

# Beyond CSDRs: Collecting Contractor Cost Data for Detailed Cost Estimates

Tim Lawless

Naval Sea Systems Command  
Cost Engineering and Industrial Analysis  
Division (NAVSEA 05C)

Presented at the 2016 ICEAA  
Professional Development and Training  
Workshop  
June, 2016

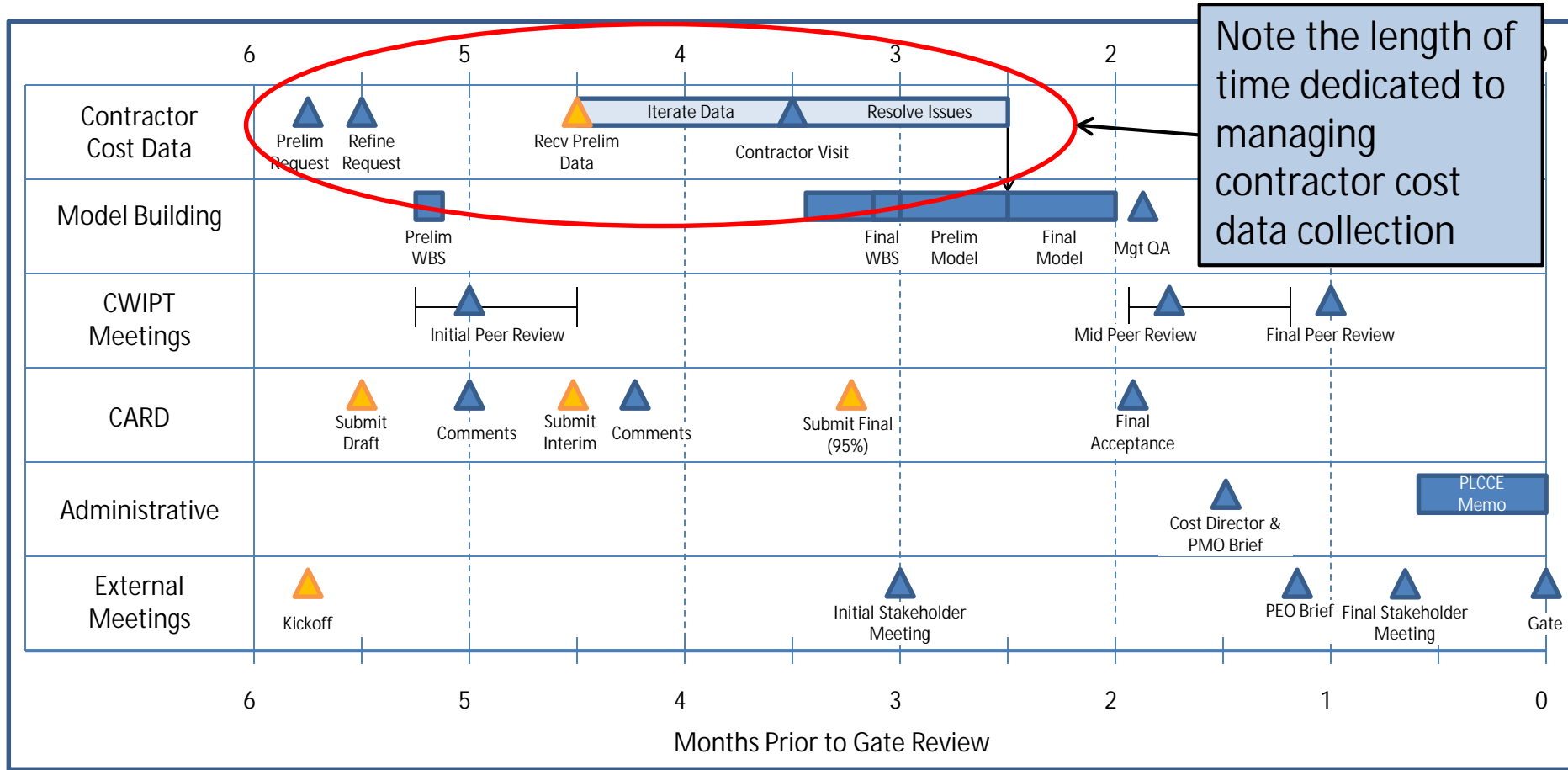
# Outline

- The importance of data
- Discussion of data sources
- What are actual costs?
- CSDR Overview, with discussion of pros and cons
- SEA 05C4 and CSDRs
- An alternative to CSDRs
  - Example data request for contractor SE/PM
  - Scope of data requests
  - Priced Bills of Material, and their analytical benefits
  - Other cost elements
- Vision of a way ahead without CSDRs

