Potential Impacts of Non-Major Program Data Collection on Cost Estimating

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ABSTRACT

The FY 2017 NDAA requires the armed services to collect cost data on all acquisition programs over $ 100 M. The requirement creates a challenge of balancing data collection standardization and flexibility for programs that have not been required to follow traditional data collection strategies. Though this challenge exists, there is a tremendous opportunity to improve cost analysis for both MDAPs and non-major programs as the Department of Defense (DoD) has lacked visibility into the costs of non-major programs. Additionally, the lack of standardized data collection on non-major programs has made data accessibility and one's ability compare cost across analogous programs difficult. This paper provides implementation strategies, how to leverage current data collection tools, and potential impacts on cost estimating.

INTRODUCTION

Any cost analyst can attest to the challenge of availability of quality data. Imagine quality data is at your fingertips for hundreds of programs. With reliable data, how much cost growth could be eliminated? According to a RAND study conducted on cost growth by Bolten et al (2008), approximately one-third of the overall development cost growth for major defense acquisition programs was attributed to cost estimating error. In aircraft and helicopter and missile programs, cost estimating was the single largest cost growth contributor at 27 percent and 15 percent, respectively (Bolten et al, 2008). For example, if there was a $500 million helicopter program and only 5% of the cost estimating cost growth, or $25M, could be avoided spending $1 million to receive quality data, would it be worth it?

Poor data not only affects the credibility of cost estimates that rely on the data, but an organization's effort and cost to acquire the right data. Everyday analysts must validate the data and possibly return to the provider for clarification (Redman 2017). If data is not readily available, the cost and effort to locate and obtain data must also be considered. The purpose of

this paper is to review recent policy changes for non-Acquisition Category (ACAT) I defense programs and the opportunity it presents to the DOD cost community, specifically the opportunity for DOD cost organizations in the Service components to institutionalize a routine, systematic approach to collecting data for non-ACAT I acquisition programs for which data ideally suited to cost analysts has heretofore been unavailable.

OVERVIEW OF NON-ACAT REPORTING

In fiscal year 2014, over half of the $168 billion the DoD requested for weapon systems and other products was to be used as funding for ACAT II and III programs. Major (ACAT I) and non-major (ACAT II and III) programs are classified according to total development and total production funding thresholds as follows:
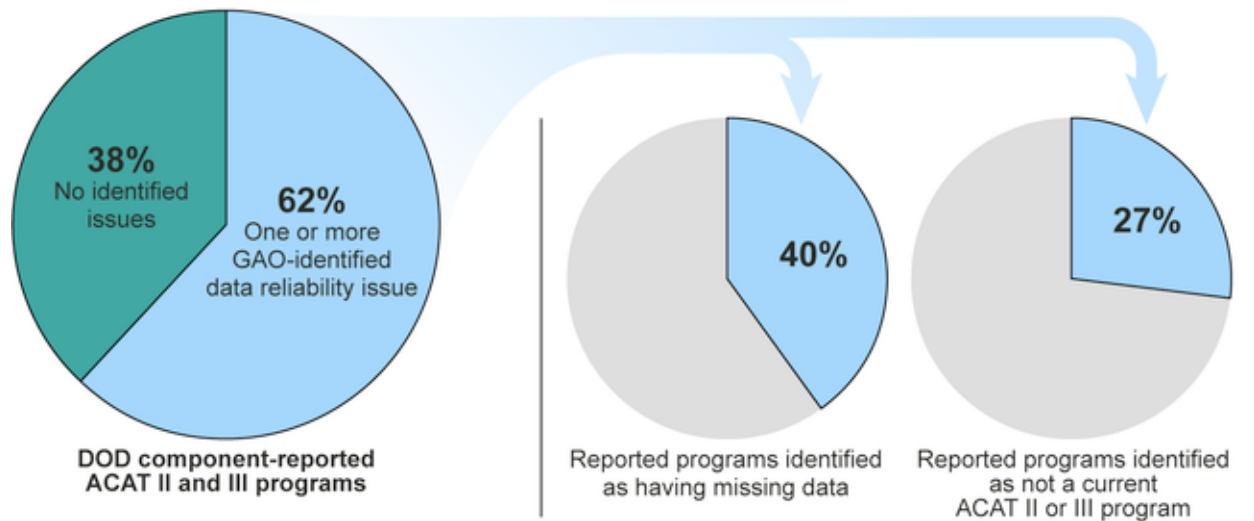
ACAT I: $480M (FY14$) in RDT&E or $2.79B in procurement

