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OFFICE OF THE SECRETARY OF DEFENSE
COST ASSESSMENT AND PROGRAM EVALUATION

SLIDES ONLY
NO SCRIPT PROVIDED

Interesting Results from EVAMOSC or *"Wow There is a Lot of O&S Data"*

2023 ICEAA Professional Development & Training Workshop

IT & Cloud Computing Track (IT01)

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Operations Research Analyst
OSD CAPE
Land & Naval Warfare Cost Analysis Division (LNWCAD)

The overall classification of this briefing is:
UNCLASSIFIED

Purpose / Agenda

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Purpose:

1. Raise awareness of O&S data and EVAMOSC
2. Identify the power of cloud computing/"big" data and how it can help cost estimating
3. A cautionary tales: are we ready for this?

Agenda:

- About the presenter.
- What is O&S data?
- What is EVAMOSC?
- Exploring Maintenance Data
  - The Pareto Rule applied to maintenance data
  - Did COVID impact maintenance?
  - Are field units experiencing inflation/escalation?
- Cautionary tales from the "Big" data fronter.

About the Presenter: Daniel Germony

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2008

Bachelor's Degree in Economics from the University of Michigan

Cost Estimator/Analyst at US Army TACOM

- Life Cycle Cost Estimates, Independent Government Cost Estimates, Analysis of Alternatives, and Cost Benefit Analysis
- Primary tools: Excel + ACEIT

2014

Master's Degree in Cost Estimating and Analysis from the Navel Postgraduate School

Cost Estimator/Analyst at US Army TACOM

- Cost Data Collection, Contract Writing, Source Selections
- Primary tools: Excel + @Risk

2018

Senior Data Scientist at US Army TACOM

- Data Automation, Linearly Programming, Optimization Analysis
- Primary tools: R + (limited) Excel

2020

Operations Research Analyst at OSD CAPE

- Data Collection Policy, Standardization, and Enforcement, Data Transformation Lead for EVAMOSC
- Primary tools: R + SQL

Today

What is O&S Data and EVAMOSC?

What are Operating & Support (O&S) Costs?

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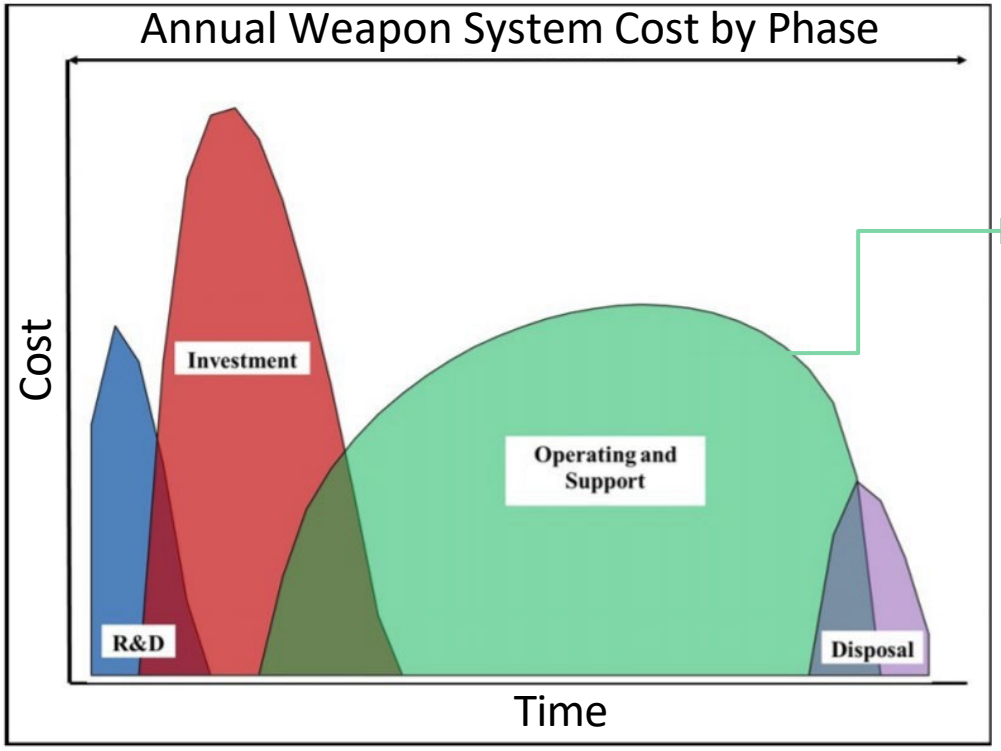
- Operating & Support (O&S) consists of all effort related to sustainment; from initial system deployment/fielding through the end of system operations.
- For most weapon system commodities, the O&S phase is the longest, most costly phase, and often partially overlaps the investment and disposal phases.
- O&S costs are categorized utilizing OSD CAPE's O&S Cost Estimating Guide's Cost Element Structure.



2020 O&S Cost Estimating Guide's Cost Element Structure (CES)

CES Number & Title	CES Description
1.0 UNIT-LEVEL MANPOWER	Operators, maintainers, and other support manpower assigned to operating units. Includes military, government civilian, and/or contractor manpower
2.0 UNIT OPERATIONS	Unit operating material (e.g., direct fuel and training material) and unit support services. Excludes all maintenance and repair material
3.0 MAINTENANCE	System maintenance other than maintenance manpower assigned to operating units. Consists of organic and contractor maintenance
4.0 SUSTAINING SUPPORT	System support activities other than maintenance that can be attributed to a system and are provided by organizations other than the system's operating units
5.0 CONTINUING SYSTEM IMPROVEMENTS	Hardware modifications and software maintenance to keep the system operating and operationally current

What is EVAMOSC?

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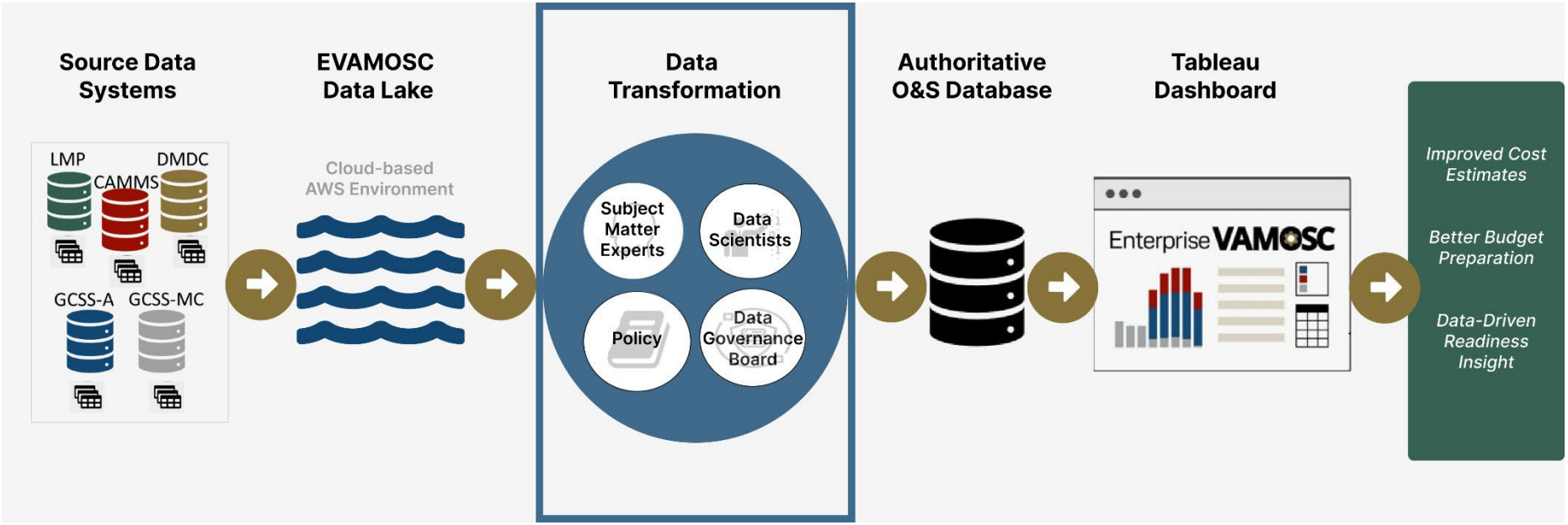
BLUF: ~3TB cloud-based database with O&S data on major weapon systems. Build on AWS using Redshift (PostgreSQL), hosted via Cloud One, user access via Tableau.



About

The **Enterprise Visibility and Management of Operating and Support Costs (EVAMOSC)** is a OSD CAPE product used to enable the estimation of O&S costs major weapon systems. This new system was initially released within CAPE in December 2021 and is anticipating release DoD-wide this winter.

Key Facts

- Enterprise access to previously unavailable data sources
- Historical, actual O&S costs standardized to OSD CAPE Cost Element Structure for all major weapon systems across the DoD
- Granular, transactional level data

Use Cases

- Business Case Analysis
- Sustainment Reviews
- Selected Acquisition Reviews
- Independent Cost Estimates
- Readiness Cost Driver Analysis
- Budget preparation with historical data

EVAMOSC by the Numbers (as of March 2023)

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Source Data Systems Ingested	9
TB of Data	2.9
Data Schemas	15
Data Tables	~830
Data Fields	31k
Amount of Transaction Data	$25B
Weapon Systems	~1,400
Replacement Part Numbers	267k
Army and USMC Unit Identification Codes	~6,100
Army Depot Projects	81k
Army Ground Vehicle and Aircraft Maintenance Work Orders	5.4M
Army Aircraft Inspection and Maintenance Records	250k
USMC Ground Vehicle & Equipment Service Requests	859k
Army Purchase Orders	29.3M
USMC Material Transactions	4.0M

There is a lot of O&S data to work with in EVAMOSC.

