



Cracking Open the 'Black Box' of Product Technical Support Contracts

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Research Team Introduction



Alex Bonich

Alex Bonich, an Associate with Technomics, Inc., has over a year of experience in the defense industry. For the past year, he has supported the Army in the development of Life Cycle Cost Estimates for various vehicle programs. Prior to joining Technomics, Alex began his professional career at General Dynamics Land Systems as a Mechanical Engineering contractor. He graduated with academic honors and a B.S.E. in Mechanical Engineering from the University of Michigan.



Rhys Bergeron

Rhys Bergeron, a Lead Analyst with Technomics Inc., has over 3 years of experience supporting government entities. Rhys specializes in using data science skills to empower government analysts to exploit and make use of their data. Many of his projects involve building ETL (Extraction, Transform, and Loading) processes, creating automation scripts to scrape information, engineering databases, and building analysis tools. Rhys holds a B.S. in Chemical Engineering from Virginia Tech.



Pat McCarthy

Pat McCarthy, a Program Manager with Technomics, has over 19 years of experience in Federal and private industry performing cost analysis and Industrial Engineering studies. He has previously worked as a Cost/Price Analyst and Team Lead with Booz Allen Hamilton and the Army Contracting Command and as a Senior Industrial Engineer and Team Leader with General Dynamics. Pat is CCEA and PMP certified and holds B.S. and M.S. degrees in Industrial Engineering from Purdue University.

Overview

- Product Technical Support Contract Overview
- Data Collection and Mapping Process
- Sample Mapping Rules
- Analysis & Observations
- Summary of Findings and Recommendations

The Anatomy of PTS Contracts

- What exactly is a Product Technical Support Contract?

- “A contract awarded by a Service acquisition program management office that provides hardware and software technical support, maintenance and, in some cases, repair parts for selected military weapon systems.”

- PTS Contract Characteristics

- Almost exclusively IDIQ contracts
 - Covers a broad array of services and deliverables
 - Key Sub-components:
 - Contract Line Item Numbers (CLINs)
 - Sub Contract Line Item Numbers (SLINs)
 - Work Directives (WDs)

Production Contracts

Warfighter Need: Weapon System



Contract Scope
 Production of Weapon System
 Initial Spares
 Delivery
 SEPM
 Some CLS

Contract Type
 Production Contract (FFP, FPIF)
 May or May not be IDIQ

PTS Contracts

Warfighter Need: System Sustainment and Technical Support



Contract Scope
 Sustaining CLS
 Fielding
 Data
 SW Maintenance
 Maintenance
 Overhaul
 Field Service Support
 Modifications
 New Equipment Training
 SEPM

Contract Type
 IDIQ PTS Contract
 CPFF or FFP Task Orders

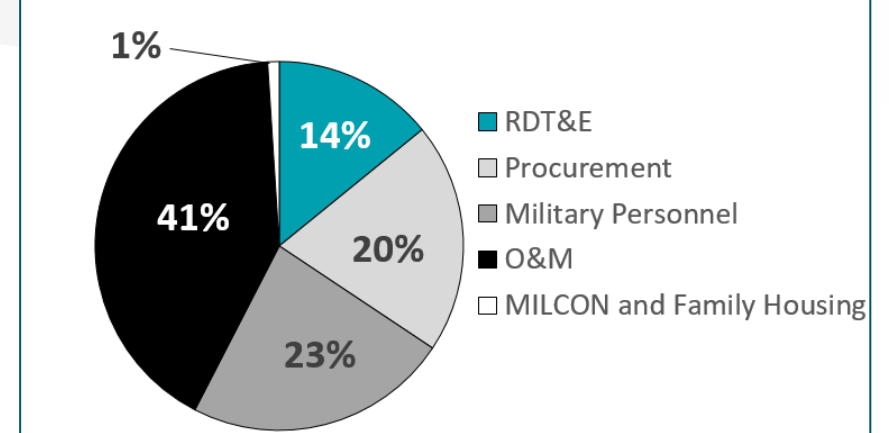
Why This Analysis?

- Why study PTS contracts?
- What does 'PTS' mean with respect to the Army estimating and budget process?

