force aircraft, space, weapons, command and control, nuclear, and information systems to support acquisition, programming, and budgeting decisions. This agency also develops annual estimates of aircraft cost per flying hour to support programming and budgeting decisions. In addition, AFCAA conducts and coordinates DAF cost research, methods, and tools. It also is responsible for collecting, processing, and publishing the Air Force Total Ownership Cost (AFTOC) data warehouse. The headquarters staff elements conduct non-advocate business case analyses, economic analyses, financial analyses and special cost studies supporting multiple DAF and DoD stakeholders; oversee financial performance of DAF non-appropriated fund activities and the DAF non-appropriated fund employee pension fund; monitor budget risk for major programs; and advocate for and manage the Air Force and Space Force cost analysis workforce, ranging from base to headquarters levels.

Additional Field-Level Cost Organizations and Activities

There are several field-level cost organizations. These typically are located at a major system command or product center such as the Naval Air Systems Command (NAVAIR) or the Space Force Space Systems Center (SSC). This section summarizes these important organizations.

Department of the Army

Beginning in FY 2021, the Army began moving cost support personnel from the Tank-Automotive and Armaments Command (TACOM) and the Aviation and Missile Command (AMCOM) cost analysis organizations to the Program Executive Officers (PEOs) and Program Management Offices (PMOs).

Communication-Electronics Command

The Communication-Electronics Command (CECOM) Cost and Systems Analysis Division provides cost estimation and analysis support to CECOM Program Executive Offices and their Program/Project Offices. This division provides several cost analysis services, including life-cycle cost estimating, EVM, economic analysis, modeling and simulation, computer software and database support, and review and validation of business case analyses and other cost analyses.

Department of the Navy

Naval Air Systems Command

The NAVAIR Cost and Schedule Analysis Department provides a wide variety of cost analysis products and services. Its primary focus is to provide a clear and comprehensive understanding of

life-cycle cost and attendant uncertainties to be used in developing, acquiring, and supporting affordable naval aviation systems. Besides conducting life-cycle cost estimates, the Cost Department supports source selection cost evaluations, EVM analysis, cost research and databases, and various cost/benefit studies.

Naval Sea Systems Command

The Naval Sea Systems Command (NAVSEA) Cost Engineering and Industrial Analysis Division provides cost engineering and industrial base analysis for ships, ship-related combat systems, and weapons. This division also provides cost estimates to support the acquisition review process, including AoA studies. In addition, this division participates in contract proposal evaluations and the source selection process for builders and suppliers of ships and weapon systems. This division also conducts analysis and forecasting of labor, industrial, and technical trends as they affect the overall acquisition of ships, combat systems, weapons, and other equipment.

Naval Information Warfare Systems Command

The Naval Information Warfare Systems Command (NAVWAR) Cost Estimating and Analysis Division aids ACAT I program offices, performs an ICE for ACAT II programs prior to a Milestone B or C review, or reviews a program office cost estimate at the request of the PEO/C^{4}I or PEO Space Systems. The division also provides more general cost analysis support to the PEOs, as needed.

Marine Corps Systems Command

The Cost Estimating and Analysis (CE&A) Community is the Marine Corps Systems Command (MCSC) authority in the field of cost analysis. The CE&A Community conducts and oversees the development of cost estimates and analyses for MCSC and related PEO weapon, information technology, and non-standard training systems programs. The community advises the Commander, MCSC, and related PEOs on the historic, current, and emerging trends in elements of cost estimating and analysis. The community works for the MCSC Commander as an agent that provides independent cost and analytical products to MCSC Portfolio Management Offices, PMOs and related PEOs. The community has four functional areas: Cost Estimating (CE), Contract Services Management (CSM), Integrated Program Management (IPM), and Studies and Analysis (S&A). CE includes analytical teams in direct cost support of the Portfolio Managers, Direct Reporting Program Manager, Training Systems, and related PEOs. CSM manages the Command's Services Requirements Review Board process and Program Management Tool submissions. IPM conducts Earned Value (EV) Management determination, EV and scheduling analysis, and scheduling. S&A is a general support studies team for conducting AoAs and other operations research studies and analyses.

Department of the Air Force

Air Force Life Cycle Management Center

The Air Force Life Cycle Management Center (AFLCMC) leads estimates for program milestone decisions, manages the annual cost estimate process, supports pre-award activities and source

selections, and participates in policy discussions, resulting in high-quality cost estimates and analysis across the center.

Space Force Space Systems Center

The Space Systems Center (SSC) Cost Estimating Division supports cost estimates and cost analyses associated with the United States Space Force and SSC's mission of satellite acquisition, launch, and control.

Air Force Sustainment Center

The Air Force Sustainment Center (AFSC) Cost Estimating Division supports cost estimates and cost analyses associated with the AFSC's mission to provide depot maintenance, supply chain management, and installation support to Air Force weapon systems.

Air Force Nuclear Weapons Center

The Air Force Nuclear Weapons Center (AFNWC) Cost Estimating Division supports cost estimates and cost analyses for all nuclear weapon system activities. The responsibilities of the AFNWC include acquisition, modernization, and sustainment of nuclear system programs for both DoD and the Department of Energy.

Other

National Reconnaissance Office

The National Reconnaissance Office (NRO) Cost Analysis Improvement Group provides independent cost-estimating support to the NRO. This support covers milestone decisions, budget submissions, EVM, *ad hoc* program support, data collection, methods development, and model/tool development.

Defense Information Systems Agency

The Defense Information Systems Agency (DISA) Cost Analysis Branch prepares cost estimates for the development, procurement, and sustainment of automated information systems and information technology capabilities. The division also provides independent support for DISA business case analyses.

Missile Defense Agency

The Missile Defense Agency Director of Cost Estimating and Analysis (DOC) is responsible for ensuring the quality of cost estimates; providing direction on cost-estimating processes; and working with the service cost organizations, CAPE, and the Government Accountability Office on all cost-related matters. In recent years, DOC has worked closely with CAPE on preparing cost estimates for Missile Defense Agency programs and responding to congressional and Missile Defense Executive Board inquiries and tasks. In addition, the agency has established a policy to collect CSDR data for its high-cost programs. For such programs, the CSDR plans are subject to approval by CAPE.

Appendix B.

Unit Cost Reporting for Major Defense Acquisition Programs

Since 1982, the Congress has required DoD to track and report on the unit cost for most MDAPs. The requirement for unit cost reporting may be waived if the program has not entered Engineering and Manufacturing Development (EMD), a reasonable cost estimate has not been established for the program, and the system configuration is not well defined. The provisions of the law concerning unit cost reporting, commonly referred to as the Nunn-McCurdy provisions, are found in 10 U.S.C. § 4372 (Unit Cost Reports).

Two unit cost metrics are subject to reporting: Program Acquisition Unit Cost (PAUC) and Average Procurement Unit Cost (APUC). PAUC is defined as the total program acquisition cost (sum of research, development, test, and evaluation; procurement; military construction; and acquisition-related Operations and Maintenance (O&M) appropriations) divided by the total program quantity of fully configured end items from both the EMD and Production and Deployment Phases. APUC is defined as the program procurement cost divided by the procurement quantity. Both unit cost metrics are tracked in constant dollars of a base year established for each program.

The most current cost estimate for each unit cost metric is tracked relative to two baseline cost estimates. The current baseline estimate refers to the most recent baseline approved by the Milestone Decision Authority (MDA). The original baseline estimate refers to the baseline approved at program initiation (usually Milestone B). A program is declared to have a unit cost breach when the most current unit cost estimate exceeds either baseline unit cost estimate by more than specified percentages. Specifically, a unit cost breach takes place when any of the following criteria in Table B-1 are met, for either version of program unit cost (APUC or PAUC).

Table B-1. Unit Cost Breach Thresholds

	"Significant" Breach	"Critical" Breach
Current Baseline Estimate	+15%	+25%
Original Baseline Estimate	+30%	+50%

Note that two degrees are associated with the severity of the unit cost breach. For significant unit cost breaches, the Department notifies the Congress of the breach within 45 days of the unit cost report and subsequently submits a program SAR with additional, breach-related information. For critical unit cost breaches, in addition to notifying the Congress and submitting the SAR, the Department is required to conduct a complete assessment of the program, led by USD(A&S), and determine whether the program should be terminated or continued. The Department is required to terminate the program unless a letter signed by USD(A&S), certifying that the program meets specific criteria established in law (10 U.S.C. § 4376), is submitted to the Congress within 60 days of the SAR submission. Among other things, USD(A&S) must certify that DCAPE has determined that the new unit cost estimates are reasonable.

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Appendix C.

Additional Cost Assessment Guidance and Procedures

This Appendix describes the additional CAPE guidance documents and other procedures that augment the guidance in DoDI 5000.73, *Cost Analysis Guidance and Procedures*.

Inflation and Price Escalation

Title 10 U.S.C. § 3221 (Independent Cost Estimation and Analysis) requires that CAPE periodically assess and update the cost indices used by the Department to ensure that such indices have a sound basis and meet the Department's needs for realistic cost estimation. Based on several studies, which were described in earlier editions of this report, the current practice in the DoD cost analysis community now distinguishes between inflation and price escalation.

Inflation refers to an increase in the general price level across the *economy as a whole*. To account for inflation in budgeting and cost estimates, each year the Under Secretary of Defense (Comptroller) issues inflation guidance derived from forecasts made by the administration and issued by the Office of Management and Budget (OMB).

Price escalation refers to changes in prices of a *specific good or service*. Escalation accounts for not only inflation, but also any real price change experienced in a specific industry or commodity group. Escalation may also account for any real price change associated with a specific contractor (such as costs of direct labor or overhead).