EVAMOSC Schema Overview

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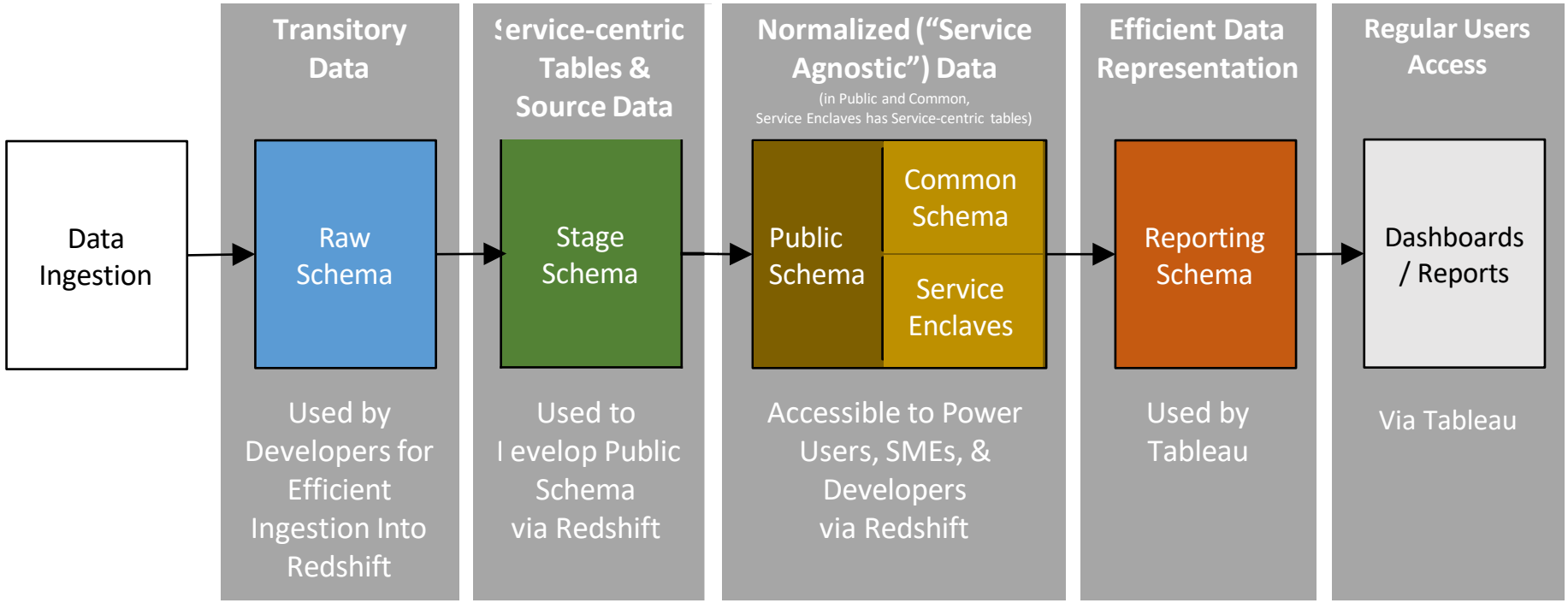
EVAMOSC utilizes a multi-schema structure to ingest, clean, and normalize data.

- Each schema is critical to the efficient execution of EVAMOSC and each has a specific use case / set of users.



Data schemas are not a common concept in cost estimating but are critical in data engineering projects.

EVAMOSC Website: https://evamosc.osd.mil/

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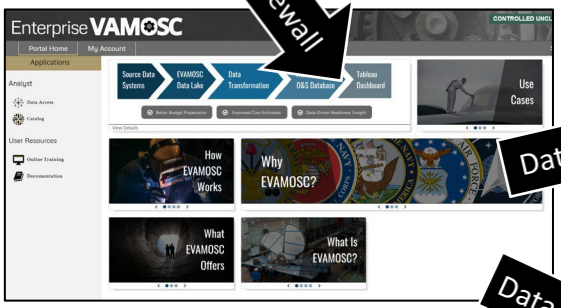
CAC Firewall



Public Site

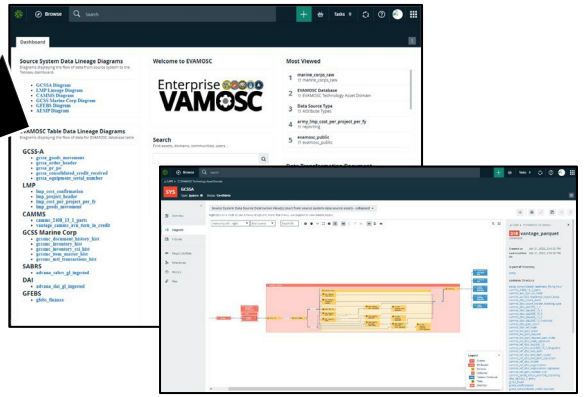
- EVAMOSC Statutory Requirements
- Training Calendar
- Data Governance Policy
- Recent News

Data Access

Data Access (Tableau)

- Prebuilt Workbooks with Normalized Data
- Data Export Capability
- Self-service Analytics using Tableau Templates

Data Catalog



Firewalled Site

- Training Videos
- Written Documentation
- Data Access (Tableau)
- Data Catalog (Collibra)

Data Catalog (Collibra)

- Data Linage Diagrams for Each Source Data Systems
- Data Dictionary/Definitions
- Transformation Documentation

Accessible to DoD Common Access Card (CAC) holders.

Exploring Maintenance Data In EVAMOSC

How well does the Pareto Rule (80/20) rule apply to O&S data? *(1 of 4)*

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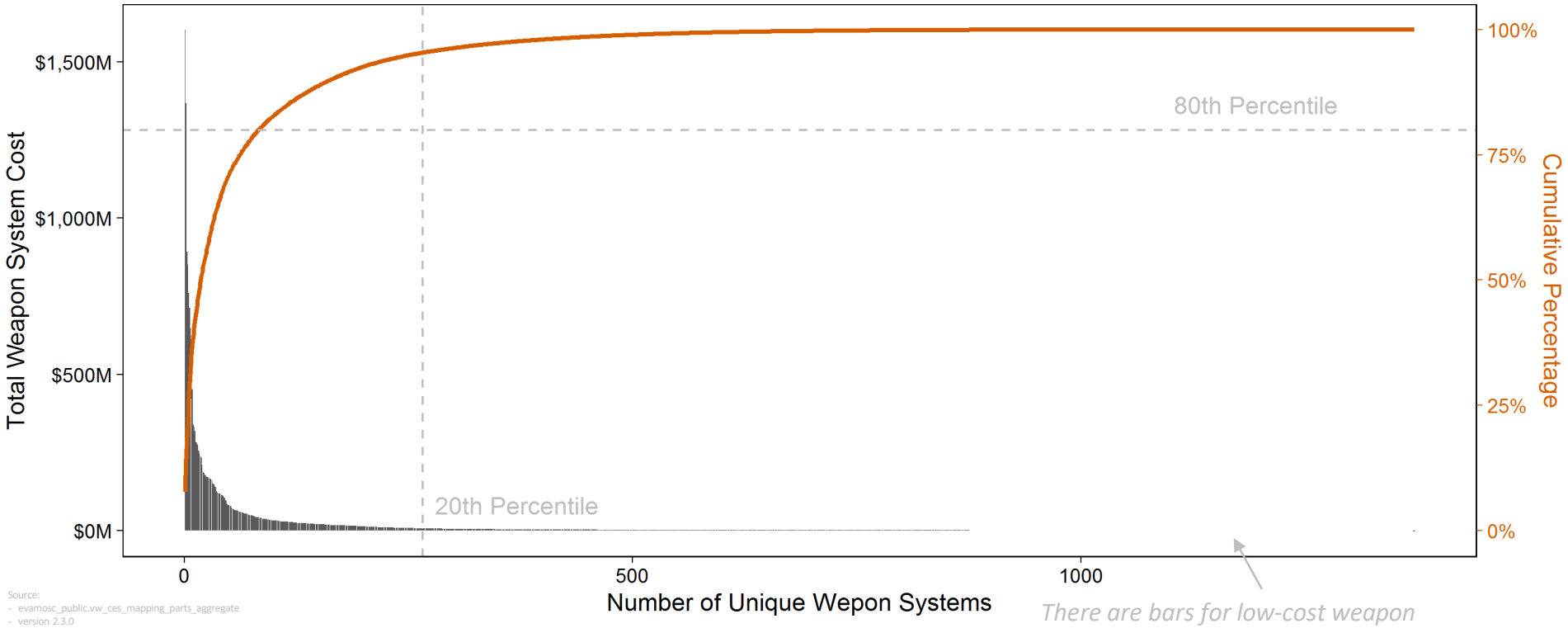
- EVAMOSC has data on ~1,300 weapon system; 80/20 rule predicts the top 260 weapon systems will account for 80% cost.
- In actuality…
  - The top 83 (~6.3%) most expensive weapon systems account for 80% of total cost.
  - The top 260 (20%) most expensive systems account for ~95.4% of total cost.

Pareto Rule (a.k.a, the 80/20 rule) states that 80% of total cost will be contained in the most expensive 20% of the data.