Army Cost Element Structure (CES)

CES #	COST ELEMENT	CES #	COST ELEMENT
1.0	RDT&E-FUNDED ELEMENTS	3.0	ACQUISITION OPERATIONS AND MAINTENANCE (O&M)
1.01	DEVELOPMENT ENGINEERING	3.01	SE/PM GOVERNMENT RDT&E EFFORTS
1.02	PRODUCIBILITY ENGINEERING AND PLANNING (PEP)	3.02	SE/PM GOVERNMENT PROCUREMENT EFFORTS
1.03	DEVELOPMENT TOOLING	3.03	OTHER ACQUISITION O&M
1.04	PROTOTYPE MANUFACTURING	4.0	MILCON-FUNDED ELEMENTS
1.05	SYSTEMS ENGINEERING/PROGRAM MGMT (SE/PM)	4.01	DEVELOPMENT CONSTRUCTION
1.06	SYSTEMS TEST AND EVALUATION	4.02	PRODUCTION CONSTRUCTION
1.07	TRAINING	4.03	OPERATIONAL/SITE ACTIVATION CONSTRUCTION
1.08	DATA	4.04	OTHER MILCON
1.09	SUPPORT EQUIPMENT	5.0	OPERATING AND SUPPORT (O&S) ELEMENTS
1.10	DEVELOPMENT FACILITIES	5.01	UNIT-LEVEL MANPOWER
1.11	OTHER RDT&E	5.02	UNIT OPERATIONS
2.0	PROCUREMENT ELEMENTS	5.03	MAINTENANCE
2.01	NON-RECURRING PRODUCTION	5.04	SUSTAINING SUPPORT
2.02	RECURRING PRODUCTION	5.05	CONTINUING SYSTEM IMPROVEMENTS
2.03	SE/PM	5.06	INDIRECT SUPPORT
2.04	SYSTEMS TEST AND EVALUATION	6.0	DEMILITARIZATION
2.05	TRAINING		
2.06	DATA		
2.07	SUPPORT EQUIPMENT		
2.08	OPERATIONAL/SITE ACTIVATION		
2.09	FIELDING		
2.10	WAR RESERVE AMMUNITION/MISSILES		
2.11	SOFTWARE MAINTENANCE		
2.12	TECHNICAL REFRESH		
2.13	HELP DESK		
2.14	OTHER PROCUREMENT		

DoD Spending by Category in FY 2020¹



Key Questions

- Where is PTS in the Army CES?
- What type of work is being awarded with PTS contracts?
- Do PTS contracts lend themselves to this type of analysis?
- What can be improved?
- One more big question.....

PTS Requirements for Army Modernization

- What can be learned from Army legacy system PTS contracts relative to NGCV PTS requirements?