The cost analysis community considers both inflation and appropriate escalation indices in cost estimates to be a best practice. This approach provides the most realistic forecast of future prices, considering specific markets, products, and contractors. To institutionalize this practice throughout the Department, CAPE most recently published *Inflation and Escalation Best Practices for Cost Analysis: Analyst Handbook*, in December 2021. This handbook supersedes two prior publications: *Inflation and Escalation Best Practices for Cost Analysts* (April 2016), and *Inflation and Escalation Best Practices for Cost Analysis: Analyst Handbook* (January 2017).

The most recent handbook is a more in-depth document explaining specific processes, computations, and data sources that analysts can use to prepare and document inflation and price escalation in cost estimates. The handbook was also updated to clarify terminology and provide more step-by-step instructions. The information in this handbook is not only important to cost estimates of weapon systems, but is also applicable to general programming and budgeting.

The handbook is available on the CAPE public website (https://www.cape.osd.mil) at "Public Reports."

DoD Cost Estimating Guide

In January 2022, CAPE issued the *DoD Cost Estimating Guide (v2.0)*, which is an update to the guide previously published in January 2021. This guide is intended to be useful to all cost analysts, from novices to seasoned veterans. The guide provides important background

information, including a review of relevant policy established in statutes and instructions, and explains standard cost terms and definitions. The guide also takes the reader through each critical step in the cost-estimating process: (1) program definition; (2) cost estimate planning; (3) identification, collection, and validation of data; (4) selection of estimating methods and models; and (5) documentation and presentation of results. In addition, the guide provides an extensive list of references and relevant courses at DAU and other institutions. The new version of the guide provides a case study demonstrating the cost-estimating process using a notional program.

This guide is available on the CADE public website at https://cade.osd.mil/policy/costestimating.

Operating and Support Cost-Estimating Guide

Title 10 U.S.C. § 3221 (Independent Cost Estimation and Analysis) requires that DCAPE issue guidance relating to full consideration of life-cycle management and sustainability costs in MDAPs. CAPE meets this requirement through the *Operating and Support Cost-Estimating Guide,* which provides terms and definitions for the standard structure or taxonomy for O&S cost elements. The guide also summarizes the O&S cost data and related data systems available to the DoD cost analysis community, including contractor cost data reporting for major sustainment contracts. In addition, the guide provides a tutorial on best practices for planning, conducting, presenting, and documenting O&S cost estimates.

The guide was revised and reissued in September 2020. The revision added a discussion about a wide range of O&S metrics that are used by various DoD organizations for a variety of analytic purposes. The revision recommends an analytic approach that can be used to support sustainment reviews of major weapon systems after IOC. The guide also provides an example of an O&S cost estimate at the component or black box level of detail. In addition, the revision discusses the critical importance of product support during acquisition and provides a roadmap of the transition from the acquisition product support cost elements to the O&S cost elements.

This guide is available on the CADE public website at https://cade.osd.mil/policy/os.

Analysis of Alternatives Cost Estimating Handbook

This handbook is described in Chapter IV.

Cost Analysis Requirements Description

CAPE requires and provides guidance on the technical content and use of a document known as the Cost Analysis Requirements Description (CARD) that supports preparation of the CCP, the ICE, and other cost estimates as required. The CARD succinctly describes the key technical, programmatic, operational, and sustainment characteristics of an acquisition program. The foundation of a sound and credible cost estimate is a well-defined program, and the CARD provides that foundation. The CARD, along with supporting data sources, provides all of the information necessary to develop a cost estimate. By using the same CARD, various organizations preparing cost estimates for a program can develop their estimates based on a shared understanding of program requirements and content.

The CARD format uses a narrative document augmented by a data template for the collection of most technical data (such as programmatic information and design and performance parameters). The narrative, excluding tables and figures, should be approximately 20 pages long. The technical data are provided through standardized spreadsheet templates (known as CARD tables) specific to each weapon system commodity type (such as aircraft, ships, missiles, and so on). In addition, the burden of CARD preparation is minimized by allowing program management offices to provide updates through revision of only the program parameters that have changed from the previous submission. CARDs are now stored electronically by CAPE in the CADE library and are available to CADE users.

Additional information about the CARD is available on the CADE public website https://cade.osd.mil/policy/card.

Cost Comparisons of Military, Civilian, and Contractor Manpower

CAPE revised DoDI 7041.04, *Estimating and Comparing the Full Costs of Civilian and Active Duty Military Manpower and Contract Support,* on July 1, 2020. This Instruction establishes policy and provides procedures to estimate and compare the full costs of active-duty military, DoD civilians, and contract support. The business rules, potential cost factors, and data sources provided in this instruction are used in cost-benefit analyses or business case analyses in support of workforce mix decisions. This instruction is available on the Executive Services Directorate website at https://www.esd.whs.mil/DD/.

To support the DoD users that need to perform the numerous calculations required by this instruction, CAPE has made available a web-enabled tool for estimating the Full Cost of Manpower (FCoM), which will automatically calculate all cost elements required to maintain consistency with guidance in the instruction. The FCoM tool is available on the CADE public website (https://cade.osd.mil) at "Tools/Other Cost Tools" and is usable by all personnel who possess a valid Common Access Card. The personnel cost factors for active-duty military and civilian personnel have been updated to FY 2021 rates. A classified version of the tool is available on the DoD Secure Internet Protocol Router Network (SIPRNet). The tool has been used to compare the costs of military and civilian intelligence personnel, as well as to compare military and civilian manpower costs for the development and expansion of the cyber workforce.

Economic Analysis for Decision-making

CAPE revised DoDI 7041.03, *Economic Analysis for Decision-making,* on October 2, 2017. This instruction is the DoD implementation of OMB Circular A-94, *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs*. The instruction prescribes the application of economic analysis concepts to the evaluation of costs and benefits of investment alternatives. This instruction is available on the Executive Services Directorate website at www.esd.whs.mil/DD/.

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Appendix D.

CAPE Policy Memos

This appendix lists recent CAPE policy memos that pertain to cost data reporting. The contents of these memos have been incorporated in the latest issuances of DoDI 5000.73, *Cost Analysis Guidance and Procedures*, and DoDM 5000.04, *Cost and Software Data Reporting (CSDR) Manual*. These memos are available on the CADE public website at https://cade.osd.mil/policy.

Deputy Director of Cost Assessment Policy Memorandum, "Change to Requirement for Submission of Contractor Business Data Report (DD Form 1921-3)," February 6, 2018

Director of Cost Assessment and Program Evaluation Policy Memorandum, "Implementation of Data Reporting Requirements for Acquisition Programs in Accordance with the National Defense Authorization Act (NDAA) for Fiscal Year (FY) 2017," February 16, 2018

Director of Cost Assessment and Program Evaluation Policy Memorandum, "Implementation of Cost Data Reporting Requirements for Middle Tier Acquisition Programs," August 30, 2018

Director of Cost Assessment and Program Evaluation Policy Memorandum, "Updated Implementation of Cost Data Reporting Requirements in Accordance with Section 2334(g)," January 4, 2019

Deputy Director of Cost Assessment Policy Memorandum, "Implementation of Cost and Hour Report (FlexFile) and Quantity Data Report Within the Cost and Software Data Reporting (CSDR) System," March 22, 2019

Director of Cost Assessment and Program Evaluation Policy Memorandum, "COVID-19 Cost and Performance Data Collection Guidance," May 27, 2020

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Appendix E.

CADE and Cost Data Collection Systems

Cost Assessment Data Enterprise

As explained in Chapter II, the Cost Assessment Data Enterprise (CADE) provides users in the cost analysis community with single-point access to a wide range of cost data and related information. The CADE website provides user access to the data. The specific data systems that are warehoused in CADE are described later in this appendix.

 In addition, a complementary public website (https://cade.osd.mil) provides considerable background information about CADE, such as the role of the major organizations that support it. The public website contains information about policy and procedures relevant to data reporting and collection and the other initiatives described in Chapter IV, as well as information about training opportunities concerning CADE and its supporting data systems.

Access to CADE is available to government analysts throughout the cost and acquisition communities. CADE is also selectively available to government-sponsored support contractors that sign company-specific nondisclosure agreements. A display of active users throughout the Department is shown in Figure E-1.

CADE Account Holder Distribution (as of Jan 2021)

Industrial Base
825

DoD or Public
Sector Contractor
177

DoD
Civilian/Military
1952
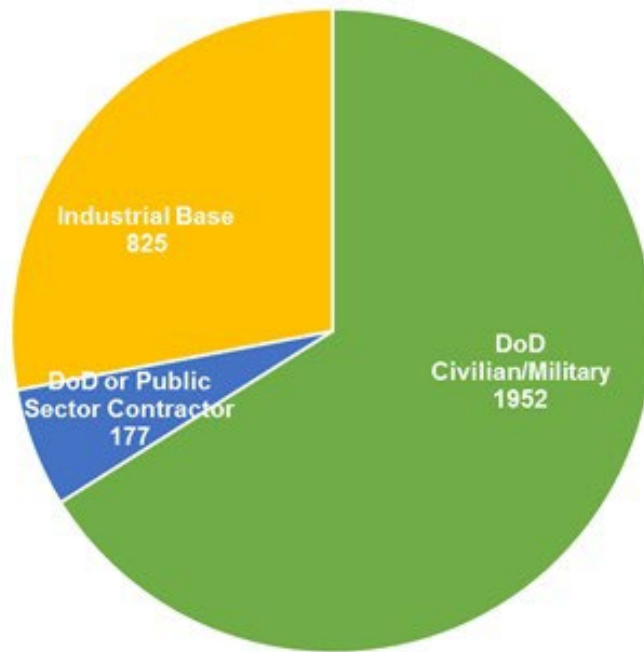
DoD Civilian/Military Account Holder Distribution (as of Jan 2021)

Non-DoD
3

4th Estate
425

Air Force
574

Space Force
34

Navy
584

Army
332

Figure E-1. CADE Users

Note that more than 75 percent of the CADE Government users reside in the military departments.