Source:
- evamosc_public.vw_ces_mapping_parts_aggregate
- version 2.3.0
- extracted: 2023-04-12
- timeframe: FY2015 to March FY23
- source_data_system: GCSS-A, LMP, GCSS-MC, CAMMS
- ces: 3[illegible]

How well does the Pareto Rule (80/20) rule apply to O&S data? *(2 of 4)*

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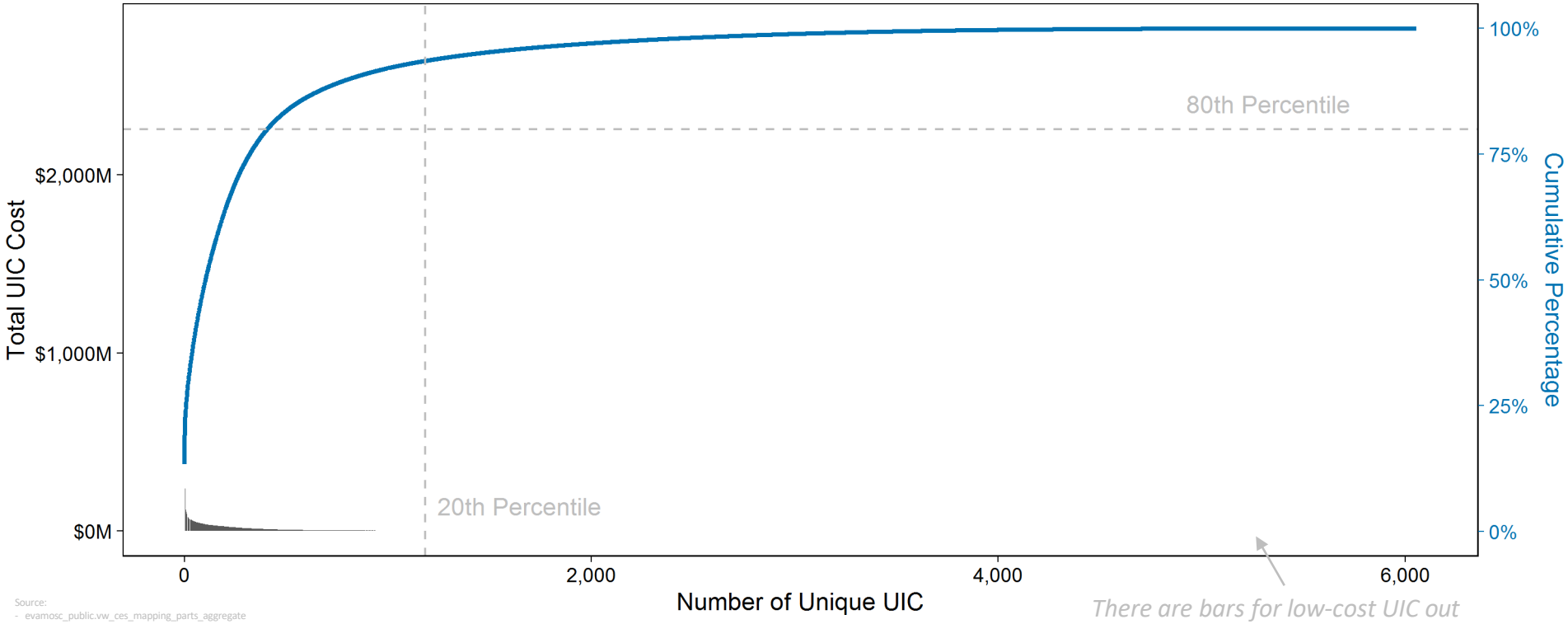
- EVAMOSC tracks costs to ~5,900 unique UIC; 80/20 rule predicts ~1,180 UIC will account for 80% of total cost.

A Unit Identification Code (UIC) identifies a specific organization within the DoD.

- In actuality…
  - The top 408 (~6.9%) most expensive weapon systems account for 80% of total cost.
  - The top (20%) most expensive parts account for ~93.6% of total cost.



Source:
- evamosc_public.vw_ces_mapping_parts_aggregate
- version 2.3.0
- extracted: 2023-04-13
- timeframe: FY2015 to March FY23
- sou
- ces: 3.1, 3.2, 3.3
- filter uic != NULL, amount > 0

How well does the Pareto Rule (80/20) rule apply to O&S data? *(3 of 4)*

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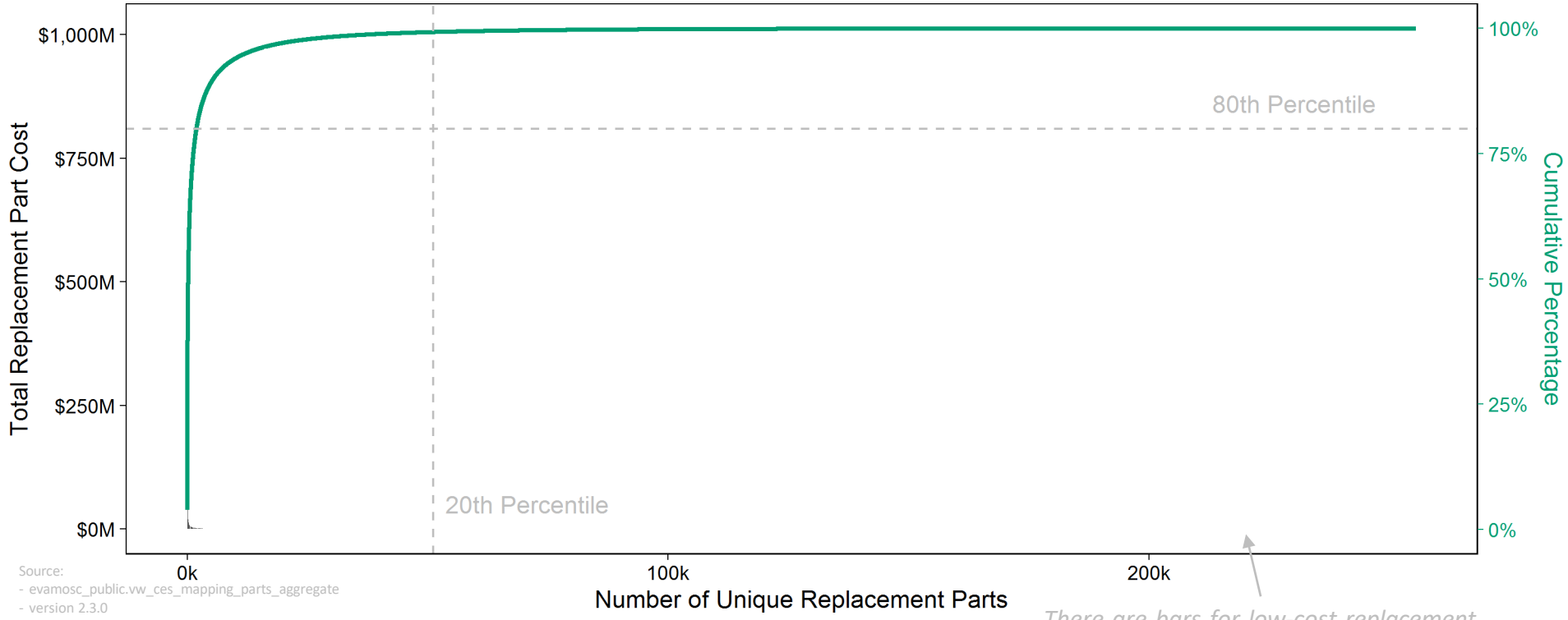
- EVAMOSC has data on ~256k unique replacement parts; 80/20 rule predicts the top 51.2k replacement parts will account for 80% of total cost.
- In actuality…
  - The top ~1,900 (~0.74%) most expensive weapon systems account for 80% of total cost.
  - The top (20%) most expensive parts account for ~99.3% of total cost.



Source:
- evamosc_public.vw_ces_mapping_parts_aggregate
- version 2.3.0
- extracted: 2023-04-12
- timeframe: FY2015 to March FY23
- source_data_system: GCSS-A, LMP, GCSS-MC, CAMMS
- ces
- issue_or_return: "Issued"

How well does the Pareto Rule (80/20) rule apply to O&S data? *(4 of 4)*

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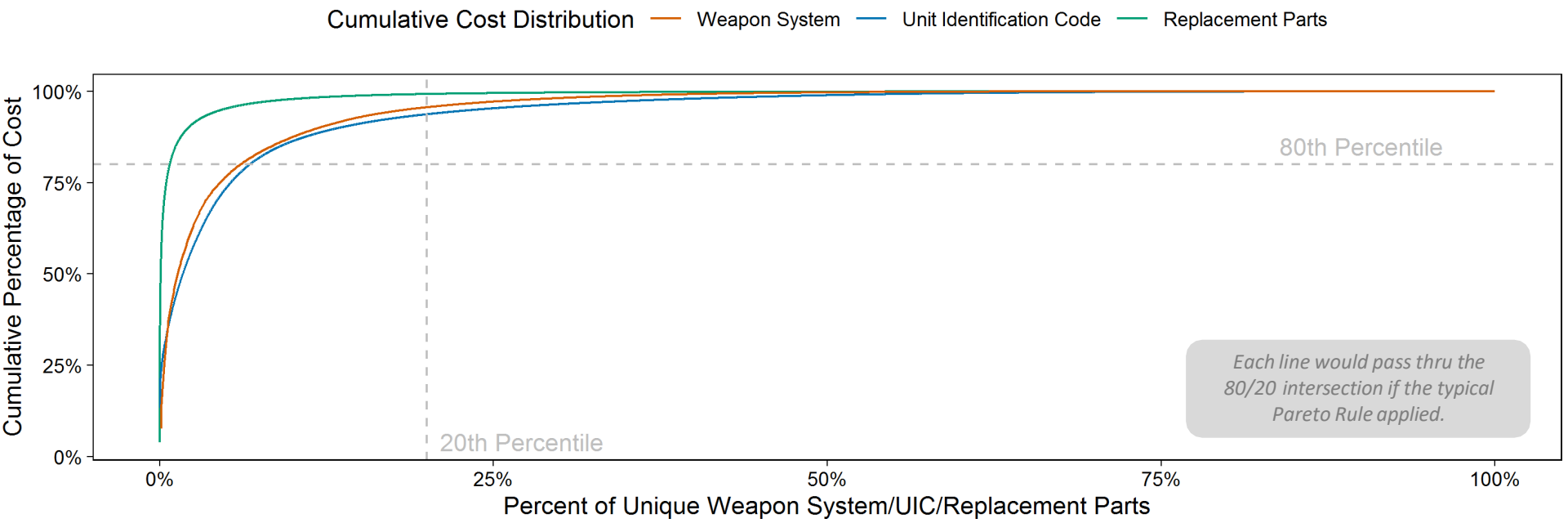
- O&S data does not follow a typical Pareto Rule; relatively few weapon systems, units, or replacement parts account for a disproportionally larger amount of total cost, compared to what Pareto would predict.
- The same behavior is observed when looking at subsets of data.
  - Total cost for a specific unit is disproportionally attributable to a few weapon systems at that unit.
  - Total cost for a weapon system is disproportionally attributable to a few replacement parts on that system.