Legacy Army Combat Vehicles

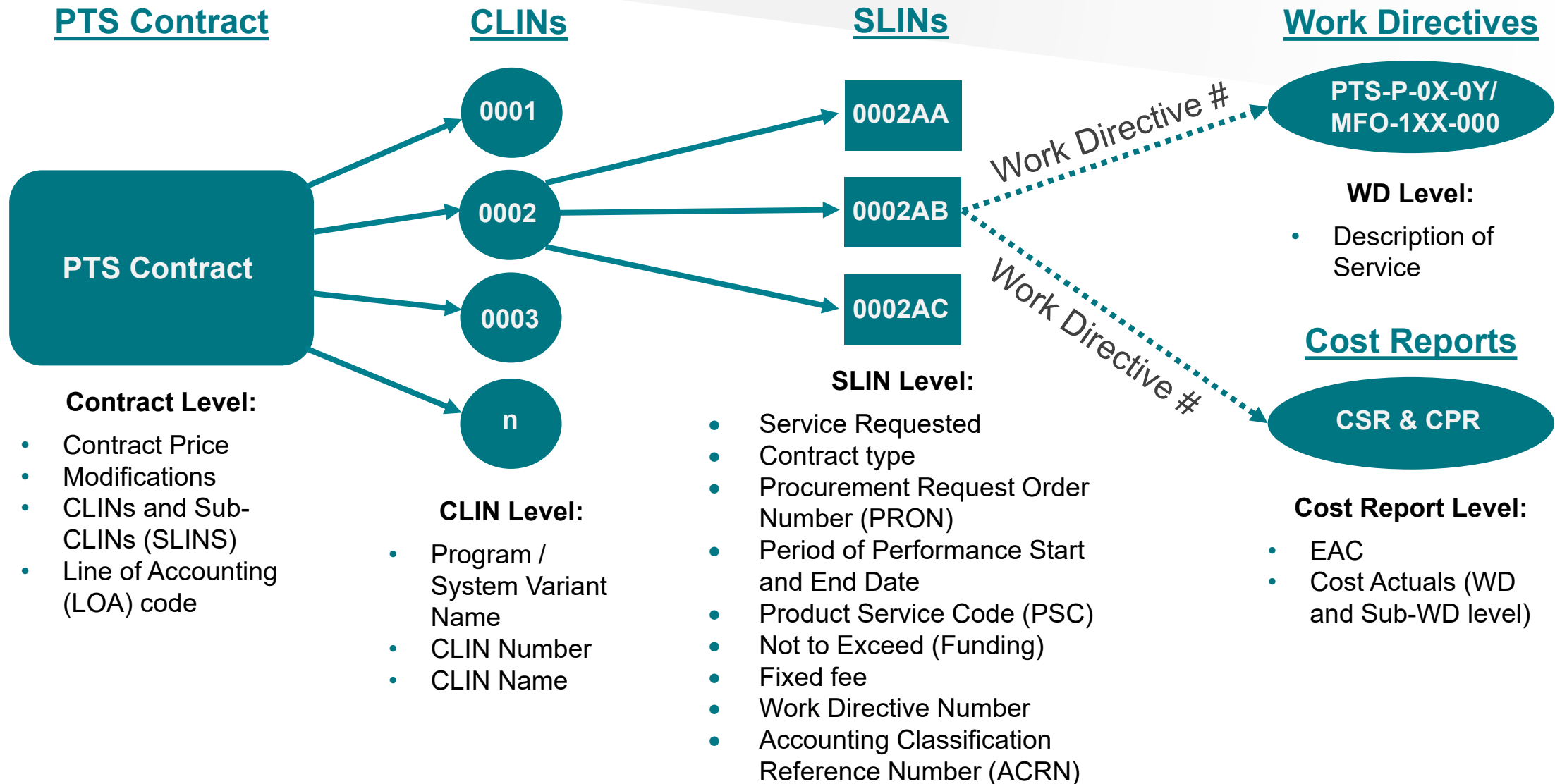


Next Generation Combat Vehicle



- As the Army transitions to a more modernized fleet, new KSAs, KPPs and mission objectives must be taken into account when utilizing legacy data to predict future needs.
- For this research, PTS data for (4) legacy Army ground vehicles programs were analyzed.

Data Identification



Data Collection Methodology

	Contract Data	Work Directive Data	Cost Actuals Data
Collection Method	<ul style="list-style-type: none"> Utilized Conformed Contract copy (summary of modifications) and developed programming language script to automatically extract data. 	<ul style="list-style-type: none"> Retrieved all available work directives comprising of scanned & machine-readable PDFs. Manually extracted relevant data fields. 	<ul style="list-style-type: none"> Retrieved excel reporting files & created ad-hoc programming language scripts to ingest data.
Challenges Faced	<ul style="list-style-type: none"> Multiple programs in one contract Lack of detail in scope of work Missing or multiple WD numbers in SLINs No actual cost 	<ul style="list-style-type: none"> Limited number of historical WD documents Multiple revisions to WD Documents No uniformity between documents 	<ul style="list-style-type: none"> Actuals reported at different levels of data (CLIN/SLIN/WD) No uniformity between documents Cost Actuals reported were not complete

Mapping

- Initial mapping category
 - CES – Army standard framework for cost organization
- Challenges mapping to CES
 - Difficulty in accurately mapping WD service to cost element
 - Large portion of funding left unmapped