ACAT II: $185M (FY14$) in RDT&E or $835M in procurement

ACAT III: Does not meet criteria for ACAT II or above

Since these non-major programs typically have lower research, development, test, and evaluation (RDT&E) and procurement costs than ACAT I programs, they are not subject to the same reporting requirements as major programs, which generally translates to less data availability and reliability. With less reliable data, Congress and the DoD do not get an accurate comprehensive view of these programs. According to a GAO study, "DoD components could not provide sufficiently reliable data for us to accurately determine the number, total cost, or performance of DoD's current ACAT II and III programs" (Sullivan, 2018). GAO found that issues with DoD data were due to data entry issues, missing data, and inconsistent identification of current ACAT II and III programs across the components. As shown in Figure 1, GAO identified data issues in 62% of the component-reported ACAT II and III programs. Cost data was inaccurate and incomplete, and there was inconsistent program data across the components for these non-major programs. These problems limit the ability of Congress, the DoD, program managers, and other decision makers to evaluate and monitor programs as they mature.
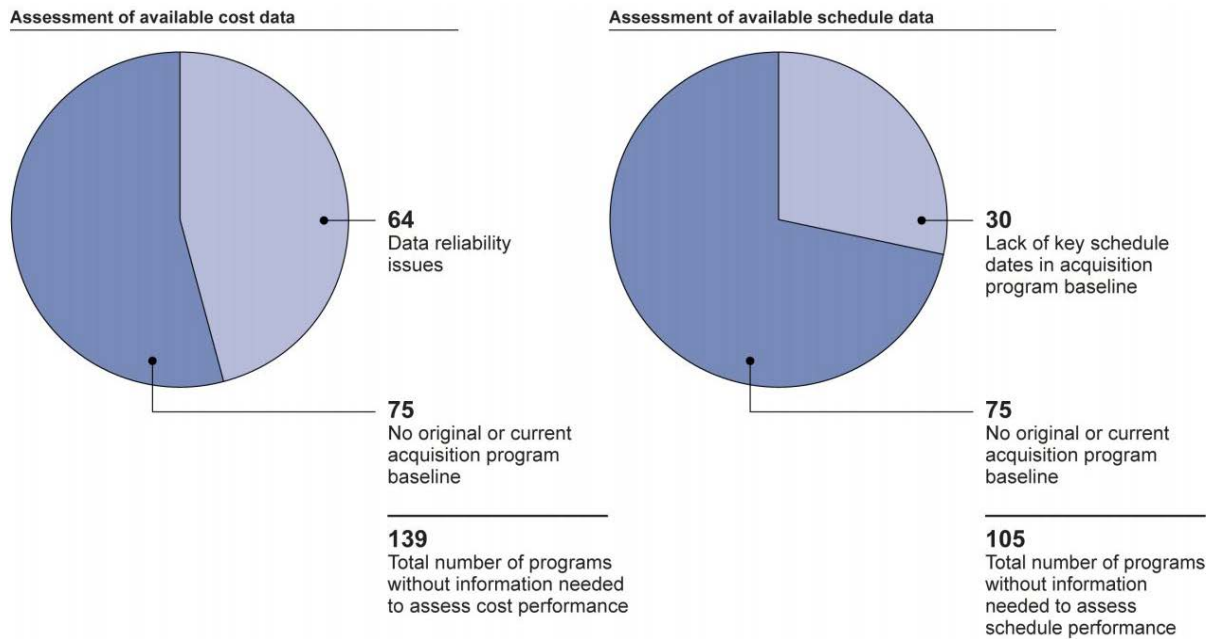
Figure 1. Data Issues with ACAT II and III programs

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38%
No identified
issues

62%
One or more
GAO-identified
data reliability issue

**DOD component-reported
ACAT II and III programs**

40%

Reported programs identified
as having missing data

27%

Reported programs identified
as not a current
ACAT II or III program

Source: GAO analysis of DOD component data. | GAO-15-188

Components currently use information systems to store and track cost and schedule data for ACAT II and III programs; however, the components also cite that their systems may have gaps in information because not all program managers are diligent about updating on a regular basis. In an attempt to provide more complete program data for non-ACAT I programs, the components have implemented policies to encourage data input. Even with these efforts to provide more complete information, it is not enough to totally rectify the accuracy and consistency issues with ACAT II and III program data (Figure 2). The components must detail processes to check data quality and develop specific plans for the implementation and continuation of data improvement efforts. Additionally, there is the issue of consistently identifying current ACAT II and III programs across the components. Until there is a uniform understanding of what constitutes a current ACAT II or III program, comparing program data across the DOD will be limited.