Practical result of this finding is that large portions of the data can be replaced with a factor to reduce the size of data tables, without compromising accuracy.

Did COVID impact maintenance?
(1 of 2)

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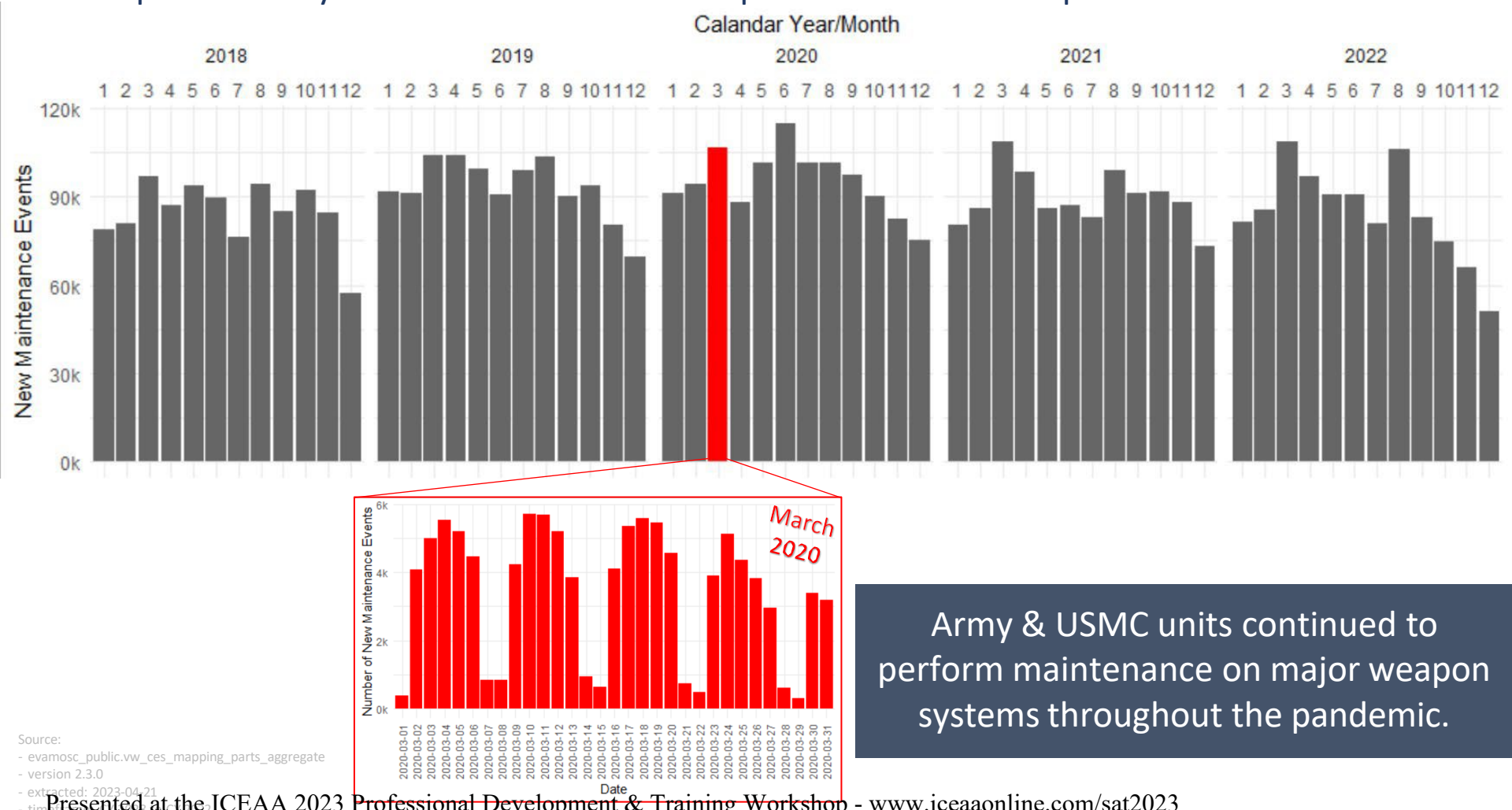
- COVID-19 massively impacted the United States economy in March of 2020. Using EVAMOC's detailed data on major weapon system maintenance, we can visualize the impact to Army and USMC maintenance operations due to the pandemic:



Army & USMC units continued to perform maintenance on major weapon systems throughout the pandemic.

Source:
- evamosc_public.vw_ces_mapping_parts_aggregate
- version 2.3.0
- extracted: 2023-04-21
- time period: 2018-2022
- source_data_system: GCSS-A, GCSS-MC

Did COVID impact maintenance?
(2 of 2)

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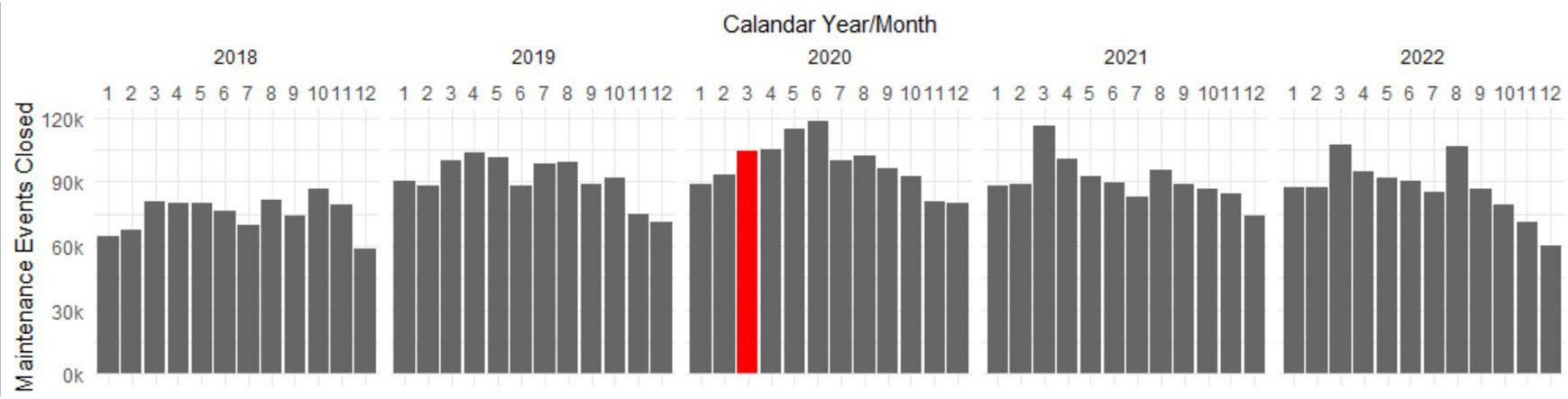
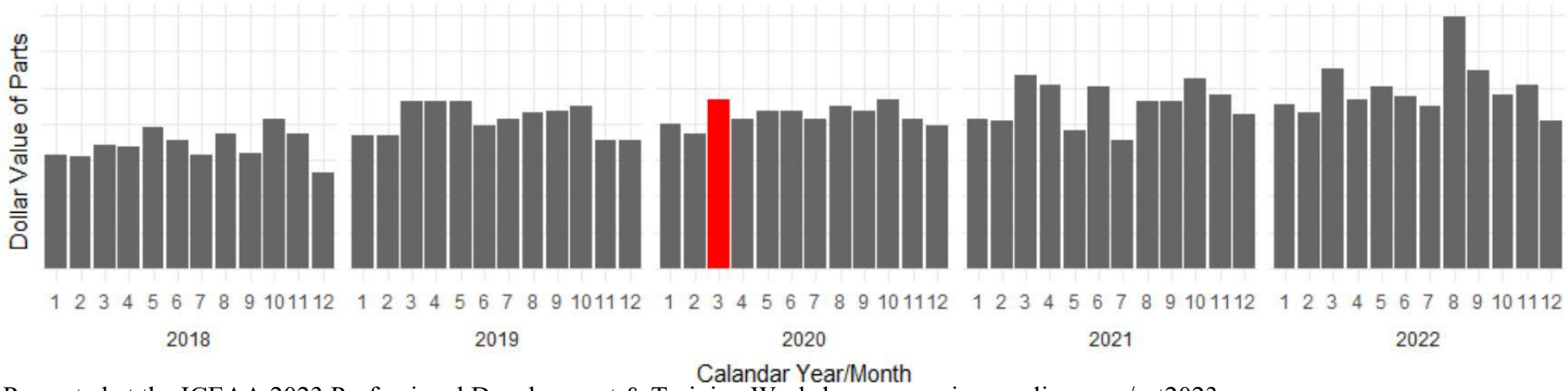
- The same (lack of a) response is seen when looking at the number of maintenance events being completed…



… or the dollar value of parts used during maintenance.