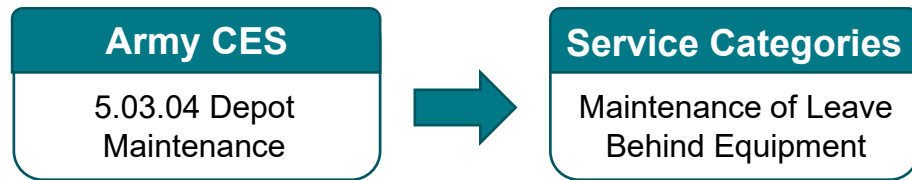
PTS funding across Army CES for Programs 1-4

Associated Cost Element	Program 1	Program 2	Program 3	Program 4
1.01 Development Engineering	\$1,536,570	\$14,014,890	\$0	\$3,285,582
1.03 Development Tooling	\$0	\$0	\$0	\$4,750
1.05.02 SE/PM (Contractor)	\$511,111	\$60,841,646	\$0	\$7,253,536
1.06 Systems Test and Evaluation	\$0	\$811,781	\$0	\$696,319
1.07 Training	\$0	\$26,835	\$0	
1.08 Data	\$0	\$36,538	\$0	\$2,468,937
2.02.02 Recurring Engineering	\$12,814,807	\$4,392,461	\$0	\$0
2.03.02 SE/PM (Contractor)	\$153,676,257	\$928,840,190	\$86,970,756	\$159,223,693
2.04 Systems Test and Evaluation	\$15,386,597	\$10,327,648	\$0	\$10,638,492
2.05 Training	\$9,695,558	\$0	\$0	\$1,107,976
2.06 Data	\$11,014,105	\$45,505,188	\$41,058,000	\$97,123,478
2.09.03 Initial Support Equipment	\$2,163,708	\$9,961,565	\$0	\$0
2.09.05 New Equipment Training	\$0	\$0	\$6,058,740	\$0
2.09.06 Contractor Logistics Support	\$30,279,292	\$66,362,338	\$0	\$0
2.11 Software Maintenance	\$61,216,828	\$101,764,917	\$0	\$18,613,121
2.12 Technical Refresh	\$2,169,032	\$4,421,823	\$0	\$0
2.14 Other Procurement	\$28,673,729	\$0	\$1,226,499	\$0
5.01.02 Unit-Level Maintenance	\$5,783,451	\$79,493,965	\$7,735,474	\$0
5.02.02 Support Services	\$4,727	\$8,227,155	\$0	\$0
5.03.03 Intermediate Maintenance	\$1,881,026	\$30,331,978	\$0	\$0
5.03.04 Depot Maintenance	\$33,509,060	\$57,495,667	\$74,068,443	\$0
5.04.01 System Specific Training	\$8,677	\$3,556,886	\$0	\$0
5.04.03 Sustaining/Systems Engineering	\$9,254,230	\$16,760,332	\$8,495,877	\$0
5.04.04 Program Management	\$12,041,742	\$20,684,918	\$0	\$0
5.04.06 Data and Technical Publications	\$0	\$15,888,196	\$0	\$0
5.05.01 Hardware Modifications	\$0	\$0	\$17,629,390	\$8,411,585
5.05.02 Software Maintenance	\$0	\$3,165,785	\$0	\$0
Unmapped Funding	\$101,539,238	\$33,850,085	\$7,223,902	\$68,560,926

	>10% Funding
	>5% Funding
	>0% Funding
	0% Funding

Mapping Comparison – Service Categories vs. CES

- Creation of Service Categories
 - Conform to PTS services found in WD
 - Highlights rigidity issues in 'one-fits-all' Army CES
 - Greater insight into what type of service is driving funding needs
- Examples demonstrating improved ability to accurately categorize PTS WD services
 1. WD Scope of Work: OMA funded work for Leave Behind Maintenance (LBM) or Equipment (LBE):