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Figure 2. Assessment of available cost and schedule data for ACAT II and III programs

Assessment of available cost data

64
Data reliability issues

75
No original or current acquisition program baseline

139
Total number of programs without information needed to assess cost performance

Assessment of available schedule data

30
Lack of key schedule dates in acquisition program baseline

75
No original or current acquisition program baseline

105
Total number of programs without information needed to assess schedule performance

Source: GAO analysis of component-reported ACAT II and III data and acquisition program baselines for a non-generalizable sample of 170 ACAT II and III programs. | GAO-15-188

The authors of the GAO report provided multiple recommendations; the following two are the focus of this paper:

- establish guidelines on what constitutes a "current" ACAT II or III program for reporting purposes; the types of programs, if any, that do not require ACAT designations; and whether the rules for identifying current MDAPs would be appropriate for ACAT II and III programs; and
- determine what metrics should be used and what data should be collected on ACAT II and III programs to measure cost and schedule performance; and whether the use of DAMIR and the MDAP selected acquisition report format may be appropriate for collecting data on ACAT II and III programs.

The DoD responded to the recommendations and partially concurred and committed to investigate the reliability of the data further. Although, the authors note, "However, as our review found, the question is not whether policy needs to be revised, but how it needs to be revised. We found that the existing policy direction was not adequate to ensure consistent data collection and reporting on ACAT II and III programs or their cost and schedule performance and our recommendations were designed to address those issues." The clearest response to their recommendations would be to implement standardized data collection procedures. While not confirmed that the DOD policy for non-major program data collection came in response to the report, the National Defense Authorization Act of fiscal year 2017 (NDAA 2017) included the following article that is directly related.

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(g) GUIDELINES AND COLLECTION OF COST DATA.

SEC. 842. AMENDMENTS RELATING TO INDEPENDENT COST ESTIMATION AND COST ANALYSIS.

(a) AMENDMENTS.—Section 2334 of title 10, United States Code, is amended—

(g) GUIDELINES AND COLLECTION of COST DATA

(1) The Director of Cost Assessment and Program Evaluation shall, in consultation with the Under Secretary of Defense for Acquisition, Technology, and Logistics, develop policies, procedures, guidance and a collection method to ensure that quality acquisition cost data are collected to facilitate cost estimation and comparison across acquisition programs

(2) The program manager and contracting officer for each acquisition program in an amount greater than $100,000,000, in consultation with the cost estimating component of the relevant military department or defense Agency, shall ensure that cost data are collected in accordance with the requirements of paragraph (1).

(3) The requirement under paragraph (1) may be waived only by the Director of Cost Assessment and Program Evaluation

(b) CONFORMING AMENDMENTS TO ADD SUBPROGRAMS. Section 2334 of such title is further amended

Major Defense Acquisition Programs and Major Automated Information System Programs replaced with

Major Defense Acquisition Programs and Major Subprograms

The policy mandated that the Department of Defense Office of Cost Analysis and Program Evaluation (CAPE) to implement data collection on acquisition programs with costs greater than $100 million. The challenge of the mandate is that the only specifications are the total program cost and that the data must be cost data. This lack of specificity produced many unanswered questions:

- How will the data be reported?
- What format and where will the data be collected?

- Is it only acquisition programs? Does a program no longer have to report once it is moved into Operations and Sustainment?
- What are the repercussions if the mandate is not followed?

These questions still exist a year later, but CAPE has tasked Service Cost Agencies to address each. The services and CAPE have been actively working together to think through the processes and policies that must be in place to effectively implement the requirements.

IMPLEMENTATION OF NON-ACAT I DATA REPORTING

According to a 2017 survey of the Service Cost Agencies, the Navy, Army, and Air Force respectively have approximately 70, 600, and 387 ACAT II and III programs. In contrast, the Navy, Army, and Air Force respectively have approximately 42, 35, and 50 ACAT I programs. As indicated by the numbers, the additional requirements outlined in the prior section present a challenge to the services as standardized data collection at this level has never been requested.