Inflation/Escalation

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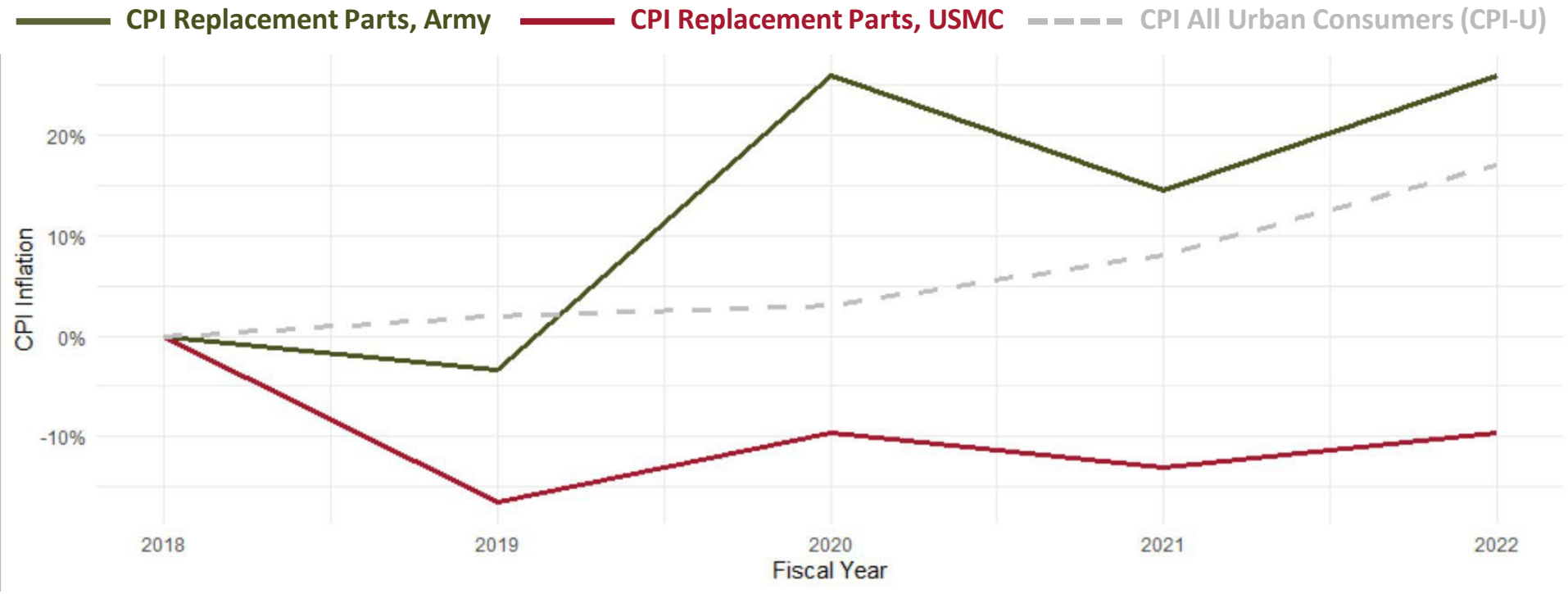
- EVAMOSC data may be used to calculate Consumer Price Index (CPI) escalation (e.g., change in price for a given market basket of goods) which can be compared to other official rates of escalation or inflation.



Replacement part prices for Army units are rising faster than general escalation while USMC replacement parts have shown negative real price change since FY18.

Source:
- evamosc_public.vw_ces_mapping_purchase_order_aggregate
- version 2.3.0
- extracted: 2023-04-24
- timeframe: FY18 to FY22
- source_data_system: GCSS-A, GCSS-MC

Source:
- U.S. BUREAU OF LABOR STATISTICS (https://www.bls.gov/data/inflation_calculator.htm)
- extracted: 2023-04-24
- timeframe: FY18 to FY22

Cautionary Tales From the "Big" Data Fronter

Cautionary Tales

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EVAMOSC offers a glimpse into the future of "big data" accessibility and how it can support cost estimates and cost analysis.

In this briefing, "big data" means more data than can be analyzed on a typical laptop. E.g., datasets > 16 Gb or > 10m rows.

However, new capabilities do not come for free…

EVAMOSC can offer some cautionary tales for the cost estimating & analysis community or anyone developing a "big data" system.

1. "Ice is heavy & it's hard to move quickly."
2. "It takes a village, and everyone speaks a different language."
3. "There are normally multiple correct answers to the same question."
4. "Insufficient data was not our only problem."

“Ice is heavy & it’s hard to move quickly.”

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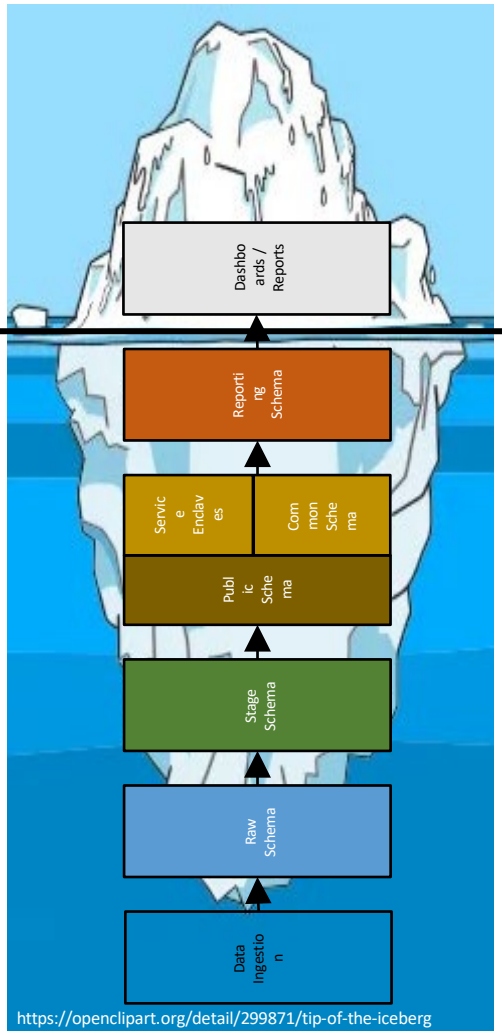
- Data which has not been (painstakingly) normalized, joined with reference tables, and prepared for “regular users” is dangerous and difficult to work with.

- Creating tables which are safe for users without a hundred caveats is time intensive and requires alignment between data engineers, SMEs, and user-representatives, even after the data is readily available in database tables.

Safer for use by “regular users”

More dangerous for use (by “regular users” and SMEs)



Everyone wants the data up here, in the sun where it is warm.

Most data is below the waterline, where it is cold, dark, and unforgiving. It’s also very hard to push the iceberg up out of the water.

The more data you have (both “detail” and “amount”), the harder it is to ensure it is ready for use.

"It takes a village, and everyone speaks a different language."

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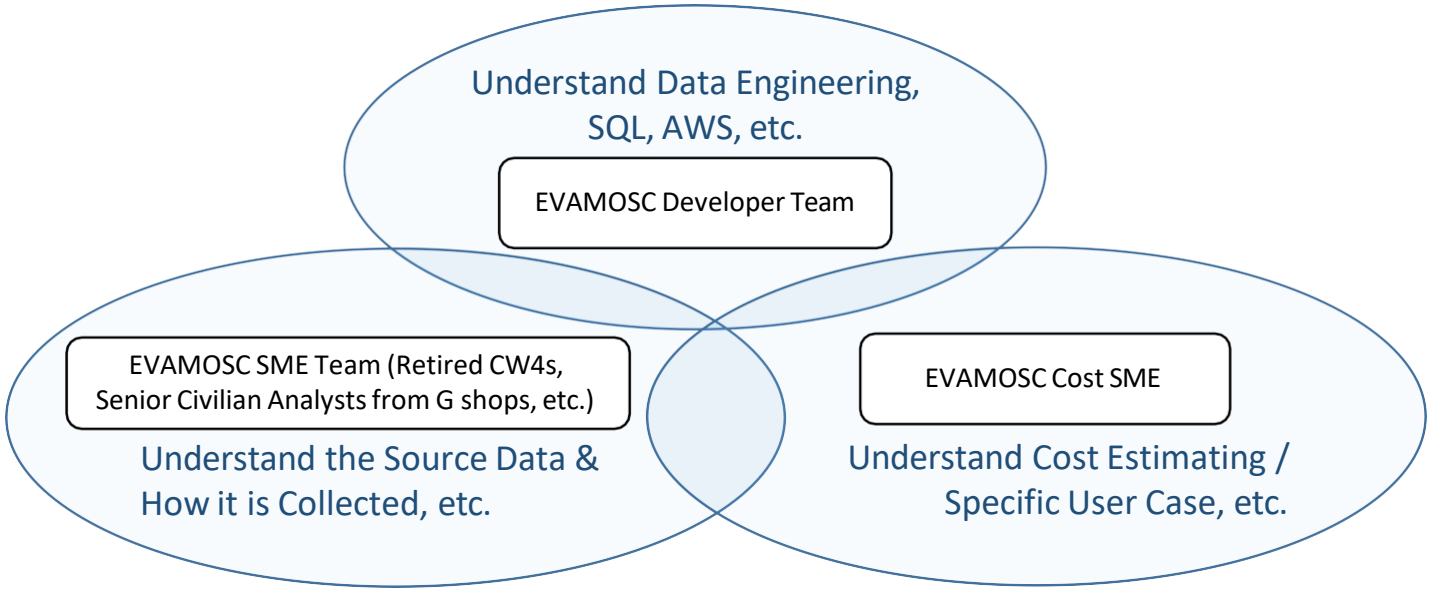
A diverse team with knowledge of "Data Engineering", "Data Subject Matter Experts", and "Cost Estimating" is *absolutely critical* when building something like EVAMOSC.

- Finding a team with those skillsets is difficult.
- "Unicorns" (i.e., a person/people with all those skills) do not exist.
- While we work to be in the center of the Venn diagram, there will be friction (e.g., confusion, errors, misunderstandings) which slow progress.
- Adding more people does not necessarily accelerate/speed up this process.