# The importance of data

- Cost estimating blends many disciplines to deliver a quality product: Math, engineering, economics, acquisition management, etc.
- However, the foundation of quality estimates is a validated data set
- Truly, “garbage in equals garbage out”
- Estimators often spend the great majority of their time collecting, validating and iterating the data to converge it to a usable condition for a cost estimate
- Data collection effort limits the amount of time cost teams have to do analysis

# Typical SEA 05C4 Cost Estimating Schedule



▲ Cost team action event    
 ▲ PMO action event    
   Cost team action activity  
  Cost team/PMO joint activity    
 Schedule leeway    
└─┘ Event dependency

**Completion of PLCCE is dependent on timely receipt of cost data**

# Discussion of Data Sources

- Several data sources are potentially available to DoD cost estimators for the prime contractor cost elements:
  - Actual costs
  - Earned value management data (CPRs and IPMRs)
  - Negotiated contract prices
  - Contractor proposals
  - Subject matter expert opinion
  - Budget projections, obligations and expenditures
- However, for quality cost estimates, DoD policy requires the use of actual costs:
  - DoDM 5000.04-M-1, dated November 4, 2011 specifies the collection and use of contractor actual costs for estimates
  - DFARS 252.234-7003 requires contractors to report their actual costs to the government

# What Are Actual Costs?

- DODM 5000.04-M-1, November 4, 2011 defines actual costs in its Glossary:
  - “The costs sustained in fact, on the basis of costs incurred, as opposed to standard or predetermined costs. Estimated actual costs may be used for actual costs that have not been recorded in the books of record, when based on verifiable records such as invoices and journal vouchers that have not yet been accrued in the books of record, to ensure all valid costs are included.
- It also clarifies actuals costs are organized into direct labor, direct material, ODCs, overhead and G&A:
  - “Actual costs to date include cost of *direct labor, direct material, and other direct charges* specifically identified to appropriate control accounts as incurred, and any overhead costs and general administrative expenses allocated to control accounts.”

# What Are Actual Costs?

- FAR language is even more explicit:
  - “...Contractor cost and data reporting (CCDR) will be based, to the maximum extent possible, upon actual cost transactions and not cost allocations”
  - “...Data from its [contractor] accounting system will be mapped into the standard reporting categories”
  - “...Recurring and nonrecurring costs will be segregated”
- Key points of actual costs, based on the above requirements:
  - From contractor accounting system
  - Based on actual transactions, not estimates or allocations
  - Organized Into standard reporting categories (MIL-STD-881C WBS for DoD)
  - Separates recurring and nonrecurring costs

# Actual Costs

- In the DoD, contractor actual costs are typically collected through the Cost and Software Data Reports (CSDR) process
- DoDI 5000.02, dated January 7, 2015 requires actual costs to be reported on:
  - Contracts valued at more than \$50M for ACAT I and ACAT IA programs, including ACAT II or ACAT III programs which are major components of an ACAT I system
  - Contracts between \$20M and \$50M for programs with high-risk or high-technical-interest
- CSDRs required regardless of contract type—common source of confusion with program offices and government contracting officers
- Reporting can be waived for commercial items or non-commercial items procured under competitive firm fixed price contracts, provided competitive conditions continue to exist



# CSDR Overview

- CSDR plans
  - Approved by OSD CAPE
  - Defines the program and contract WBS
  - Each WBS element can invoke several cost reports
- Available reports
  - Contractor Cost and Data Reports (CCDRs) DD Forms 1921 family
    - Cost Data Summary Reports (CDSRs) DD Forms 1921
    - Functional Cost Hour Reports (FCHR) DD Forms 1921-1
    - Progress Curve Reports (PCRs) DD Forms 1921-2
    - Contractor Business Data Reports (CBDRs) DD Forms 1921-3
    - Sustainment Functional Cost Hour Reports (SFCHR) DD Forms 1921-5
    - Frequencies: Initial for first time submitters, Interim, Final
  - Software Resource Data Reports (formerly DD Forms 2630 family)
    - Initial Software Developer Report
    - Final Software Developer Report