Since the 1960's, the DoD's mechanism for collecting cost data is Cost and Software Data Reporting (CSDRs). The 5000.02 requires CSDRs be placed on contracts that are valued over $50 M for Major Defense Acquisition Programs (MDAPs). To fulfill the NDAA 17 requirement for non-major program cost reporting, all of the Service Cost Agencies have chosen Cost and Software Data Reporting (CSDR), because it is a widely accepted process and follows a standardized methodology. There are three key CSDR processes: planning, validating, and compliance.

The planning process begins when the program office places a CSDR plan on contract. The purpose of a CSDR plan is to provide the contractor a framework for how to report data based on the program office and cost analyst's data needs. Additionally, a CSDR plan establishes data collection expectations and ensures the requested data is standardized, a trademark of CSDRs. A CSDR plan provides a work breakdown structure, typically following the MIL-STD-881C, due dates for when reports are due, and any special instructions for the reports. CSDRs have six different reporting forms, described below:
- CWBS Dictionary: Provides details on the cost attributes, technical details, and work scope related to a given WBS element per the CSDR plan. It is used to provide context behind the cost being reported in the 1921 series.
- 1921 (Cost Data Summary Report): Provides actual and estimated costs by WBS element broken out by non-recurring and recurring activities. Additionally, provides summary level costs such as General & Administration, Management Reserve, Undistributed Budget, Facility Capital Cost of Money, and most importantly profit (fee or loss). It provides top-level insight into prime mission product, subsystem cost, and below the line costs.
- 1921-1/-5 (Functional Cost-Hour Report/Sustainment Functional Cost-Hour Report): Provides further detail and insight by breaking out costs functional category (Engineering activities, Manufacturing activities, material, other direct costs, and overhead transactions).

- 1921-2 (Progress Curve Report): Provides another level of detail by providing direct cost data by functional categories and unit or lot. This data is used to build learning curves.
- 1921-3 (Contractor Business Data Report): Provides insight into the overall business units.
- Software Resources Data Report (SRDR): Provides staffing data, number of requirements, and hours by computer software configuration items. There is an at least an initial and final SRDR to demonstrate if there is requirements growth or general changes as the software development process matures.

The data reports are the basis of CSDRs. All three process focus on using the reports to meet analysts' needs.

For ACAT I programs, the OSD CAPE Defense Cost and Resource Center (DCARC), which manages the CSDR process. CAPE, the Service Cost Agency (SCA), program office, and DCARC (also known as the Cost Working Integrated Product Team (CWIPT)) will then review and discuss the CSDR plan. Once agreed upon, the CWIPT will approve the plan followed by the Service Cost Agency Director, DCARC Director, and CAPE Deputy Director of Cost Assessment. Upon approval, the program office must place the CSDR plan on contract. The entire process typically takes a month or two unless there are major concerns with the plan.

Once the plan is on contract and the contractor has begun work on a particular contract, the contractor will start reporting. The contractor submits the CSDR report and it is then validated by the DCARC to ensure data clarity and accuracy. The program office, CAPE analyst, and SCC analyst have the opportunity to review the submission and provide feedback. DCARC compiles all of the feedback and sends a validation error report to the contractor to respond and to make the appropriate corrections. Generally, DCARC and the contractor will go back and forth a few times and then either the report will be accepted or rejected. If it is rejected, the contractor has a month to resubmit the report. If it is accepted, DCARC makes the report available for authorized DoD analyst use.

The final process is CSDR compliance. CAPE rates each program office quarterly in conjunction with the Defense Acquisition Executive Summary (DAES) Report process. Program offices will be given a color rating determined by the number of overdue prime and subcontractor CSDRs and program office issues, such as not placing a CSDR plan on contract. The program office is then given until the end of the month to resolve compliance issues before the final DAES report is entered into DAMIR, an online tool that provides visibility into acquisition information.