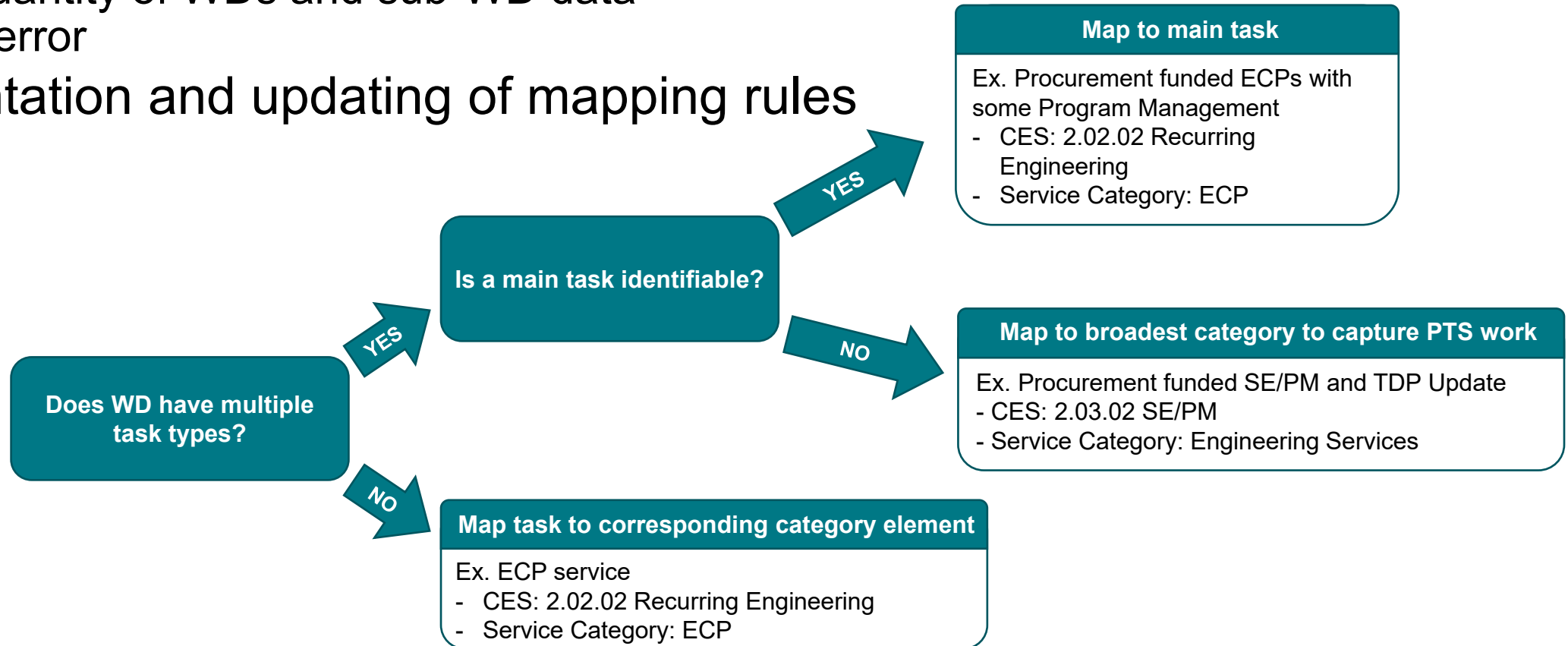
2. WD Scope of Work: OMA funded work for Logistics and Engineering efforts for RESET:



Service Categories
Program Management
Engineering Services
Logistics Services
Test / Test Support
Software Maintenance
SSTS
Development
Field Modifications / MWO
Reset / Retrofit / Overhaul
Maintenance of Leave Behind Equipment (LBE)
Fielding / Deprocessing / NET
Field Service Representatives (FSR)
TDP Update
Environmental
Software