CAPE provides extensive support to CADE users and data providers. For example, CAPE hosts CADE Focus Group meetings that provide a forum for government and industry personnel to learn and ask questions about the latest CADE initiatives and the evolving associated policies, processes, and data products. In addition, these meetings allow users to raise issues and concerns and provide feedback. The most recent Focus Group meeting was held in October 2021.

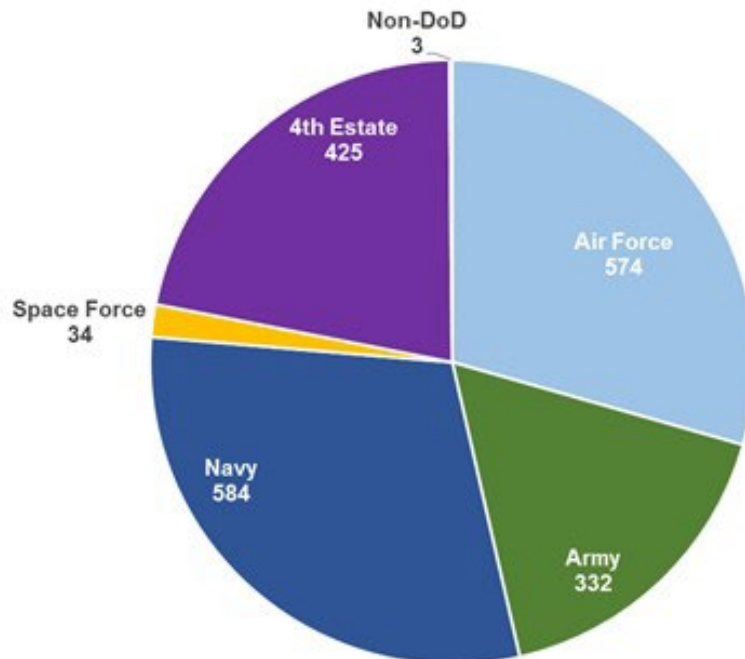In addition, as discussed in Chapter IV, the CADE Training Team hosts regional training sessions open to industry and government throughout the year. Further information on CADE training can be found on the CADE public website at https://cade.osd.mil/support.

Overview of Cost Data Reporting and Collection

DoD uses two primary data collection systems as the major sources of cost data for acquisition programs:

- Cost and Software Data Reporting (CSDR) system
- Visibility and Management of Operating and Support Costs (VAMOSC) systems

CSDR reporting uses a common, product-oriented taxonomy known as a Work Breakdown Structure (WBS) that follows the guidelines of the DoD Standard Practice, *Work Breakdown Structures for Defense Materiel Items* (MIL-STD-881E). The WBS is a hierarchy of product-oriented elements (hardware, deliverable software, data, and services) that collectively constitute the system to be developed or produced.

Cost and Software Data Reporting System

The CSDR system is the primary means that DoD uses to collect actual cost and related data on major defense contracts and subcontracts. Defense contractors provide information to support the CSDR system, under contractual agreements, by reporting data on development, production, and sustainment costs incurred in executing contracts. The two principal components of the CSDR are the contractor cost data reporting (CCDR) system and the software resources data reporting (SRDR) system. These systems are hosted in a secure, web-based information repository within CADE.

Detailed procedures and other implementation guidance for both CSDR systems are found in DoDM 5000.04, *Cost and Software Data Reporting (CSDR) Manual*. This manual was most recently revised in May 2021.

Additional information on CSDR reporting policies can be found on the CADE public website at https://cade.osd.mil/policy/csdr-timeline.

Beginning in 2017, CAPE significantly expanded the range of CSDR cost reporting. As noted in Chapter IV, cost data reporting has been extended beyond MDAPs to other acquisition programs, information systems, software programs, and acquisition of services. CAPE is also now working on a tailored version of cost data reporting from government entities supporting acquisition programs. These entities include maintenance depots, test sites, arsenals, laboratories and DLA.

Contractor Cost Data Reporting

CCDR is the primary means within DoD to systematically collect data on the development, production, and sustainment costs incurred by contractors. Section 4 ("Data Collection") of DoD Instruction (DoDI) 5000.73, *Cost Analysis Guidance and Procedures*, establishes CCDR reporting requirements. For MDAPs and major systems, CCDR reporting is required for contracts, subcontracts, and government-performed efforts valued at more than $50 million (then-year dollars). For MTA programs anticipated to exceed $100 million (then-year dollars), CCDR reporting is required for contracts, subcontracts, and government-performed efforts valued at more than $20 million (then-year dollars). CSDR reporting requirements for programs below the major system threshold are left to the discretion of the military department cost agencies.

The CCDRs provide essential cost information based on actual cost experience not found in other data sources. The reports provide labor hours, material dollars, and overhead dollars by WBS element and cost-estimating functional category. The data may also be used to investigate fixed-variable direct and indirect cost behavior and to segregate nonrecurring and recurring costs. The data from these reports can also be used to construct learning curve projections for labor hours and other recurring costs at various levels of the WBS. The timing of the periodic data reporting is structured to provide key support to the preparation of cost estimates at milestone and other acquisition reviews.

CCDR data collection was extended to sustainment contracts in 2012. Since then, CAPE has continued to improve the collection and reporting of contractor actual costs for major sustainment, logistics, and maintenance contracts. The first cost data report for sustainment was approved in May 2012 and became effective at that time. This summary report collects and displays contractor costs by CAPE O&S cost element. A second and more detailed cost data report (known as the Sustainment Functional Cost-Hour Report) was approved in September 2015. This report, for selected high-cost elements, provides visibility into labor and material for a specific cost element by functional category (such as touch maintenance labor hours or purchased parts dollars). For current and former MDAPs and major systems, these reports are now required on major sustainment contracts and subcontracts worth more than $50 million (then-year dollars).

Additional information on CSDR sustainment data can be found on the CADE public website at https://cade.osd.mil/policy/sustainment.

An additional data report, known as the Maintenance and Repair Parts Data Report, has been developed to collect detailed cost and technical data for maintenance events and repair parts, similar to the data already collected by maintenance data collection systems for major weapon systems supported under organic maintenance. For each maintenance event, this report collects (1) maintenance data, such as reason for failure, maintenance type, and labor hours; and (2) repair data, such as the name and repair or replacement cost of the repair part. For MDAPs and major systems, a Maintenance and Repair Parts Data Report is required for sustainment contracts that exceed $100 million (then-year dollars) when a significant portion of the cost of the contract is due largely to parts-related maintenance activities (such as supply chain management, heavy maintenance, recurring spares, or repairs), and equivalent information cannot be provided by the program manager.

Additional information on the Maintenance and Repair Parts Data Report can be found on the CADE public website at https://cade.osd.mil/policy/maintandrepair.

The legacy CCDR reports are being replaced with the Cost and Hour Report (FlexFile), as described in Chapter IV. The new FlexFile report format has been designed so that data submissions can be used to generate the equivalent of each legacy report.

Software Resources Data Reporting

The SRDR system collects software cost metrics data to supplement the CCDR cost data and to provide a better understanding and improved estimating of software-intensive programs. Data collected from applicable contracts include type and size of the software application(s), schedule, and labor resources needed for software development. The SRDR data formats and reporting instructions use state-of-the-art terms, definitions, and agile metrics for software development. SRDR reporting was expanded in 2016 to include major software maintenance activity. SRDR reporting was expanded again in 2017 for an important class of Defense Business Systems/Information Systems known as Enterprise Resource Planning (ERP) systems.

Section 4 of DoDI 5000.73 establishes SRDR reporting requirements. For software development and ERP reports, SRDR is required on all contracts, subcontracts, and government-performed efforts for MDAPs, major systems, and MTA programs anticipated to exceed $100 million (then-year dollars). For the software maintenance report, SRDR is required on all contracts, subcontracts, and government-performed efforts for MDAPs and major systems.

The data report formats and reporting instructions for the three data reports (software development, software maintenance, and reporting for ERP programs), as well as additional technical information on software data reporting, can be found on the CADE public website at https://cade.osd.mil/policy/srdr.

Contractor Business Data Report

One of the reports in the CSDR system is the Contractor Business Data Report (referred to as the 1921-3 by the cost analysis community). Although other CSDR reports focus on individual programs and contracts, the Contractor Business Data Report collects general contractor cost data stratified by direct categories (direct labor, direct material, and other direct expenses) and indirect categories (overhead, General and Administrative, and other indirect expenses) for a company business unit. The key point is that this report provides a firm basis for assessing contractor overhead and other indirect costs. These assessments are based on the occurrence of actual indirect expenses relative to an actual defined business base, rather than as measured as a generic indirect percentage rate relative to an undefined business base.

The design of the Contractor Business Data Report used from 2009 to 2015 was based on government-defined categories for direct and indirect expenses. By 2015, actual experience with the report was that each contractor defines direct and indirect costs differently. The contractor categories typically do not have a simple cross-walk to the government categories, so the Contractor Business Data Report format was forcing contractors to map their expenses to the government categories. This approach caused the mapping to be artificial and somewhat arbitrary,

obfuscating important business base information. In addition, this mapping was not readily visible to government users of the report.

To remedy this situation, CAPE developed a revised draft Contractor Business Data Report format with associated instructions and distributed it to reporting contractors in February 2018. The revised report can be submitted in the contractor's format and rate structure and is more useful to the cost analysis community, since it eliminates the mapping issue. In addition, this report is more applicable to the contract cost and price communities because the revised format aligns with contractor proposals, Defense Contract Management Agency Forward Pricing Rate Proposals, Forward Pricing Rate Agreements, and Defense Contract Audit Agency audits. The report is also less burdensome for contractors to prepare. During 2018 and 2019, contractors could choose whether to use the previous report with the government-defined categories, or use the new draft Contractor Business Data Report. Beginning in 2020, this report is transitioning to the contractor-defined format. The final version of the report format and reporting instructions were approved in March 2021.