The services are currently working through how to tailor the current CSDR processes to fit their needs or how to create their own processes for non-major program cost reporting. The greatest challenge for the implementation of CSDRs is the existing policy. The current policy neither mandates to the services nor enforces the law. The services will likely face push back from the program offices until a memo or similar document is released stating that they must follow the NDAA 2017 and the process for doing so. In the absence of a hard requirement for program managers to ensure that their prime and major subcontractors deliver CSDR or CSDR-like cost data, there is no incentive for program managers to invest the time and resources to do so. As a result, it is incumbent upon service cost analysts at all experience levels, particularly managers and senior executives, to understand the value proposition for credible cost data and actively advocate for it with program managers, who certainly represent the primary beneficiary

of the data in the form of more credible estimates leading to more realistic budgets and executable contracts. As indicated by the GAO report, many ACAT II and III programs need more reliable, consistent, and complete data. Until a policy requires the use of CSDRs, the services will face issues with implementing the mandate.

CASE STUDY OVERVIEW

Though NDAA 2017 officially mandated the collection of contractor cost data, and OSD CAPE and the Services have jointly worked to implement the collection of CSDRs for the majority of FY 2017, there are programs that took the initiative to collect CSDRs prior to these policies and efforts. This section of the paper discusses one non-ACAT I program's experience implementing CSDRs. Additionally, it provides various program office, system command, and service level stakeholder perspectives on the benefits and challenges of implementing CSDRs. The intent in conveying others' experience and perspectives is to share informed, real world lessons-learned that enable a better understanding of the wide variety considerations surrounding the advocacy and implementation of systematic cost reporting for non-major programs.

Assault Amphibious Vehicle – Survivability Upgrade (AAV-SU) Overview

The AAV-SU program is a US Marine Corp ACAT III program managed by the PM Advanced Amphibious Assault which reports to the Program Executive Officer (PEO) for Land Systems. The Assault Amphibious Vehicle (AAV-P7/A1, formally known as LVTP-7) has existed since 1972 providing Marines sea to land transport to conduct ashore operations. Several enhancements were made over the last four decades to improve the major subcomponents and was planned to be replaced by the Expeditionary Fighting Vehicle (EFV). However, due to advances to guided anti-ship weapons and unaffordable EFV production and sustainment cost estimates, the EFV program was cancelled. In order to address the aging AAV system, the Marines developed the following strategy:

"In the aftermath of the cancellation of the Marine Corps Expeditionary Fighting Vehicle (EFV) program in early 2011, the service took a fresh look at how it could ensure the nation's ability to "conduct operations ashore whether for training, humanitarian assistance, or combat." That fresh look resulted in a three-pronged strategy focusing on the Amphibious Combat Vehicle (ACV) and Marine Personnel Carrier (MPC) noted above, as well as complementary enhancements to the aging Amphibious Assault Vehicle (AAV) fleet that performed such remarkable service in the ground assault on Baghdad during the initial phase of Operation Iraqi Freedom."

The AAV-P7/A1 is planned to serve the Marines until at least 2035 until the ACV is fully operational and can replace the AAV-P7/A1. With new development of ACV and the expected enhancements, cost data collection is imperative to ensure the government understands the costs associated to acquiring the next generation of amphibious vehicles.

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Implementation of CSDR Reporting on the AAV-SU Program

PM Advanced Amphibious Assault (PM AAA) decided to implement CSDR reporting for the AAV-SU program, despite the program not being required to meet the CSDR requirement. Other PM AAA programs, such as ACV, are required to report CSDRs, and to ensure data is available for the portfolio of amphibious vehicles, PM AAA determined it would be valuable to place CSDRs on contract for the AAV-SU program. Additionally, PM AAA has a cost lead that has CSDR experience from both a government and industry perspective, the latter during employment with EFV prime contractor, General Dynamics Land Systems (GDLS). With knowledge of how the data is collected following the planning and validation process, and how the reports are generated from GDLS's various systems financial systems, the AAV-SU was able to collect CSDR data without significant roadblocks.

Being a non-ACAT I program, the AAV-SU did not have to adhere to all of the same policies and procedures as an ACAT I. Given that PM AAA had a CSDR-experienced cost analyst, the program office employed some key best practices. One of those is adherence to MIL-STD-881C Appendix G Surface Vehicle Work Breakdown Structure (WBS) as the starting point for a cost reporting structure. Another is expansion of the WBS to lower levels to capture subsystem component costs, requesting certain reporting requirements (data formats) at the level necessary to conduct analysis, and defining a reporting schedule that aligns with key contract milestones.