The more data you have (both "detail" and "amount"), the more difficult communication becomes.

"There can be multiple correct answers to the same question."

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What was the incurred cost of that depot level accident damage repair?

MIPR Value from Unit to Depot	$1.0M
Depot Labor Cost	$0.2M
Depot Material Cost	$0.7M
Depot Underrun/(Overrun)	$0.1M

- Alice, the depot finance director, says $0.9M
- Bob, from the unit who crashed the truck, says $1.0M

Which one of them is wrong?

How much money did you spend on parts last FY?

Value of parts requisitions	$1.0M
Value of parts installed on trucks	$0.7M
Value of parts added to the shelf	$0.3M

- Alice, the unit's quartermaster, says $1.0M
- Bob, a 91B wheeled vehicle mechanic, says $0.7M

Which one of them is wrong?

In many instances, there may be multiple, different but equally reasonable answers to a question. Each answer will have a time and place where it is more accurate for a given analysis.

"Insufficient data was not our only problem."

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Incomplete data collection or availability is often cited as a significate factor preventing cost estimates & analysis from being more accurate/complete/effective.

Although certainly true, EVAMOSC presents an example in which detailed data is available in copious amounts.

- Inexact or inconsistent terminology limit the usefulness of data.
- The "garden of forking paths" problem becomes more pronounced.
- More data (both "detail" and "amount") is more difficult to work with, summarize, and communicate to other analysts and decision makers.

More data is just more data. Thoughtful questions and an ability communicate results are still the most important aspects of data analysis.

Take Aways

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- EVAMOSC is DoD's first cloud-based database built by and for cost estimators & analysts.
- EVAMOSC makes massive amounts of maintenance, finance, and supply system data available for analysis.
- Although data can always be summarized, to work with O&S data to its fullest potential requires tools (e.g., SQL, R, Python) with low adoption rates by cost estimators & analysts.
- Even with modern tools, the complexity of "big" data requires new and different analysis techniques not typically taught in traditional cost estimating & analysis curricula.

Go here to get an account (https://evamosc.osd.mil/)

The "big data" revolution is coming to cost estimating & analysis. Will we be ready for it?

Backup, Supporting Content

Current EVAMOSC Data Availability

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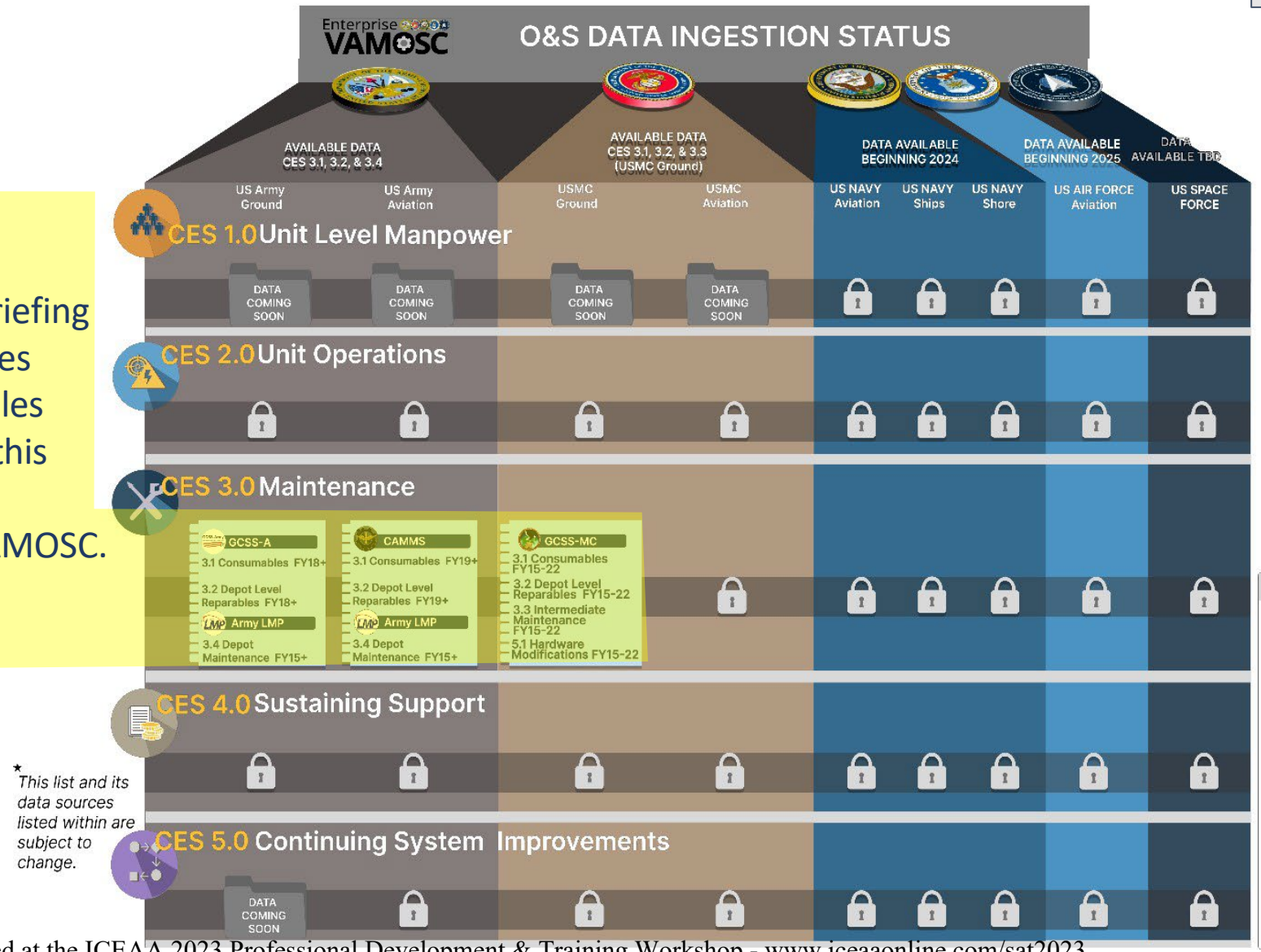
This briefing provides examples from this subset of EVAMOSC.



*This list and its data sources listed within are subject to change.

**EVAMOSC does not currently have Contractor Logistic Support (CLS) data

Icon Key

- Data not yet available
- Data is either partially or fully available
- Data available within the next year

EVAMOSC Statutory Requirements

Why Build EVAMOSC?

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Standardized, Historical O&S Cost Data

10 U.S. Code §4325

Assessment, Management, and Control of Operating and Support Costs

The Director of Cost Assessment and Program Evaluation shall be responsible for developing and maintaining a database on operating and support estimates, supporting documentation, and actual operating and support costs for major weapon systems." Further, this section states that "The Secretary of Defense shall ensure that the Director, in carrying out such responsibility

(A) promptly receives the results of all cost estimates and cost analyses conducted by the military departments with regard to operating and support costs of major weapon systems;

(B) has timely access to any records and data of the military departments (including classified and proprietary information) that the Director considers necessary to carry out such responsibility; and

(C) with the concurrence of the Under Secretary of Defense for Acquisition and Sustainment, may direct the military departments to collect and retain information necessary to support the database.

FY19 NDAA, Section 832

Implementation of Recommendations of the Independent Study on Consideration of Sustainment in Weapon Systems Life Cycle

Section 832 of the FY19 NDAA requires the Secretary of Defense 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 the Cost Assessment Data Enterprise (CADE) data system

Other Relevant Statutes

- 10 U.S. Code §4251
- 10 U.S. Code §4252
- 10 U.S. Code §4253
- 10 U.S. Code §4228
- FY20 NDAA, Section 151
- FY 19 NDAA. Section 879

EVAMOSC will serve as the DoD's authoritative source of O&S cost data for major weapon systems

Relevant EVAMOSC Statutory Requirements (1 of 4)

EVAMOSC Statutory Mandate:

10 U.S. Code §4325 Assessment, Management, and Control of Operating and Support Costs: Section 4325 of U.S. Code Title 10 states that "The Director of Cost Assessment and Program Evaluation shall be responsible for developing and maintaining a database on operating and support estimates, supporting documentation, and actual operating and support costs for major weapon systems." Further, this section states that "The Secretary of Defense shall ensure that the Director, in carrying out such responsibility—(A) promptly receives the results of all cost estimates and cost analyses conducted by the military departments with regard to operating and support costs of major weapon systems; (B) has timely access to any records and data of the military departments (including classified and proprietary information) that the Director considers necessary to carry out such responsibility; and (C) with the concurrence of the Under Secretary of Defense for Acquisition and Sustainment, may direct the military departments to collect and retain information necessary to support the database."

Relevant EVAMOSC Statutory Requirements (3 of 4)

Other Relevant EVAMOSC Statutes:

10 U.S. Code §4325 Assessment, Management, and Control of Operating and Support Costs Section B: The Director of Cost Assessment and Program Evaluation shall

- **(4)** establish policies and procedures for the collection, organization, maintenance, and availability of standardized data on operating and support costs for major weapon systems in accordance with section 2222 of this title;
- **(5)** establish standard requirements for the collection and reporting of data on operating and support costs for major weapon systems by contractors performing weapon system sustainment functions in an appropriate format, and develop contract clauses to ensure that contractors comply with such requirements

Relevant EVAMOSC Statutory Requirements (3 of 4)

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Other Relevant EVAMOSC Statutes:

10 U.S. Code §4323 Sustainment Reviews: Section 4323 requires the Secretary of Defense to conduct a sustainment review of each major weapon system not later than five years after declaration of initial operational capability of a Major Defense Acquisition Program and throughout the life cycle of the weapon system to assess the product support strategy, performance, and operation and support costs of the weapon system. The section focuses on requiring reporting of actual O&S costs. Specifically, sustainment reviews must include:

- An independent cost estimate for the remainder of the life cycle of the program.
- A comparison of actual costs to the amount of funds budgeted and appropriated in the previous five years, and if funding shortfalls exist, an explanation of the implications on equipment availability.
- A comparison between the assumed and achieved system reliabilities.
- An analysis of the most cost-effective source of repairs and maintenance.
- An evaluation of the cost of consumables and depot-level repairables.
- An evaluation of the costs of information technology, networks, computer hardware, and software maintenance and upgrades.
- As applicable, an assessment of the actual fuel efficiencies compared to the projected fuel efficiencies as demonstrated in tests or operations.
- As applicable, a comparison of actual manpower requirements to previous estimates.
- An analysis of whether accurate and complete data are being reported in the cost systems of the military department concerned, and if deficiencies exist, a plan to update the data and ensure accurate and complete data are submitted in the future.