A sample format, reporting instructions, and other information on the new Contractor Business Data Report can be found on the CADE public website at https://cade.osd.mil/policy/1921-3.

CSDR Planning

A CSDR plan is submitted for approval prior to the release date of a Request for Proposal for each contract meeting the CSDR reporting requirements. Each plan specifies the required reports and submission frequency for the major contracts and subcontracts. CAPE provides formal standards for CSDR plans that include a template of the reporting structure for each weapon system commodity type (such as aircraft, electronic system, or missile). These standards provide consistency in data reporting across programs within a commodity type, and provide better communication of government expectations to industry. The use of the standard plans also reduces the burden on program offices and cost analysis organizations, since they no longer have to construct a plan from scratch for each new program. The standard template for each program CSDR plan is subject to tailoring approved by the Cost Working Integrated Product Team (CWIPT), which consists of appropriate stakeholders for the program.

The standard plans are available on the CADE public website at https://cade.osd.mil/policy/csdr-plan.

Cost Reporting for Missile Defense Agency Programs

CAPE has worked with the Missile Defense Agency to establish cost data collection for missile defense programs. Although these programs are exempt from traditional DoD acquisition processes and requirements, the agency has instituted a policy to collect CSDR data for its high-cost programs. For such programs, the CSDR plans are subject to approval by CAPE. Between January 2020 and December 2021, there were 195 CSDR submissions from 14 Missile Defense Agency programs.

Cost and Software Data Reporting Compliance

The Defense Cost and Resource Center (DCARC)[1] continually monitors each MDAP for compliance with CSDR requirements where applicable. CSDR reporting is not required when (1) the program is in pre-Milestone A status, with no prototypes, or (2) the CSDR requirements have been waived by CAPE. Waivers for CSDR requirements may be granted when (1) the relevant item being procured is truly a commercial item, or (2) an item is purchased under competitively awarded, firm fixed-price contracts, as long as competitive conditions continue to exist.

The most recent CSDR compliance rating criteria for programs are provided in Figure E-2.

CSDR Compliance Rating Criteria
Implementation in January 2017 (Changes Shown in Red)

RATING	CRITERIA
Green	No open CSDR compliance issues.
Green Advisory	Outstanding CSDR deliverable less than or equal to three months overdue.
Yellow	Outstanding CSDR deliverable greater than three months, but less than or equal to six months overdue.
Red	1. Outstanding CSDR deliverable greater than six months overdue. 2. **Formally rejected CSDR deliverable outstanding greater than 30 days overdue.**
Red-Critical	1. Program Office released Request for Proposal (RFP) without approved CSDR plan. 2. Program Office awarded prime contract without approved CSDR plan or failed to mod contract to place an approved CSDR plan on contract. 3. Program Office or Prime contractor failed to enforce flow down of CSDR requirements to direct reporting subcontractor or the prime contractor failed to mod subcontract to place an approved CSDR plan on contract. 4. **Three or more consecutive formal rejections for the same CSDR deliverable event will remain red-critical until the deliverable is accepted.** 5. **Outstanding CSDR deliverable greater than 12 months overdue.**
Not Rated	The program has no CSDR activity (e.g., approved waiver, Pre-MDAP, cancelled, has no CSDR activity, or not currently tracked)

Figure E-2. CSDR Compliance Rating Criteria

Figure E-3 provides a breakdown of CSDR compliance by fiscal quarter using the compliance ratings in effect at the time for all MDAPs since FY 2012.

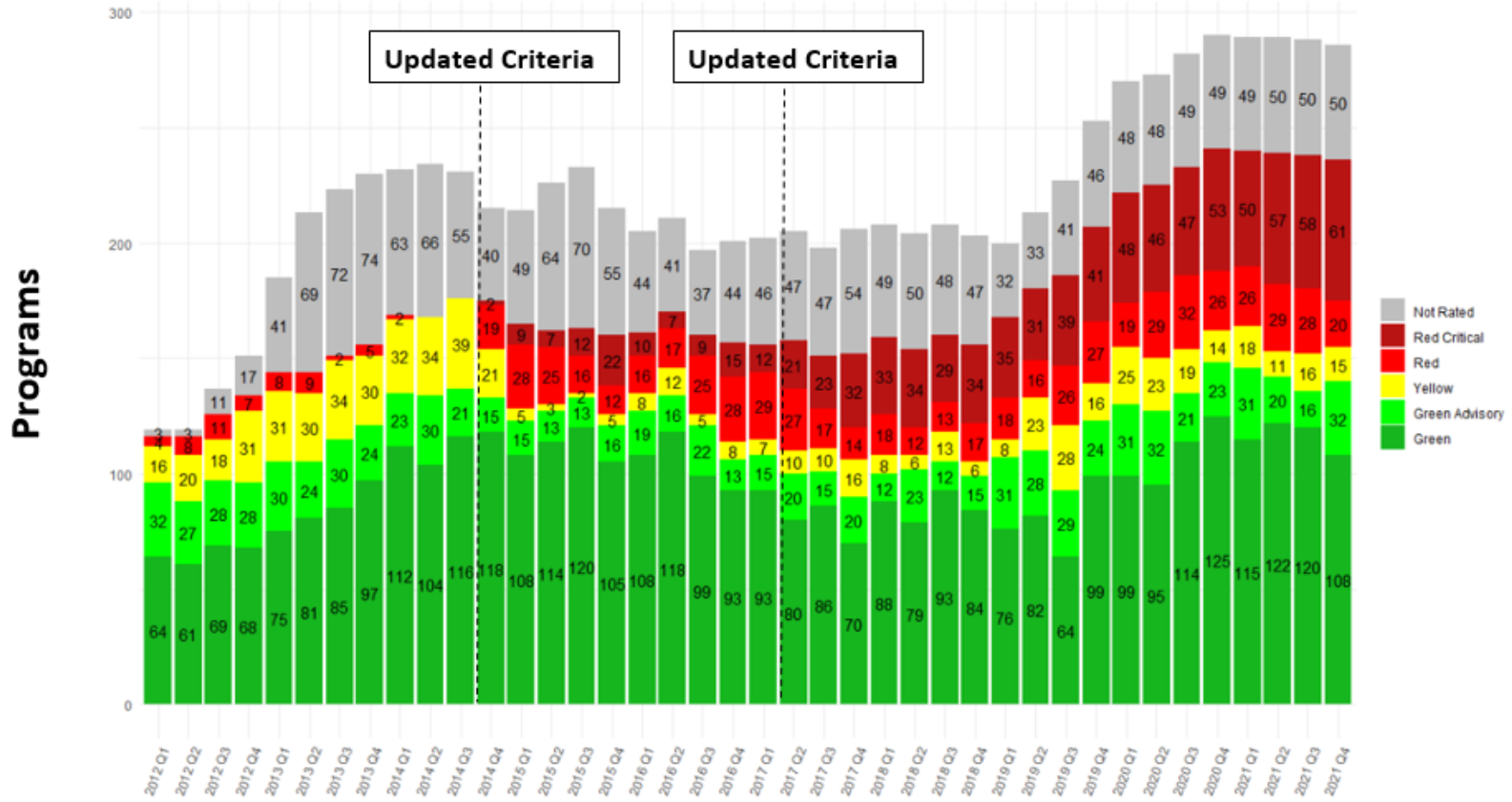[1] The DCARC is the CAPE field office responsible for administering the CSDR system.

Figure E-3. CSDR Compliance by Fiscal Quarter

Note that the compliance ratings were revised in late FY 2014 and again in the second quarter of FY 2017. At each revision, the compliance rating criteria became stricter, leading to an increase in red and/or red-critical ratings.

At the end of the fourth quarter of FY 2021, 59 percent of the programs receiving a rating were rated as green or green advisory, 6 percent were rated as yellow, 8 percent were rated as red, and 26 percent were rated as red-critical. The number of programs with a red or red-critical rating, as a percentage of all reporting programs, has been stable over the last 4 years. Between the end of the fourth quarter of FY2017, and the end of the fourth quarter of FY 2021, the average percentage number of red programs was 11 percent, and the average percentage number of red-critical programs was 21 percent.

CAPE and the DCARC continue to emphasize CSDR reporting compliance in order to achieve more accurate and timely cost data to support program cost estimates. In November 2014, CAPE revised language in the Defense Federal Acquisition Regulation Supplement that ensure that CSDR reporting requirements are made known to contracting officers. In addition, in cases where required cost data are not reported in a timely fashion (i.e., are more than 6 months late), CAPE insists that the data be provided before CAPE can complete its ICE or concur with a military department cost estimate.

Technical Data Report

Cost analysts need technical data (e.g., design and performance parameters) for legacy and new systems to adjust for complexity or to develop cost-estimating relationships used in estimates. Section 4 of DoDI 5000.73 requires a Technical Data Report on all contracts and government-performed efforts valued at more than $50 million (then-year dollars) for MDAPs and major systems when equivalent information cannot be provided by the program manager.

CAPE provides standardized data templates for technical data reporting that specify the universe of technical parameters that can be collected for each weapon system commodity type (such as aircraft, ships, and missiles) and define each parameter consistent with systems engineering practices, military standards, and industry guidelines. These formats were developed so that the parameters, definitions, and collection methodologies are consistent with DoD and industry norms, and that any requirements for contractor reporting on technical data were not excessively burdensome or redundant with contractor reporting already in place.

Additional information on technical data reporting can be found on the CADE public website at https://cade.osd.mil/policy/techdata.