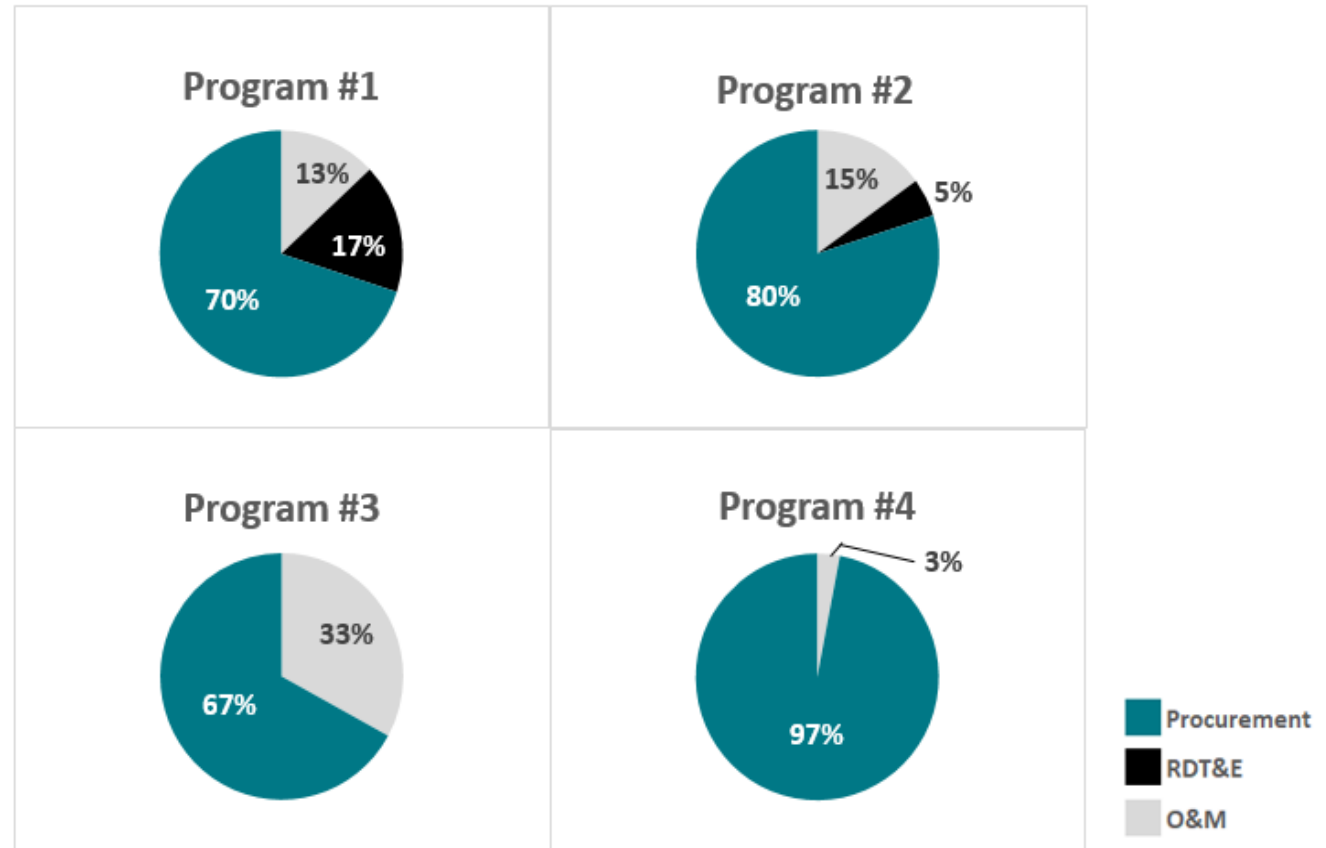
Mapping Rules

- Challenges in mapping process
 - Complexity and/or ambiguity of WD tasking
 - Large quantity of WDs and sub-WD data
 - Human error
- Implementation and updating of mapping rules
- Example