# CSDR Forms Overview: CCDRs

<i>Family</i>	<b>Contractor Cost Data Reports (CCDRs)</b>				
<i>Form Name</i>	Cost Data Summary Reports	Functional Cost Hour Reports	Progress Curve Reports	Contractor Business Data Reports	Sustainment Functional Cost Hour Reports
<i>Abbreviation</i>	CDSR	FCHR	PCR	CBDR	SFCHR
<i>Form Number</i>	1921	1921-1	1921-2	1921-3	1921-5
<i>Notes</i>	<ul style="list-style-type: none"> <li>- Generally comprehensive of contract costs</li> <li>- Provides costs only, no labor hours</li> </ul>	<ul style="list-style-type: none"> <li>- Expands on CSDR WBS elements to provide labor/material splits</li> <li>- Provides labor hours in engineering and manufacturing functional categories</li> </ul>	<ul style="list-style-type: none"> <li>- Gives insight into unit costs within a manufacturing lot</li> <li>- Useful early in production phase</li> </ul>	<ul style="list-style-type: none"> <li>- Comprehensive view of recent and projected contractor business base</li> <li>- Accounts for direct and indirect costs, DoD and non-DOD work</li> </ul>	<ul style="list-style-type: none"> <li>- Similar in structure to FCHR form</li> <li>- Applied to contracts for O&amp;S support</li> </ul>

# CSDR Forms Overview: SRDRs

<i>Form Name</i>	Initial Software Developer Reports	Final Software Developer Reports
<i>Abbreviation</i>	SRDR (Initial)	SRDR (Final)
<i>Form Number</i>	None	None
<i>Notes</i>	- Documents estimated software development hours, staffing, schedules, SLOC and requirements.	- Documents actual software development hours, staffing, schedules, SLOC and requirements.

# Discussion of CSDRs as data source: Pros

- CSDRs are the most common source of contractor actual costs for DoD cost estimating, available from the Defense Automated Cost Information Management System (DACIMS) database on the DCARC website
- DACIMS has several large advantages:
  - Reported data is based on contractor actual costs
  - Central repository of DoD cost data: One stop shopping
  - Large population of programs that have reported costs
  - Reporting formats are generally consistent between programs, often allowing for a normalized basis of comparison
  - History stretches back in some cases to the 1980s

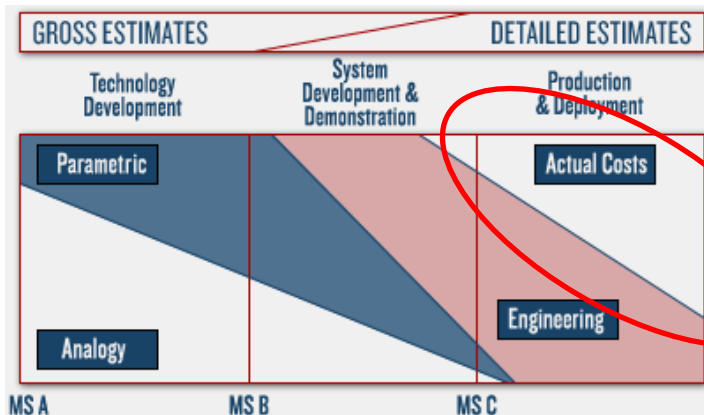
# Discussion of CSDRs as data source: Cons

- Unfortunately, DACIMS has several drawbacks to DoD estimators, complicating analysis:
  - For programs in production, not all production lot reports may be available
  - Most interim reports are not reliable for performing analysis, as the final costs are projections (SEA 05C4 standard is to reject interim reports at less than 85%-90% complete)
  - Bookkeeping of costs in CWBS dictionaries can be ambiguous, such as recurring versus nonrecurring or production support labor versus systems engineering and program management, leaving analysts to infer how the data should be interpreted, or reject the data altogether
  - Prime contractors can find them cumbersome and frustrating to prepare and submit

Most importantly, few ACAT II or ACAT III programs comply with CSDR reporting

# SEA 05C4 and CSDRs

- SEA 05C4 independently estimates costs of NAVSEA ordnance and electronics systems to NAVSEA program offices and senior Navy and OSD leadership
- SEA 05C4 has a portfolio of over 60 active electronics and weapons programs, of which only four are designated as ACAT I and which consequently submit CSDRs
- Milestone B estimates of ACAT II and ACAT III programs are problematic, but can partially be overcome by relying upon ACAT I analogies for development and production
- Milestone C and Full Rate Production Decision Reviews (FRPDR) estimates are extremely problematic for ACAT II and ACAT III programs, as the expectation is that actual costs would be extrapolated—yet they unavailable in DACIMS
- An alternative approach was needed to satisfy the requirement for using contractor actual costs for Milestone estimates