Contracts Price Database

CADE hosts not only cost data reports, but contract data as well. Over the past decade, the military department cost agencies have funded the development of a Contracts Price and Schedule Database. Now containing more than $500 million in contract value across a wide range of commodities, this database is unique in providing information at the level of the Contract Line Item Number (CLIN). In cases where CSDR reporting requirements were not in place, these CLIN-level data may be the only cost data available to the cost analysis community. Where

CSDR data do exist, the database provides useful contextual information (such as contract type or profit margin) and important cross-checks to other cost data. The database can also be used to construct metrics for cost and schedule growth over contract execution. A new tool to analyze the contracts database was made available to CADE users in October 2019.

Selected Acquisition Report Database

CADE now hosts a database of SARs that includes the older acquisition programs. The current USD(A&S) system that is used for modern electronic reporting of SAR data, known as Defense Acquisition Visibility Environment (DAVE), has reports from 1997 to the present. Prior to that, SAR data was provided in hard copy. The military departments have databases for the older SAR data that have been keystroked from portions of the official paper SARs. These databases have been merged with the DAVE data to provide CADE users with a relational and authoritative database of SAR data. This database is useful to cost analysts and includes program information such as mission and description, schedule, performance, cost and funding, major contracts, and deliveries and expenditures.

Visibility and Management of Operating and Support Costs System

DoD requires that each military department maintain a system that collects historical data on the O&S costs for major fielded weapon systems. The CAPE Deputy Director for Cost Assessment provides policy guidance on this requirement, known as the VAMOSC program; specifies the common format in which the data are to be reported; and monitors its implementation by each of the military departments.

Each department has its own unique VAMOSC data system that tracks actual O&S costs experienced by major weapon systems. The data can be displayed by timeframe, at various levels of detail, and by functional cost elements (such as depot maintenance, fuel, consumable items, and so forth). Each VAMOSC system provides not only cost data, but related non-cost data (such as system quantities and operating tempo). VAMOSC data can be used to analyze trends in O&S cost experience for each major system and to identify and assess major cost drivers. VAMOSC data systems are managed by each military department as follows:

- The Air Force VAMOSC system is known as the Air Force Total Ownership Cost (AFTOC) system. AFTOC provides O&S cost data for all manned and unmanned aircraft; aircraft engines; missiles; munitions; command, control, and communication systems; space systems; and other miscellaneous systems and programs. AFTOC also provides supplementary data such as aircraft quantities and flying hours, fuel consumption, numbers of personnel by skill/function, and other non-cost information. AFTOC is managed by the Deputy Assistant Secretary of the Air Force for Cost and Economics. See https://aftoc.hill.af.mil for additional information.
- The Army VAMOSC system is known as the Operating and Support Management and Information System (OSMIS). OSMIS provides O&S cost data for aviation, tracked and wheeled combat vehicles, artillery systems, engineering and construction equipment, communication and electronic systems, and other tactical systems and equipment. It also provides supplementary data such as system quantities; vehicle miles; aircraft flying

hours; consumption for repair parts, fuel, and ammunition; and man-hours for intermediate and depot maintenance. OSMIS is managed by the Deputy Assistant Secretary of the Army for Cost and Economics. See https://www.osmisweb.army.mil for additional information.

- The Department of the Navy system is known as Naval VAMOSC and includes both Navy and Marine Corps platforms and systems. Naval VAMOSC provides O&S cost data for ships and shipboard systems, Navy and Marine Corps aircraft, weapons (missiles and torpedoes), military and civilian personnel, facilities, and Marine Corps ground systems. Naval VAMOSC also provides key non-cost data such as personnel counts for ship crews and aircraft Type Model Series, system quantities, flying hours/ship steaming days, fuel consumption, and maintenance hours/days. Naval VAMOSC is managed by NCD/FMB-6. See https://www.vamosc.navy.mil for more information.

The military departments provide training and documentation for their VAMOSC users. The training material consists of on-site presentations and online videos. The documentation consists of extensive user guides and manuals.

A major enterprise-wide upgrade to the VAMOSC systems, known as EVAMOSC, is described in Chapter IV

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Appendix F.

Recent Legislative Changes

The NDAAs for FY 2016 through FY 2021 significantly changed acquisition and cost assessment policy and statutory requirements. These changes have been assessed by USD(A&S) and CAPE to determine the appropriate revisions that were incorporated into DoD Instruction (DoDI) 5000.02, *Operation of the Defense Acquisition System*, its supplementary acquisition regulations, and DoDI 5000.73, *Cost Analysis Guidance and Procedures*.

The NDAA for FY 2016 contained the following provisions pertaining to defense acquisition policy and cost assessment procedures:

- Section 802 (Role of Chiefs of Staff in the Acquisition Process) enhanced the role of the military Chiefs of Staff in the defense acquisition process. This section also provided specific responsibilities to the Chiefs of Staff and Secretaries of the Military Departments for balancing resources against priorities on acquisition programs, ensuring that appropriate trade-offs are made between cost, schedule, technical feasibility, and performance throughout the life of each acquisition program.
- Section 804 (Middle Tier of Acquisition for Rapid Prototyping and Rapid Fielding) required USD(A&S) to issue guidance that establishes a "middle tier" of acquisition programs that are intended to be completed within 5 years. These programs would fall between "rapid acquisitions" that are generally completed within 6 months to 2 years, and "traditional" acquisition programs that last much longer than 5 years. The guidance for middle tier acquisition addresses two acquisition pathways: (1) rapid prototyping (prototypes with innovative technologies) and (2) rapid fielding (new or upgraded systems with minimal development). This provision also established a DoD Rapid Prototyping Fund to be managed by a USD(A&S) official authorized to transfer funds to the military departments using a merit-based process for selecting prototypes with innovative technologies. Programs in this middle tier are to follow streamlined procedures and are to be exempt from the traditional requirements and acquisition processes. The USD(A&S) guidance for middle tier acquisition establishes a process for transitioning successful prototypes to new or existing programs for production and fielding under the rapid fielding pathway or the traditional acquisition process. CAPE guidance for establishing cost data reporting for middle tier programs is described in Appendix D; recent CAPE guidance concerning cost estimates for middle tier programs is described in Chapter IV.
- Section 809 (Advisory Panel on Streamlining and Codifying Acquisition Regulations) called for the Secretary of Defense to establish an independent advisory panel on streamlining acquisition regulations. A Defense Technical Information Center web site (discover.dtic.mil/section-809-panel/) provides various reports and recommendations made by the panel from August 2016 through its conclusion in July 2019.
- Section 815 (Amendments to Other Transaction Authority) expanded DoD's ability to use Other Transaction Authority (OTA) for certain prototype programs. OTA permits DoD to enter into transactions (other than a contract, grant, or cooperative agreement)

with private organizations (that are small businesses or nontraditional defense contractors) for basic, applied, and advanced research projects. OTA transactions are exempt from many acquisition and contracting statutes and regulations.

- Section 825 (Designation of Milestone Decision Authority) specified that the MDA for an MDAP reaching Milestone A after October 1, 2016, will be the SAE of the military department managing the program, unless under specific circumstances the Secretary of Defense may designate another official as the MDA.

The NDAA for FY 2017 contains the following provisions pertaining to defense acquisition policy and cost assessment procedures:

- Section 805 (Modular Open System Approach in Development of Major Weapon Systems) required that an MDAP that receives Milestone A or Milestone B approval after January 1, 2019 will be designed and developed, to the maximum extent practicable, with a modular open system approach intended to enable incremental development and enhance competition, innovation, and interoperability. In the modular open system approach, weapon system platforms are developed so that the system design is partitioned into discrete modules that are self-contained, functional elements. The key interfaces among the modules are based on commonly accepted industry standards. This approach permits weapon system platforms to be incrementally upgraded with new components and systems with advanced technologies as they emerge with minimal impact to the host platform.
- Section 806 (Development, Prototyping and Deployment of Weapon System Components or Technology) provided the military departments with new authorities to mature and demonstrate higher risk technologies prior to initiating a formal program of record. This section also provided the military departments with new funding and acquisition flexibility to experiment with, prototype, and rapidly deploy weapon system components or other technologies.
- Section 807 (Cost, Schedule, and Performance of Major Defense Acquisition Programs) established a requirement for the Secretary of Defense, or the Deputy Secretary of Defense, to establish program cost and fielding targets for an MDAP before Milestone A, B, or C approval. The program cost targets are the procurement unit cost and sustainment cost. The program fielding target is the date for IOC.
- Section 808 (Transparency in Major Defense Acquisition Programs) established a requirement for the MDA for an MDAP to provide the congressional defense committees with a brief summary report (or "acquisition scorecard") no later than 15 days after granting approval at Milestone A, B, or C. The summary report provides certain information about the program pertaining to cost; schedule; and technical, manufacturing, and fielding risks. In particular, the summary report includes (1) the program cost and fielding targets described in Section 807, (2) the estimated cost and schedule of the program established by the military department concerned, (3) the statutory independent estimate of the cost of the program, and (4) any independent estimate for the program schedule. The summary and description of the ICE includes an assessment of the major contributors to the program acquisition unit cost and total life-cycle cost.