The significance of tailoring the program's reporting requirements is the reality that an analyst exhibited an understanding of what data the program required to meet its cost analysis needs. In many cases, analysts will request reporting at all levels when developing a plan and not be aware of the consequences of these actions, specifically the cost associated with unnecessary detailed cost reporting. Since the AAV-SU program is an ACAT III program with less resources than an ACAT I program, it was imperative for them to be thoughtful and practical in defining the reporting requirements. One of the key elements of good data is the timeliness of the data to support analysis.

CSDR plans typically require submissions an initial submission at the beginning of the contract, an interim when the contract is 50% complete, and a final submission when the contract is complete. Instead, PM AAA leveraged a technique employed by many ACAT I programs today -- using event driven submissions to enable availability of CSDR to cost analysts generating cost estimates to support key events and milestones. Overall, the importance of PM AAA taking these actions to develop a plan that fits the need of the program (including only what they need no more or less) and adheres to policy is that it balances the needs of the larger cost community by providing highly structured data that can be used for cross program analysis (e.g., to estimate analogous programs) and data that can support future PM AAA of the AAV-SU program and other related programs.

In addition to adhering to following the planning procedures, PM AAA also enforces the same verification practices as identified in the 5000.04-M-1. Current DCARC validation processes includes adherences to the Data Item Descriptions (DIDs) for the various data formats and adherence to the CSDR plan. This ensures that the contextual information provided in the remarks aligns with the data reported, and ensures that all major anomalies are clearly explained. Though these are important things to look for when collecting data, verification alone does not ensure quality data is collected. PM AAA also collects and utilizes other data reports to validate the data reported in the CSDRs.

PM AAA collects three cost reporting requirements other than CSDRs -- the material pricing report (more robust Bill of Material), lot-size pricing report, and contractor controlled Life-Cycle Cost Estimate (LCCE). Each of these three reports is used to support PM AAA estimating abilities and ensures the data collected in the CSDRs is accurate. According to PM AAA, the majority of cost for a surface vehicle is material cost (80%-85%), which explains why the program office requires the material pricing report. This particular report provides detailed cost information on the specific piece parts that make up the subsystem components and can be used to cross-check the data reported in the CSDRs. This is important because one of the most difficult aspects of estimating surface vehicles are understanding the supplier costs on a learning curve. This particular report provides the insight required to gain that understanding. Additionally, the lot size pricing report enables analysis that provides insight into supplier learning curve slopes at the component level of detail. Lastly, the contractor conducts a Lifecycle Cost Estimate, which uses the WBS that is included in the CSDR plan. This provides a holistic view of the program and provides the contractors' perspective of the programs costs that can be used to compare the CSDRs against.

Validation and verification steps like these are the ideal case when implementing CSDRs, whether it is an ACAT I, II, III or IV program. It takes into account the major cost drivers for a program, includes multiple perspectives on the costs, and improves the confidence that the data is accurate because various data sources either corroborate each other or provide insight into data source differences. PM AAA has been fortunate to have both a cost lead with extensive experience with CSDR reporting and a Program Manager that understands the value of having data to support cost estimating and defend budgets.

To date CSDR data has been used in several estimates for PM AAA including estimates for major program milestones. The importance of taking these steps for the larger community is that the confidence behind the data is improved because it has been verified that it is consistent with DIDs and a CSDR plan, it is accessible in the CADE database that provides all government analysts access, and most importantly has been validated against multiple other data sources. Though PM AAA has been a model example of how CSDRs have been implemented, there have been various challenges that need to be overcome to ensure the collection of accurate, structured, and detailed data.

Lessons Learned from AAV-SU CSDR Reporting

One key challenge of the CSDR reporting process is ensuring that programs understand the importance of CSDRs to the cost community and more importantly the program office, which must justify applying the resources required to collect this data. This was not the case of the AAV-SU program. Due to having an experienced cost analyst and a program manager that is aware of the importance of CSDR reporting, this common issue of lack of advocacy was not the challenge.

One of the issues PM AAA faced was getting contractors to correct problems identified by the program office analyst who reviewed the data. The problems were the combination of lack of contractor experience, lack of alignment of financial systems, lack of auditability, and lack of manpower needed for developing the CDRLs necessary to conduct the extensive reviews. Of these reasons, PM AAA has stated that the lack of alignment of financial systems is the greatest challenge. Many times the issue may be that the contractor's engineering systems do not connect with the accounting system, thereby adversely impacting traceability. Many programs implementing CSDR reporting believe that having a conversation at the Post Award Conference of how each system is setup and planned to be used is enough to implement CSDR reporting and ensure there is traceability between reports, but as with any process that is not systematically implemented, deviations from the original plan are inevitable as program execution needs to allow for adaptability.