For ACAT II and ACAT III systems, actual costs are needed to perform Milestone estimates

# An Alternative to CSDRs

- Over the years, the division gained experience collecting actual costs directly from prime contractors
- Crafting concise, precise data requests became important to rapidly iterate to the cost data necessary to do the estimate
  - Division over time developed skill to recognize what data it needed early in the milestone process, and acquire it
  - Had to avoid “Bring me a rock” requests; neither party could afford to waste resources
  - Iteration always needed to converge to the final data set—no request is ever prescient and perfect
- Because the data requested from contractors was already organized in their accounting systems, collection of this data minimized both imposition and cost on contractors
- Learning how to speak the contractor’s language was the key

# Example Request: Systems Engineering and Program Management (SE/PM)

- Example of a poor request: “How much does SE/PM cost?”
  - Ambiguous time phasing
  - Does not acknowledge labor hours
  - Does not consider difference between recurring and nonrecurring activities
  - No clear definition of what is SE/PM, as it can vary from one contractor to the next, and can evolve over time with the same contractor
- Example of a typical, successful request: “Please provide SE/PM labor hours by month from the existing development contract, split between recurring and nonrecurring activities, from May 2012 to April 2016; also, please provide a description of which activities are performed under SE/PM”
  - Bounded time period with clear intervals
  - Segregates recurring and nonrecurring
  - Requests CWBS dictionary for this element to clarify work scope



# Scope of Data Requests

- Requests customarily cover the period of the system during the EMD phase, and if available, LRIP production
- The full range of contract costs are requested, with each question or set of questions oriented towards MIL-STD-881C organization
- Technical data can be collected, as well, if not available in the CARD
- If the system is in production, a schematic of manufacturing flow is usually helpful to visualize choke points and risks to production
- A discussion of the noteworthy points of the principal cost drivers follows

# Priced Bills of Material (PBOMs)

- Prime mission product of an electronics or weapons program is usually the largest cost driver of the procurement phase
- Over the course of procurement, direct material costs are usually the largest driver of prime mission product
- Priced Bills of Material (PBOMs) represent the comprehensive list of parts required to manufacture, assemble and test hardware on a contract, and contains several fields:

# PBOMs and Actual Costs

- PBOMs are critically important information, but are not actual costs, as they do not contain the actual transaction from the contractor's accounting system
- Paid invoices documenting the actual transaction are needed to tie PBOMs back to actual costs
- A typical PBOM contains thousands of rows, and collecting invoices on every item would be tedious and wasteful
- SEA 05C4 takes a Pareto Principle approach, concentrating on roughly the top 80% of cost drivers, which often are only a half dozen or so items

# PBOMs and Actual Costs (continued)

- Invoice unit prices replace PBOM unit prices
- Prices of remaining items can be left as is in PBOM or adjusted if consistent pattern is discerned between invoices and PBOM prices
- PBOM material burdening code is important to select correct Forward Pricing Rate Agreement or Recommendation burdening values—sometimes an additional translation key or “decoder ring” is needed from the contractor to interpret

# Benefits of Using PBOMs

- Assuming invoices are available to translate PBOMs to actual costs, PBOMs afford cost estimators richness of analysis not available in CCDRs
- Deeper Data: Whereas CCDRs only provide direct material costs at the WBS level, PBOMs provide costs at the part level, providing more data sets for regression analysis
- Micro Escalation: Year-to-year variation of unit prices can be observed on each part, allowing analysts to develop their own specific escalation indices within a specific market basket of goods
- ECPs: With sufficient production lots, analysts can observe and examine the frequency and change in unit price as a result of part number changes, allowing them to directly observe the recurring cost impacts of Engineering Change Proposals
- Depot Level Repairables (DLRs) Basis: With identifying information, the acquisition costs of Lowest Replaceable Units (LRUs) can be determined and used as the basis for LRU repair costs during the O&S phase—reference 2015 ICEAA brief on DLRs

# Other Cost Elements

- The labor in Prime Mission Product can also be a significant cost driver during the procurement phase
  - Touch labor: Artisans directly involved with fabrication, assembly, integration and test of hardware
  - Support labor: Engineering and other support labor which assists touch labor and provides infrastructure
  - Request by lot if program is in production or for EDM units if program is still in development
- Software development data
  - New, modified, reused SLOC
  - Start and end dates
  - Direct labor hours for Design Code Test and Integration
  - Direct labor hours for support (SE/PM, logistics, test, etc.)
  - DCTI and end-to-end productivities can be discerned from this data
  - DSLOC basis is provided for software maintenance in O&S phase