- Section 842 (Amendments Relating to Independent Cost Estimation and Cost Analysis) provided clarifying amendments to existing statutes for independent cost estimation. At Milestone A, the ICE includes the identification and sensitivity analysis of key cost drivers that may affect life-cycle costs of the program. In addition, the ICE includes an analysis to support decision-making that identifies and evaluates alternative courses of action that may reduce cost and risk, and result in more affordable programs and less costly systems. Also, CAPE guidance concerning cost assessment procedures for MDAPs establishes a requirement for all cost estimates to include a discussion of risk, the potential impacts of risks on program costs, and approaches to mitigate risk. This discussion of risk is documented in program SARs and in decision documents that approve program baselines. Section 842 also required CAPE, in consultation with USD(A&S), to develop policies, procedures, guidance, and a collection method to ensure that quality acquisition cost data are collected for each acquisition program with a dollar amount greater than $100 million (which is considerably less than the dollar threshold for an MDAP). These data are to facilitate cost estimation and comparison across acquisition programs. CAPE implementation of this provision is described in Chapter IV.
- Section 844 (Review and Report on Sustainment Planning in the Acquisition Process) required the Secretary of Defense to enter into a contract with an independent entity with appropriate expertise to assess the extent to which sustainment matters are considered in decisions related to requirements, acquisition, cost estimating, programming and budgeting, and research and development for MDAPs.
- Section 849 (Improved Life-Cycle Cost Control) made several amendments pertaining to life-cycle cost controls of a program. In particular, the military departments are required to conduct a sustainment review for an MDAP 5 years after declaration of IOC and throughout the system's life cycle, using availability and reliability thresholds and cost estimates as the triggers that prompt such a review. The sustainment review addresses the program product support strategy, performance, and operations and support costs of the system. Each sustainment review includes a life-cycle cost estimate for the remainder of the program. Recent CAPE guidance concerning cost estimates for sustainment reviews is described in Chapter IV.
- Section 897 (Rapid Prototyping Funds for the Military Departments) authorized the military department secretaries to establish service-specific funds for the rapid prototyping and rapid fielding pathways established by Section 804 (Middle Tier of Acquisition for Rapid Prototyping and Rapid Fielding) of the NDAA for FY 2016 described earlier.
- Section 901 (Organization of the Office of the Secretary of Defense) modified the position of USD(AT&L) by replacing this position with two new positions: the Under Secretary of Defense for Research and Engineering (USD(R&E)) and Under Secretary of Defense for Acquisition and Sustainment (USD(A&S)). This reorganization became effective February 1, 2018.

The NDAA for FY 2018 contained the following provisions pertaining to defense acquisition policy and cost assessment procedures:

- Section 802 (Management of Intellectual Property Matters Within the Department of Defense) required DoD to develop policy on the acquisition or licensing of intellectual property. The purpose of this policy is to enable coordination and consistency across the military departments and DoD in strategies for acquiring or licensing intellectual property; to ensure that program managers fully consider and use all available techniques and best practices for acquiring or licensing intellectual property early in the acquisition process; and to encourage customized intellectual property strategies for each system based on, at a minimum, the unique characteristics of the system and its components, the product support strategy for the system, the organic industrial base strategy of the military department concerned, and the commercial market. This provision also required DoD to establish a cadre of personnel who are experts in intellectual property matters. These experts are to be assigned to a program office or an acquisition command within a military department to advise, assist, and provide resources to a program manager or program executive officer on intellectual property matters at various stages of a system's life cycle.

- Section 833 (Role of the Chief of the Armed Force in Materiel Development Decision and Acquisition System Milestones) established a role for the Service Chiefs to concur with MDAP milestone approvals made by the MDA. As a result, the MDA must determine that the Service Chief and Secretary of the Military Department concur with the trade-offs among cost, schedule, technical feasibility, and performance at each milestone throughout the life of the program.

- Section 836 (Codification of Requirements Pertaining to Assessment, Management, and Control of Operating and Support Costs for Major Weapon Systems) amended Title 10 U.S.C. to codify Section 832 of the NDAA for FY 2012. This provision mandated several ambitious requirements intended for DoD to take specific steps to improve its processes for estimating and managing O&S costs of major systems. In particular, the Department is required to periodically update estimates of program O&S costs, and track and assess these estimates relative to previous estimates. The CAPE *Operating and Support Cost-Estimating Guide* describes how the Department has implemented this legislative provision in various DoD instructions and regulations. This guide also recommends approaches and analytic methods for dealing with these legislative requirements. In addition, DCAPE is responsible for developing and maintaining a database on (1) operating and support estimates, (2) supporting documentation, and (3) actual operating and support costs for major weapon systems. Cost estimates and supporting documentation are archived in CADE. The EVAMOSC system will provide a single source of operating and support cost data.

- Section 839 (Enhancements to Transparency in Test and Evaluation Processes and Data) required senior officials in major DoD test and evaluation organizations to jointly develop policies, procedures, guidance, and a method for collecting consistent and high quality data on the full range of estimated and actual costs of development, live fire, and operational testing for MDAPs. These data are to be stored in an electronic database maintained by CAPE and made available for analysis by testing, acquisition, and other analysts in DoD. The DoD implementation of this provision is described in Chapter IV.

- Subtitle G (Provisions Relating to Other Transaction Authority and Prototyping) of Title VIII (Acquisition Policy, Acquisition Management, and Related Matters) contained eight sections intended to expand and improve the use of OTA for prototyping projects.
- Section 1652 (Collection, Storage, and Sharing of Data Relating to Nuclear Security Enterprise) required DoD and the National Nuclear Security Administration (NNSA) to jointly collect and store cost, programmatic, and technical data relating to programs and projects of the nuclear security enterprise and nuclear forces. Responsibility for this collection and storage is assigned to DCAPE and the NNSA Director of Cost Estimating and Program Evaluation.

The NDAA for FY 2019 contains the following provisions pertaining to defense acquisition policy and cost assessment procedures:

- Section 817 (Preliminary Cost Analysis Requirement for Exercise of Multiyear Contract Authority) contained a clarifying amendment to 10 U.S.C. § 3507 (Multiyear Contracts) that a cost analysis supporting a DoD multi-year request is preliminary (as explained in Chapter II).
- Section 831 (Revisions in Authority Relating to Program Cost Targets and Fielding Targets for Major Defense Acquisition Programs) modified Section 807 of the NDAA for FY 2017. The individual responsible for establishing program cost, fielding, and performance goals is no longer the Secretary of Defense, and instead is the milestone decision authority for the program.
- Section 832 (Implementation of Recommendations of the Independent Study on Consideration of Sustainment in Weapon Systems Life Cycle) required the Secretary of Defense to begin implementing each recommendation of an independent assessment conducted by the MITRE Corporation (of the extent to which sustainment matters are considered in decisions related to requirements, acquisition, cost estimating, and programming and budgeting for major defense acquisition programs). This assessment was directed by Section 844 of the NDAA for FY 2017. The implementation of each recommendation is to commence no later than 18 months after the enactment of the NDAA for FY 2019. CAPE efforts to address certain improvements concerning the collection of O&S cost data recommended by the MITRE study are discussed in Chapter IV.

The NDAA for FY 2020 contained the following provisions pertaining to defense acquisition policy and cost assessment procedures:

- Section 830 (Modification of Requirements for Reporting to Congress on Certain Acquisition Programs) required that SARs continue in their present form through FY 2021. This provision also required the Secretary of Defense to propose an alternative method for reporting the status for MDAPs and acquisition programs that use alternative acquisition pathways or tailored acquisition procedures. SARs have been valuable to the cost analysis community as important sources of information and data regarding program cost and schedule performance over time. CAPE and the military department cost agencies are now working with USD(A&S) to develop a reporting format for the replacement report or system.

- Section 831 (Pilot Program to Streamline Decision-Making Processes for Weapon Systems) required each SAE to recommend to the Secretary of Defense at least one MDAP as a pilot program, including tailored measures to streamline the entire milestone decision process, with the results evaluated and reported for potential wider use.
- Section 836 (Report on Realignment of the Defense Acquisition System to Implement Acquisition Reforms) required the Secretary of Defense to include with the budget request for FY 2021 a report on the progress of implementing acquisition reform initiatives that were enacted into law through DoD regulations, directives, instructions, or other guidance.
- Section 837 (Report on the "Middle Tier" of Acquisition Programs) required USD(A&S) to submit a report that includes the guidance required by Section 804 (Middle Tier of Acquisition for Rapid Prototyping and Rapid Fielding) of the NDAA for FY 2016. This guidance includes the business case elements required by an acquisition program and the metrics required to assess the performance of such a program.

The NDAA for FY 2021 contained the following provisions pertaining to defense acquisition policy and cost assessment procedures:

- Section 151 (Budgeting for Life-Cycle Costs of Aircraft for the Army, Navy, and Air Force) established a requirement for the Secretary of Defense to submit an annual plan for the procurement of the aircraft in the military departments in order to meet the requirements of the National Defense Strategy. This plan includes the estimated levels of annual investment funding necessary to carry out each aircraft program, and the estimated annual funding necessary to operate, maintain, sustain, and support each aircraft program throughout the life cycle of the program. For each of these two cost estimates, the plan documents whether the cost estimate is derived from a military department cost position or from a CAPE estimate. If the military department cost position and the CAPE estimate differ by more than 5 percent for any aircraft program, the plan will document the percentage difference and provide sufficient rationale to explain the difference.
- Section 802 (Improving Planning, Execution, and Oversight of Life Cycle Sustainment Activities) modified 10 U.S.C. to improve DoD's planning, execution, and oversight of life cycle sustainment activities for covered systems. This section modified the earlier provisions of Section 849 (Improved Life-Cycle Cost Control) of the NDAA for FY 2017. In particular, this section directed the Secretary of each military department to conduct a sustainment review for an MDAP 5 years after declaration of IOC and every 5 years thereafter throughout the life cycle of the program. The Secretary of each military department annually submits to the congressional defense committees the sustainment reviews required for each fiscal year. The Comptroller General of the Government Accountability Office annually selects 10 covered systems for which a sustainment review has been submitted, and submits to the congressional defense committees an assessment of the steps taken by the Secretaries concerned to quantify and address any critical operating and support cost growth for each selected system.