Relevant EVAMOSC Statutory Requirements (4 of 4)

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Other Relevant EVAMOSC Statutes (con't):

10 U.S. Code §4325 Assessment, Management, and Control of Operating and Supporting Costs Sections B: section 4325 states that, The Director of Cost Assessment and Program Evaluation shall

(4) establish policies and procedures for collection, organization, maintenance, and availability of standardized data on operating and support costs for major weapon systems in accordance with section 2222 of this title.

(5) establish standard requirements for collection and reporting data on operating and support costs for major weapon systems by contractors performing weapon system sustainment functions in an appropriate format and develop contract clauses to ensure that contractors comply with such requirements.

10 U.S. Code §4251 Major Defense Acquisition Programs: Determination Required Before Milestone A Approval

Section 4251 states that an MDAP may not receive Milestone A approval until the Milestone Decision Authority (MDA) determines in writing that the program meets several criteria, including planning for sustainment.

10 U.S. Code §4252 Major Defense Acquisition Programs: Determination Required Before Milestone B Approval

Section 4252 states that an MDAP may not receive Milestone B approval until the MDA determines in writing that the program meets several specific criteria, including planning for life-cycle sustainment planning.

10 U.S. Code §4253 Major Defense Acquisition Programs: Determination Required Before Milestone C Approval

Section 4253 requires that the MDA provide the congressional defense committees a brief summary report not later than 15 days after granting Milestone C approval for an MDAP, including total life-cycle costs.

10 U.S. Code §4328 Sustainment Factors in Weapon System Design

Section 4328 states that DoD shall ensure that the Defense Acquisition System gives ample emphasis to sustainment factors, particularly those factors that are affected principally by the design of a weapon system, in the development of a weapon system

O&S Cost-Estimating Guide

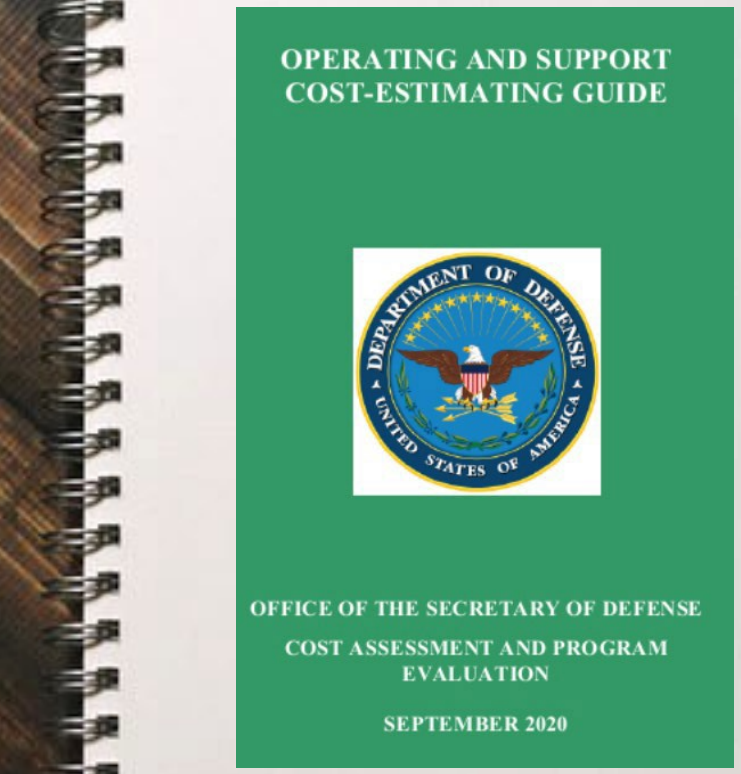
Enterprise VAMOSC

OSD CAPE

URL: https://www.cape.osd.mil/files/OS_Guide_Sept_2020.pdf

O&S Cost Estimating Guide:
The Authoritative Document for O&S Cost Estimating for the DoD

Goal: Define and clearly present analytics methods and data for O&S costs estimates and analyses



Defines O&S Best Practices for the Cost Community

Ground Vehicle Data Normalization

Purchase Order, Work Order Goods Movement, & Order Header

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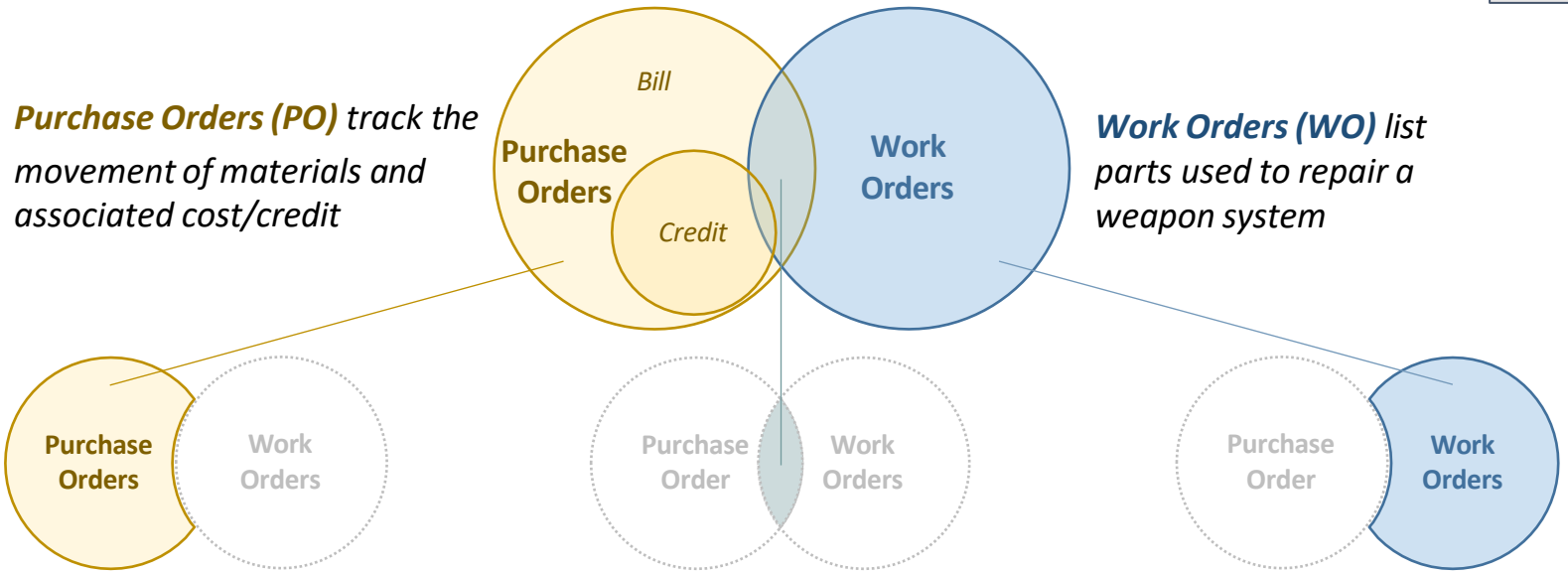
Purchase Orders (PO) *track the movement of materials and associated cost/credit*



Work Orders (WO) *list parts used to repair a weapon system*

*Without a link to a **WO**, we know what part was ordered/turned in and the cost/credit but not what the part was used to repair.*

*When a **PO** and **WO** can be linked, both the cost of the part and what weapon system it was used to repair is known.*

*Without a link to a **PO**, we know what part was used during a repair, but not when that part was procured or how much it cost when it was procured.*

Goods Movement (GM) is a data flow that tracks the kinds and quantities of parts being transferred in the supply system and the date the transfers occur. No money/funding is transferred when parts are transferred (money only changes hand in response to a ***PO***).

Order Header (OH) is a subset of the ***WO*** and it identifies the weapon system (by NIIN and serial number) receiving maintenance, when the ***WO*** was opened and when it was closed/completed.