# Vision of a Way Ahead

- Contractor custom data collection has successfully been used by SEA 05C4 for over four years to acquire cost data needed for Milestone cost estimates
- This detailed data allows for greater flexibility and depth of analysis than is usually experienced with CSDRs
- Prime contractors have been supportive of this effort
- Disadvantage 1: Data is not uploaded into DACIMS and can only be used by the small number of cost analysts within NAVSEA
- Disadvantage 2: Data formats vary with each estimate, making cross-check comparisons between programs less than straightforward
- Disadvantage 3: Process is very labor-intensive, as formulating data requests, tracking progress and iterating towards a usable data set takes months of effort
- Disadvantage 4: There is no analog in this process for the DD Form 1921-3, Contractor Business Data Reports

# Vision of a Way Ahead

- OSD CAPE Initiative underway to move towards “flexfiles”, which mirror the approach outlined in this presentation
- Ideally, its implementation would lead to global, consistently acquired cost, technical and CWBS dictionary data available to DoD analysts to replace CSDRs
- Warehousing and accessibility of data would likely be major undertakings—such a large volume of data would require a new user interface to retrieve in a reasonable time
- Once completed, analysts would have unprecedented access to detailed cost data across the entire range of DoD programs
- Until then, the approach outlined in this brief can be used to collect contractor actual costs for high-quality estimates



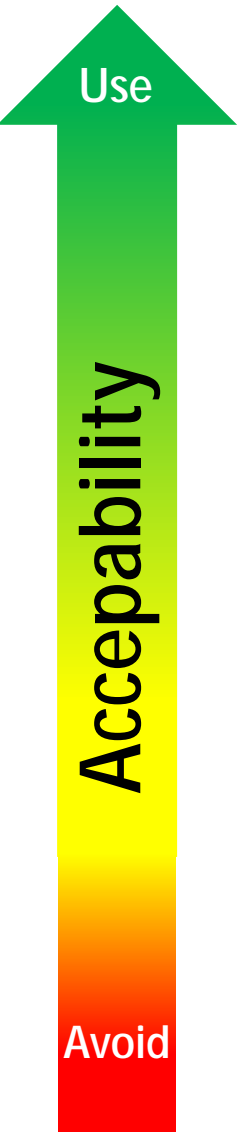
# Acknowledgements

---

- We truly stand on the shoulders of giants, metaphorically speaking
- This presentation would not be possible without the contributions from the following individuals, who I gratefully wish to acknowledge:
- Tom Burton, Tecolote Corporation
- Jay Black, DHHS
- Mike Biver, OSD CAPE

# Back Up

# Hierarchy of Cost Data Sources



- Material Invoice
- Material Purchase Order
- Negotiated Priced Bill of Material (PBOM)
- Cost and Software Data Report (CSDR); i.e. the DD 1921 family of reports and DD 2630 Software Resources Data Report (SRDR)
- Reports generated directly from contractor accounting system
- Cost Performance Report (CPR); reporting format is not product-oriented and often does not separately identify recurring and nonrecurring costs
- Awarded contract price; represents the cost the government paid, but not the cost the contractor(s) paid
- Subject Matter Expert (SME) input
- Budgets, Proposals, & Task Planning Sheets (TPSs)

These data sources  
contain "actual" costs

Acknowledgement for this slide goes to James 'Jay' Black, DHHS

# Discussion of Data Sources

- Several data sources are potentially available to DoD cost estimators for the prime contractor cost elements of acquisition cost estimates
- Negotiated contract prices:
  - Fixed price contracts can vary from actual costs
  - Final price of cost-plus contracts are actual costs at a total level, but rarely are organized in MIL-STD-881 WBS format or segregate and nonrecurring costs
- Contractor proposals:
  - Typically represent contractor opening position for negotiations: Upper boundary for fixed price, lower boundary for cost-plus contracts
  - Even further removed from actual costs than negotiated prices
- Earned value management data (CPRs and IPMRs):
  - Completed CPRs and IPMRs represent actual costs at a total level
  - Like cost-plus contracts, are rarely organized into useable WBSs or segregate nonrecurring costs from recurring
- Subject matter expert opinion:
  - Prone to distortions such as framing, confirmation or self-serving biases
  - Can be a reliable source if rigorous elicitation methods are used
  - Cross checks are required for verification
- Budget projections, obligations and expenditures: Not reliable as a data source