The NDAA for FY 2022 contained the following provisions pertaining to defense acquisition policy and cost assessment procedures:

- Section 805 (Two-Year Extension of Selected Acquisition Report Requirement) expanded upon Section 830 of the NDAA for FY 2020. The requirement that SARs continue in their present form was extended from FY 2021 to FY 2023. No later than March 1, 2022, and every 6 months thereafter, DoD is required to provide to the congressional defense committees a demonstration of the capability improvements necessary to achieve the full operational capability of the reporting system that will replace the SAR requirements. Also, no later than March 1, 2022, DCAPE will prepare a plan for identifying and gathering the data required for effective decision making by program managers and DoD leadership regarding the reporting programs. No later than July 1, 2022, USD(A&S) will submit to the congressional defense committees the DoD implementation plan for the replacement reporting system.

- Section 806 (Annual Report on Highest and Lowest Performing Acquisition Programs of the DoD) established a requirement for each Component Acquisition Executive to provide the congressional defense committees with an annual report that ranks the five highest performing and five lowest performing covered acquisition programs of the Component. Each Component Acquisition Executive will determine and document the criteria for the ranking of the covered programs. The term "covered acquisition program" means an MDAP or other acquisition program that is expected to reach MDAP dollar thresholds. This annual reporting is limited to 3 years.

- Section 811 (Certain Multiyear Contracts for Acquisition of Property: Budget Justification Materials) established a requirement for DoD to include a detailed proposal with the President's budget request materials if DoD proposes to cancel or reduce the end item quantities of a multiyear procurement contract.

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Appendix G.

CAPE Cost-Estimating Training and Education

DAU Curriculum Review

Over the past several years, CAPE has reviewed and provided detailed actionable feedback on all core Defense Acquisition University (DAU) cost analysis courses and a large number of continuous learning modules (CLM), as well as courses and CLMs from other curricula with relevant cost analysis content. These courses include Acquisition (ACQ), Program Management (PMT), Contracting (CON), and Engineering (ENG). During FY21, CAPE continued to lead the Back to Basics (BtB) Tiger Team to ensure smooth transition of the cost analysis curriculum from Business, Cost Estimating, and Financial Management (BFM) to Business–Cost Estimating (BUS-CE). Since this represents a significant transformation, CAPE intends to resume curriculum reviews at an appropriate time once the new courses have been deployed during FY 2022.

CADE Training Courses for Business-Cost Estimating (BUS-CE) Certification

Three CADE Academy courses (CADE 101, FlexFile 101, and CADE 201) are well on their way to becoming a part of the new BUS-CE certification. Through collaboration among the CADE Support Team and the DAU Course Managers and Instructional System Designers (ISDs), these courses have been updated and enhanced to cover the latest information on a variety of topics, including:

- Policy and guidance for Cost and Software Data Reporting (CSDR)
- Data contained in the CSDRs (both Legacy DD 1921 series and FlexFile/Quantity Data Reports)
- CSDR and FlexFile planning, submission, and validation processes
- Value that the data stored in CADE can provide to cost estimators
- Navigation of the CADE Portal to retrieve data

In preparing these courses, the CADE Support Team undertook an effort to ensure their alignment to the new BUS-CE Competency Model, which outlines the knowledge and skills that Cost Estimators are required to learn in order to obtain the Practitioner and Advanced levels of certification. The new certification levels and required courses, as featured on the DAU website, are shown in Figure G-1. Note that with the BtB transformation, the Cost Estimating career fields transitioned from a three-level to a two-level certification, with a number of courses being moved into the new credentials structure.
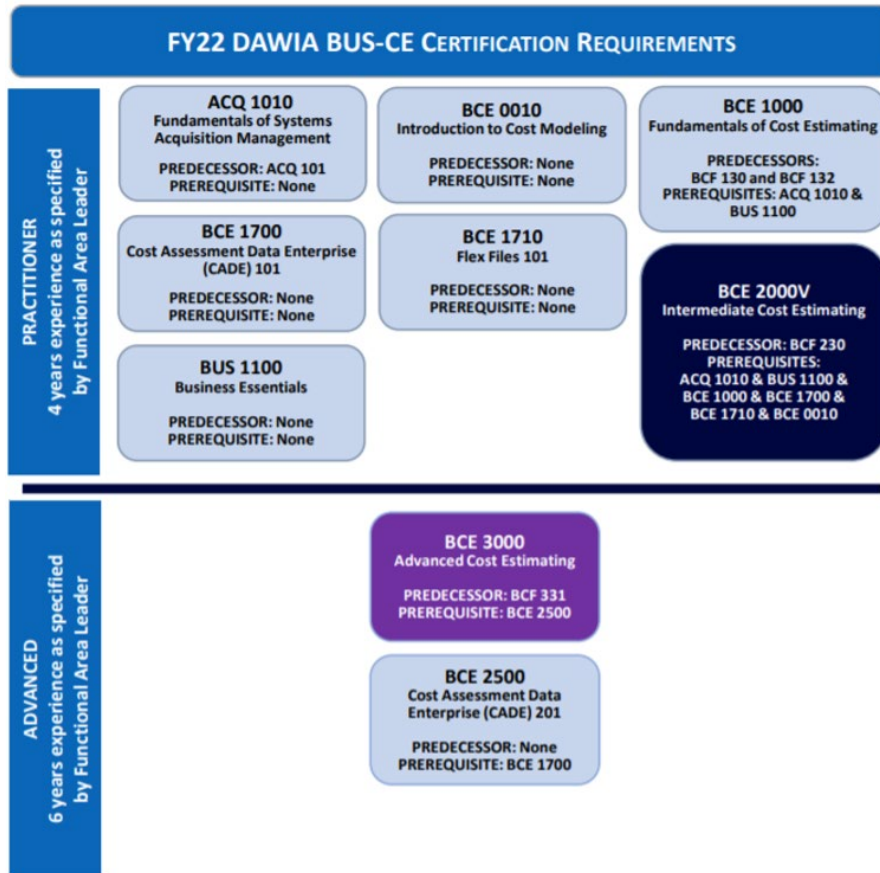
FY22 DAWIA BUS-CE Certification Requirements

PRACTITIONER
4 years experience as specified by Functional Area Leader

ACQ 1010
Fundamentals of Systems Acquisition Management

PREDECESSOR: ACQ 101
PREREQUISITE: None

BCE 0010
Introduction to Cost Modeling

PREDECESSOR: None
PREREQUISITE: None

BCE 1000
Fundamentals of Cost Estimating

PREDECESSORS:
BCF 130 and BCF 132
PREREQUISITES: ACQ 1010 & BUS 1100

BCE 1700
Cost Assessment Data Enterprise (CADE) 101

PREDECESSOR: None
PREREQUISITE: None

BCE 1710
Flex Files 101

PREDECESSOR: None
PREREQUISITE: None

BCE 2000V
Intermediate Cost Estimating

PREDECESSOR: BCF 230
PREREQUISITES:
ACQ 1010 & BUS 1100 &
BCE 1000 & BCE 1700 &
BCE 1710 & BCE 0010

BUS 1100
Business Essentials

PREDECESSOR: None
PREREQUISITE: None

ADVANCED
6 years experience as specified by Functional Area Leader

BCE 3000
Advanced Cost Estimating

PREDECESSOR: BCF 331
PREREQUISITE: BCE 2500

BCE 2500
Cost Assessment Data Enterprise (CADE) 201

PREDECESSOR: None
PREREQUISITE: BCE 1700

Figure G-1. DAU Courses for Business-Cost Estimating Certification

As we move into 2022, CADE continues to provide cost estimators across all DoD services with high-quality data, and the CADE Academy courses equip them with the skills required to extract and manipulate this data.

Learning Management System and Virtual Courses

In FY 2018, CAPE stood up CADE Learn, a Learning Management System (LMS) on the cloud-based Bridge platform. Bridge is a software application that not only enables the delivery of electronic educational technology (e-learning) courses but also facilitates the management of a holistic CADE Training program, including synchronous courses, webinars, and the CADE Focus Group. As of December 2021, the Bridge LMS instructional platform included six interactive and informative courses directed toward all manner of CADE users and analysts. Courses contain multiple interactive elements tailored to active CADE users and other members of the acquisition community. By making the CADE training material available via the LMS, CAPE can provide on-demand training to a much broader segment of the workforce. Since the beginning of FY 2021, the number of CADE Learn active users grew to over 2,304 lifetime users, an 17.4% growth rate. These users recorded over 8,931 completed modules, a 3.5% growth rate. Furthermore, during FY 2021, the team certified analysts in CADE 101, CSDR for Submitters, and FlexFile 101 via the Bridge LMS. This CADE-related training can be used by analysts to

earn continuous learning points (CLPs) toward both DAWIA and USD Comptroller Financial Management (FM) certifications.

The following courses are offered through the Bridge LMS in addition to synchronous virtual course formats. Throughout the year, these courses have been crucial in training CADE users and connecting them with others across the CADE community with the ultimate goal of providing better data. The live versions provide students the opportunity to learn directly from CADE training instructors and to participate with other members of the CADE and analyst communities. The ongoing Covid-19 global pandemic precluded the CADE Training Team from delivering training in person, as in previous years.

CADE 101 - Fundamentals of CADE

CADE 101 describes the purpose of CSDR and basic types of data contained in CSDRs. It also elaborates on the policy and guidance documents for CSDR across all Acquisition Pathways. Upon completion, students will recognize the responsibilities and actions required to navigate the CADE Portal to conduct an analysis of programmatic, cost, schedule, and software data for a program.

Course Completions:

- **790** completions of CADE 101
    - **361** – Online Program
    - **429** – Live Training

FlexFile 101 - Fundamentals of the FlexFile

FlexFile 101 covers how the Cost and Hour Report "FlexFile" initiative was derived, what the FlexFile Data Item Description (DID) requirements entail, and the current implementation plan. This course also provides an opportunity for hands-on exploration of a FlexFile data set, using tools to make it more manageable. The FlexFile improves data quality through access to native cost data at a level at or below the WBS on the approved CSDR Plan. This access provides detailed insight and analysis flexibility to view how the contractor incurs cost over time at the account level.