GCSS-A Normalization

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EV AMOSC utilizes GCSS-A data from multiple source tables broken into thr ee data flows:

- ***Order Headers***
- ***Goods Movement***
- ***Purchase Orders / Purchase Request***

"GCSS-A" "Vantage" ← **source_data_system**
← **extracted_data_system**
"Workorder" ← **source_system_record_number_type**
"Army" ← **service**
"NIIN" ← **replacement_part_type**

Additional Mapping s
lookup against niin_weapon_system ← **mds**
lookup against 'Cost Center' ← **approp_code**
lookup against approp_code ← **approp_nomenclature**
lookup against approp_code ← **approp_category**

*GCSS-A tracks maintenance via **Work Orders (WO).** Summary information from each **WO** is contained within it's **Order Header.***

GCSS-A Source Tables
Maintenance Order Header Table (afih)
Order Header Data Production Orders (afko)
Overhead Cost Order Table (aufk)
Cost Center Master Data (csks)
Cost Center Text Table (cskt)
General Material Data and Overhead Cost Orders Table (mara)
Maintenance Notifications Table (qmel)

Order Header

Friendly Name	Field Name	Value	
Work Order Number	afko_order_number_aufnr	1009043208	← **source_system_record_number**
System Part Number	mara_manufacturer_part_number_mfrpn	010871095	← **niin_weapon_system**
System Nomenclature	additional_series_groupings	TANK CMBT 120MM M1A1	← **niin_weapon_system_nomenclature**
Work Order Create Date	created_on_erdat	2020-07-01	
Work Order Complete & Closed Date	technical_completion_date_idat2	2021-06-22	
Unit Identification Code	unit_identification_code_check_tabl	WX72AA	← **uic**
Unit Nomenclature	description_ltext	1ST BATTALION, 145TH ARMORED REGIMENT	← **uic_nomenclature**
Problem Statement	description_ktext	"Engine Low Power and No Start"	
Cost Center	aufk_responsible_cost_center_kostv	0040145488	← used to lookup **approp_code**

*The parts used on **Work Orders** are tracked via a **Goods Movement.***

GCSS-A Source Tables
Material Master Table (makt)
General Material Data and Overhead Cost Orders Table (mara)
Document Segment Material Table (mseg)
Reservation/Dependent Requirements Table (resb)

Goods Movement

Work Order Number	Part Number (↓replacement_part)	Part Nomenclature (↓replacement_part_nomenclature)	Date (↓fy)	Qty (↓quantity)	Value (↓amount)	Recovery Code	issue_or_return	ces
resb_order_number_aufnr	manufacturer_part_number_mfrpn	material_description_in_upper_case_for_matchcodes_maktg	posting_date_in_the_document_budat_mkpf	quantity_merge	amount_in_local_currency_dmbtr	recovery_code_rerdelc	Issue	3.2 - Depot Level Reparables (DLRs)
1009043208	15482910	ENGINE,GAS TURBINE,NONAIRCRAFT	2020-09-02		$ 826,923.00	D	Issue	3.1 - Consumables
	7276804	WASHER,RECESSED	2020-09-02		$ 3.73	Z	Issue	3.1 - Consumables
	15637602	BRACKET,VEHICULAR COMPONENTS	2020-09-02		$	Z	Issue	3.2 - Depot Level Reparables (DLRs)
	15637602	BRACKET,VEHICULAR COMPONENTS	2020-10-13		$	Z	Return	
	13375152	STARTER,ENGINE,ELECTRICAL	2021-01-15		$	K		

***Goods Movement** is linked to the **Purchase Order** (whenever possible)*

GCSS-A Source Tables
Purchase Requisition Table (ekpo)
Purchasing Document Item Table (ekpo)
Material Master Table (makt)

Purchase Order/ Purchase Request

Work Order Number	Purchase Order Number	Part Number	Part Nomenclature	Date	Qty	Value	issue_or_return	ces
order_number_aufnr	purchasing_document_number_ebeln	ekpo_material_number_matnr	eban_short_text_bsz01	bsad_clearing_date_augdt	quantity	net_order_value_in_po_currency_netwr	N/A	N/A
1009043208	7126012202	15482910	ENGINE,GAS TURBINE,NONAIRCRAFT	N/A		$	N/A	N/A
	4548487220	7276804	WASHER,RECESSED	N/A		$	Return	3.2 - Depot Level Reparables (DLRs)
	7115069888	15482910	ENGINE,GAS TURBINE,NONAIRCRAFT	2020-12-07		$		

Result As Seen in EVAMOSC (vw_ces_mapping_parts_aggregate)

	niin_weapon_system_nomenclature	mds	fy	replacement_part	replacement_part_type	replacement_part_nomenclature	ces	source_data_system	extracted_data_system	source_system_record_number	source_system_record_type	issue_or_return	service	approp_code	approp_nomenclature	approp_category	uic	uic_nomenclature	quantity	amount
EVAMOSC	010871095 TANK CMBT 120MM M1A1	M1A1	2020	15482910	NIIN	ENGINE,GAS TURBINE,NONAIRCRAFT	3.2 -	GCSS-A	Vantage	1009043208	Work Order	Issue	Army	2065	Operation and Maintenance	OMANG	WX72AA	1ST BATTALION,		
	010871095 TANK CMBT 120MM M1A1	M1A1	2020	7276804	NIIN	WASHER,RECESSED	3.1 -	GCSS-A	Vantage	1009043208	Work Order	Issue	Army	2065	Operation and Maintenance	OMANG	WX72AA	1ST BATTALION,		
	010871095 TANK CMBT 120MM M1A1	M1A1	2020	15637602	NIIN	BRACKET,VEHICULAR COMPONENTS	3.1 -	GCSS-A	Vantage	1009043208	Work Order	Issue	Army	2065	Operation and Maintenance	OMANG	WX72AA	1ST BATTALION,		
	010871095 TANK CMBT 120MM M1A1	M1A1	2020	15637602	NIIN	BRACKET,VEHICULAR COMPONENTS	3.1 -	GCSS-A	Vantage	1009043208	Work Order	Issue	Army	2065	Operation and Maintenance	OMANG	WX72AA	1ST BATTALION,		
	010871095 TANK CMBT 120MM M1A1	M1A1	2021	13375152	NIIN	STARTER,ENGINE,ELECTRICAL	3.2 -	GCSS-A	Vantage	1009043208	Work Order	Issue	Army	2065	Operation and Maintenance	OMANG	WX72AA	1ST BATTALION,		

Example of a Time Phasing a Maintenance Event

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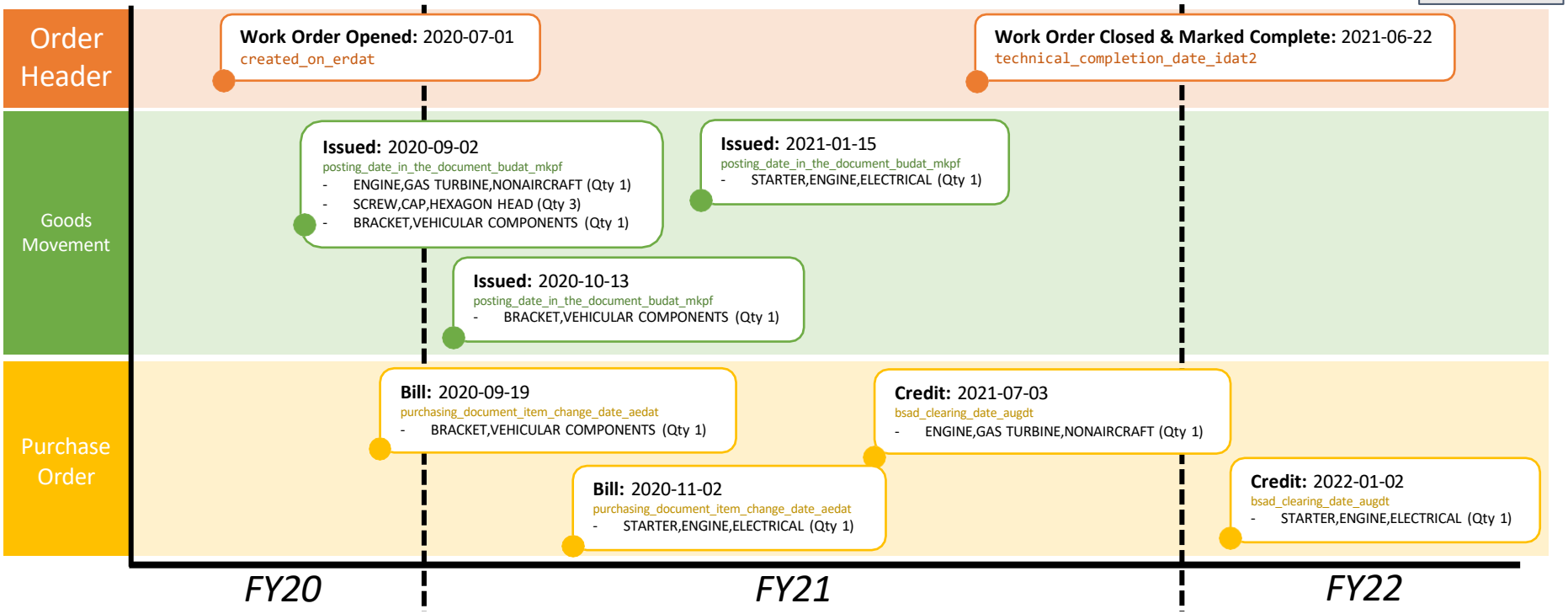
OSD CAPE



Event	Part	Date	FY	Qty.	PO Value	GM Value
WO Opened	-	2020-07-01		-	-	-
Taken Off Shelf/Issued to *WO*	ENGINE,GAS TURBINE,NONAIRCRAFT	2020-09-02		1	-	
Taken Off Shelf/Issued to *WO*	SCREW,CAP,HEXAGON HEAD	2020-09-02	FY20	3	-	
Taken Off Shelf/Issued to *WO*	BRACKET,VEHICULAR COMPONENTS	2020-09-02		1	-	
Post Good Receipt via *PO*	BRACKET,VEHICULAR COMPONENTS	2020-09-02		1		-
Issued to *WO*	BRACKET,VEHICULAR COMPONENTS	2020-10-13		1	-	
Post Good Receipt via *PO*	STARTER,ENGINE,ELECTRICAL	2020-11-02		1		-
Issued to *WO*	STARTER,ENGINE,ELECTRICAL	2021-01-15	FY21	1	-	
Credit Given to Unit via *PO*	ENGINE,GAS TURBINE,NONAIRCRAFT	2021-08-11		1		-
WO Closed	-	2021-06-22		-	-	-
Credit Given to Unit via *PO*	STARTER,ENGINE,ELECTRICAL	2022-01-02	FY22	1		