Other challenges that PM AAA experienced are also a result of conducting a detailed review of the data, which again is not a common practice of most program offices. The extensive reviews conducted by PM AAA are a resource intensive activities for both the government and contractor. It is an iterative process involving review and correction of the data provided by industry that results in multiple revisions and adjustments for a single submission. This can be reduced when industry has their various information systems integrated to allow for traceability and auditability, but this is rarely the case. One thing to note is that the challenges that were discussed are challenges that are experienced across the board for all programs implementing CSDRs. Resolving disconnects in the data and resource constraints are always going to be a challenge, but it is a more difficult and apparent issue for non-ACAT I programs given their resource constraints relative to ACAT I programs. This then begs the question does the government put enough emphasis on the importance of data. Does the department forgo the collection of data on a smaller program that can provide insights that can help defend ones budget and support the estimation of an analogous program? Or do we try to allocate as many resources to the execution of a program. In the following section the paper will discuss different perspectives on CSDR reporting.

CONCLUSIONS AND RECOMMENDATIONS

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The non-major program cost reporting policy will be challenging to implement, but represents many opportunities. The following recommendations are offered to help overcome the inevitable obstacles to smooth implementation:

1. Advocate for cost data to be placed on contract

The largest cost growth contributors are requirements and quantities changes. With improved data quality and availability, analysts could provide defensible estimates earlier and faster to decision makers. Although cost analysts cannot control quantities and requirements, they can provide the information necessary for stakeholders to understand the ramifications those decisions may have on the budget. The decision to request data or not should be clear.

As cost analysts, it is our duty to present the program manager and contracting officer with the reasons that quality data is necessary: cost savings (operational and contractor), more efficient decision making, workforce efficiency, and defensible budgets. As the Bolten et al study (2008) states, "While correction of cost estimating errors will not directly reduce overall system costs, it will better align expectations with reality and may indirectly provide modest overall cost reductions through reduction in the "churn" of program plans and activities resulting from the common mismatch between them." The costs of not having accurate, quality data is far-reaching.

The NDAA 2017 provides cost analysts the opportunity to support and push the need for quality, comparable, readily accessible data to the program offices they support. Although there is no policy or regulation for the non-ACAT I reporting yet, the opportunity to push for cost data to be placed on contract prior to RFP is in the piloting phase.

2. Provide training for cost analysts supporting ACAT II and III programs – specifically on data collection and contractor accounting systems

Collecting cost data via CSDRs is not as easy as just placing a CDRL on contract. It requires knowledge and understanding of the processes that contractors use to create CSDRs. Post-award conferences are a critical and important time to discuss how contractor's will report, but it is important for an analyst to understand how contractors will report, such as how the engineering systems integrate into the accounting system.

Additionally, many contractors for ACAT II and III programs may not have ACAT I program experience and associated CSDR preparation expertise. In these instances, the cost analyst has to be the expert and assist the contractor in reporting correctly, a lengthy but important process. This highlights the need for training programs focusing on CSDR processes that heavily leverage the years of evolving training materials that DCARC has developed and delivered to hundreds of trainees from the government and industry.

3. Further analysis needs to be conducted on the costs and benefits of CSDRs for non-ACAT I programs

This paper lays the foundation for future work on the potential impacts of the new policy, but there is no quantitative analysis on the actual costs and benefits of CSDRs. As of now, there is no usable data on the possible costs and benefits of implementing this policy. A future paper could focus on a cost-benefit analysis of collecting cost data on non-ACAT I programs. Some preliminary costs and benefits to consider are:

Costs	*Benefits*
• Contractor implementation	• Less time spent looking for reliable data
• Analyst and contractor training	• Access to more programs and data

Informed decision-making depends on a variety of enabling factors, including but not limited to sound information.   The credibility of the cost analysis provided to decision makers is dependent on a variety of factors, including but not limited to the technical/programmatic definition of the program/system being evaluated, ground rules and assumptions and underlying historical cost data. The quality of these different pieces of important information is paramount to the resulting estimates presented to decision makers. The NDAA 2017 presents cost analysts the opportunity to advocate for cost data to be placed on contract and to educate program leadership of the importance of reliable data to a program's budget and schedule.

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