Course Completions:

- **1,014** completions of FlexFile 101
    - **334** – Online Program
    - **680** – Live Training

CADE 201: CADE Intermediate

CADE 201 instills confidence in analysts to plan for, access, and analyze the new generation of CADE data. Lessons include:

- **CSDR Planning:** Use the latest DD Form 2794 to plan effectively for not just FlexFile reports but the full suite of CSDR data. Learn how to save time with Plan Standards and tailor reporting requirements to your program for maximum efficiency.

- **CSDR Implementation:** Use the Resource Distribution Table (RDT) to get the "big picture" for CSDR, and learn the mechanisms to flow down reporting requirements to subcontractors and government entities alike. Use the CSDR Readiness Review to establish consensus up front and ensure that subsequent CSDR submissions are validated quickly and painlessly.
- **CADE Data Access:** Use Browse CSDR Submissions to quickly locate the data you need and bulk-export it in a variety of analysis-ready formats. Gain practice with all four FlexFile download options.
- **FlexFile Insights and Updates:** Conduct hands-on analysis of sample FlexFile data to understand insight to be gained, including the new "Big Three" of time phasing, account-level detail, and contractor functional categories.

Course Completions:

- **620** completions of CADE 201
  - **69** – Online Program
  - **551** – Live Training

CADE for Submitters

CADE for Submitters leverages the CSDR Submitted Guide to provide instructions on how to submit CSDR CDRLs to CADE. This course is designed for industry data managers, report authors, and those that want to learn more about the submit data function in CADE. In addition to this online course, the CADE Training Team and DCARC provide on-demand training to industry teams seeking to understand the full scope of their CSDR responsibilities.

Course Completions:

- **86** completions of CADE for Submitters
  - **86** – Online Program

CADE for the Contracting Community

This course discusses how the CSDRs in CADE can be used as authoritative "other than certified cost and pricing data" in price analysis, cost analysis, and cost realism analysis. Students will learn what the data comprises, how to access it, and what their responsibilities are to put CSDR CDRLs on contract. The course addresses how CADE helps meet contracting community objectives of justifying a fair and reasonable price, efficiently analyzing proposals, and gaining leverage in negotiations. This course is recommended not just for contracting officers but also contract specialists and cost and price analysts.

Course Completions:

- **402** completions of CADE for Contracting Officers
  - **204** – Online Program
  - **198** – Live Training

CADE for the Program Management Community

This virtual course discusses how the CSDRs in CADE can be used to inform crucial decisions about system design and program acquisition over the program life cycle. Students will learn what the data comprises, how to access it, and what their responsibilities are to put CSDR CDRLs on contract. We will address how CADE helps meet the acquisition community objective of fielding and supporting capable and affordable systems for the warfighter in a timely manner. This course is recommended not just for program managers but all those playing key program office roles such as systems engineering, budget and finance, and logistics.

Course Completions:

- **249** completions of CADE for Program Managers
    - **128** – Online Program
    - **121** – Live Training

Webinars and Other Live Events

In addition to the LMS and virtual synchronous courses, the CADE Training Team organizes many events throughout the year that provide participants the opportunity to learn and interact with other members of the CADE and analyst communities.

Cost and Technical Focus Group

The Virtual Focus Group promotes discussion among key individuals within the cost analysis community so they can gain insight into their views and experiences related to the OSD CAPE initiatives. CAPE drew upon participants' experiences and reactions in a way that would not be feasible using other methods. This 2-day event provided updates on the FlexFile initiative, policy, IT applications, as well as COVID-19 cost reporting implications. There were a series of government and industry panels to address specific topics and concerns across the community. Following each panel there was a facilitated feedback forum to collectively discuss, collaborate, and formulate solutions and mitigation approaches for community concerns. There was broad participation from both government and industry across the cost and systems engineering communities.

This Focus Group is an annual offering and is now available as a course within the Bridge LMS. There have been over 1,000 non-unique participants.

Weekly Webinar Series

Similar to the live training formats, webinars are offered on Wednesdays at 1500 Eastern / 1200 Pacific. These are generally hour-long sessions that dive into different CADE Portal features, data types, and other specific timely topics of interest to both Government and Industry. The sessions are led by members of the CADE Training Team, CADE Help Desk, and other subject matter experts. These webinars are recorded and provided on the CADE public website. During FY 2021, there were 25 CADE webinars with over 2,000 non-unique attendees.

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Abbreviations

AARGM – ER	Advanced Anti-Radiation Guided Missile – Extended Range
ACAT	Acquisition Category
ACV	Amphibious Combat Vehicle
ADM	Acquisition Decision Memorandum
AFCAA	Air Force Cost Analysis Agency
AFIT	Air Force Institute of Technology
AFLCMC	Air Force Life Cycle Management Center
AFNWC	Air Force Nuclear Weapons Center
AFSC	Air Force Sustainment Center
AFTOC	Air Force Total Ownership Cost
AMCOM	Aviation and Missile Command
AoA	Analysis of Alternatives
APUC	Average Procurement Unit Cost
ASD(A)	Assistant Secretary of Defense (Acquisition)
AWF	Acquisition Workforce
BtB	Back to Basics
BUS-CE	Business-Cost Estimating
CADE	Cost Assessment Data Enterprise
CAE	Component Acquisition Executive
CAPE	Cost Assessment and Program Evaluation
CARD	Cost Analysis Requirements Description
CCDR	Contractor Cost Data Reporting
CCP	Component Cost Position
CE	Cost Estimating
CE&A	Cost Estimating and Analysis
CECOM	Communication-Electronics Command
CIPT	Cost Integrated Process Team
CIRCM	Common Infrared Countermeasures
CLB	Columbia Class
CLIN	Contract Line Item Number
CLM	Continuous Learning Module
CLP	Continuous Learning Point

CSDR	Cost and Software Data Reporting
CSM	Contract Services Management
CWIPT	Cost Working Integrated Product Team
DAB	Defense Acquisition Board
DAF	Department of the Air Force
DASA-CE	Deputy Assistant Secretary of the Army for Cost and Economics
DAU	Defense Acquisition University
DAVE	Defense Acquisition Visual Environment
DAWIA	Defense Acquisition Workforce Improvement Act
DCAPE	Director of Cost Assessment and Program Evaluation
DCARC	Defense Cost and Resource Center
DCS	Digital Century Series
DISA	Defense Information Systems Agency
DLA	Defense Logistics Agency
DOC	Director of Cost Estimating and Analysis
DoD	Department of Defense
DoDCAS	Department of Defense Cost Analysis Symposium
DoDD	Department of Defense Directive
DoDI	Department of Defense Instruction
DoDM	Department of Defense Manual
DoN	Department of the Navy
DTMHub	Datasets, Tools, and Models Hub
EMD	Engineering and Manufacturing Development
EPAWSS	Eagle Passive/Active Warning and Survivability System
ERP	Enterprise Resource Planning
EV	Earned Value
EVAMOSC	Enterprise VAMOSC
EVM	Earned Value Management
FCoM	Full Cost of Manpower
FM	Financial Management
FMS	Foreign Military Sales
FoV	Family of Vehicles
FRP	Full-Rate Production
FY	Fiscal Year

FYDP	Future Years Defense Program
HMS	Handheld, Manpack, and Small Form Fit Radio
IAMD	Integrated Air and Missile Defense
ICE	Independent Cost Estimate
IOC	Initial Operational Capability
IPM	Integrated Program Management
ISD	Instructional System Designers
LMS	Learning Management System
LRSO	Long Range Standoff Weapon
MCSC	Marine Corps Systems Command
MDA	Milestone Decision Authority
MDAP	Major Defense Acquisition Program
MOA	Memorandum of Agreement
MTA	Middle Tier of Acquisition
MYP	Multiyear Procurement
NAVAIR	Naval Air Systems Command
NAVSEA	Naval Sea Systems Command
NAVWAR	Naval Information Warfare Systems Command
NCCA	Naval Center for Cost Analysis
NCD	Naval Cost Division
NDAA	National Defense Authorization Act
NGI	Next Generation Interceptor
NGJ - LB	Next Generation Jammer – Low Band
NGJ – MB	Next Generation Jammer – Mid Band
NNSA	National Nuclear Security Administration
NPS	Naval Postgraduate School
NRO	National Reconnaissance Office
O&M	Operations and Maintenance
O&S	Operating and Support
OMB	Office of Management and Budget
OMFV	Optionally Manned Fighting Vehicle
OSD	Office of the Secretary of Defense
OSMIS	Operating and Support Management Information System
OTA	Other Transaction Authority

PAUC	Program Acquisition Unit Cost
PBR	Program and Budget Review
PEO	Program Executive Officer
PMO	Program Management Office
POM	Program Objective Memorandum
PrSM	Precision Strike Missile
RDT	Resource Distribution Table
RFP	Request for Proposal
RMP	Radar Modernization Program
RP	Rapid Prototyping
S&A	Studies and Analysis
SAE	Service Acquisition Executive
SAR	Selected Acquisition Report
SIB	Submarine Industrial Base
SIPRNet	Secure Internet Protocol Router Network
SLM	Service Life Modification
SM-3	Standard Missile-3
SSC	Space Systems Center
SRDR	Software Resources Data Reporting
SYP	Single-Year Procurement
TACOM	Tank-automotive and Armaments Command
U.S.	United States
U.S.C.	United States Code
USD(A&S)	Under Secretary of Defense (Acquisition and Sustainment)
USD(R&E)	Under Secretary of Defense (Research and Engineering)
VAMOSC	Visibility and Management of Operating and Support Costs
VCS	Virginia Class Submarine
WBS	Work Breakdown Structure
WSARA	Weapon Systems Acquisition Reform Act of 2009