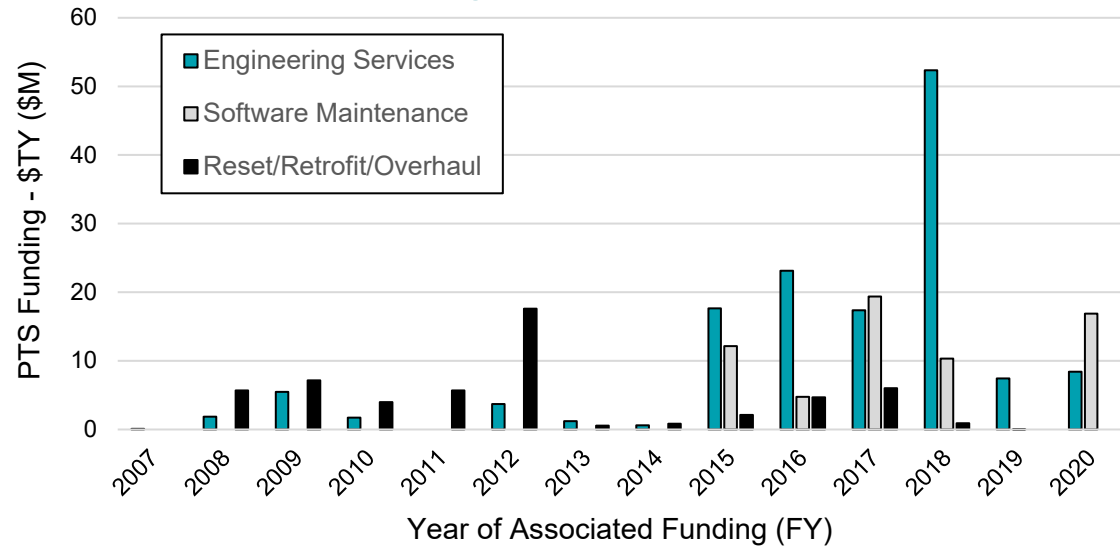
Appropriation Distribution of PTS Funding

- Observations:
 - Procurement funding - average of 78.5% of PTS funding across the four programs
 - Greatest percent of OMA funding in Program 3 → Program 3 had excess funding to use on expenses
- Takeaways:
 - Future Army vehicle programs can expect Procurement appropriation to account for 67 to 97% of total PTS funding
 - RDTE appropriated funding can vary greatly depending on:
 - Initial development effort
 - Stage of the program's life cycle under review
 - Intensive engineering efforts exceeding scope of engineering change proposals



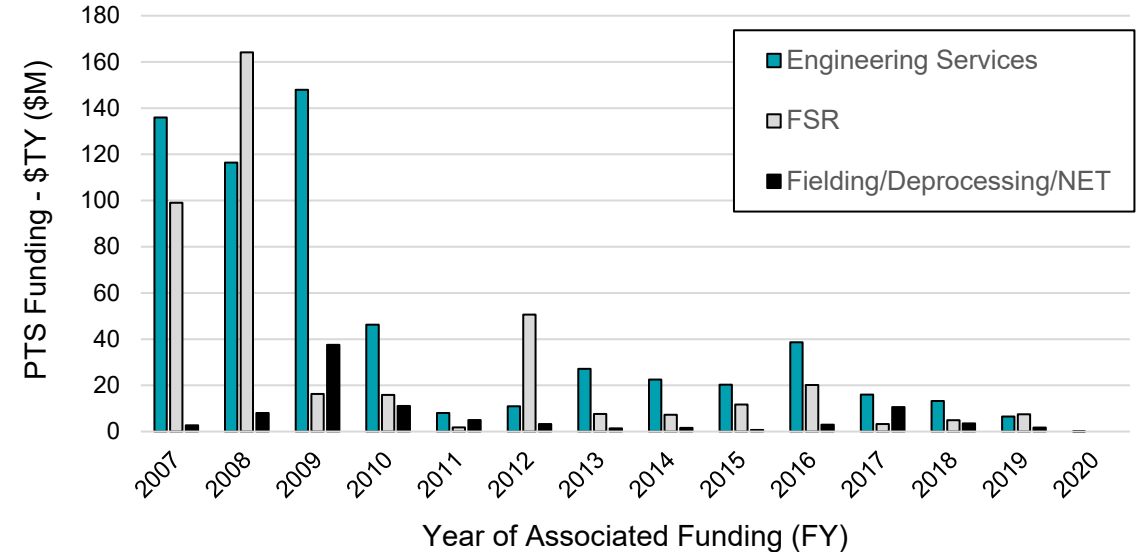
Service Category Distribution for Programs 1 and 2

Three highest funded Service Categories for Program 1 from FY07-20



- Increase in funding levels for Engineering Services from FY15-18
- Reset/Retrofit/Overhaul spike in FY12
- Overall uniform distribution of funding levels for Software Maintenance occurring in FY15-20.

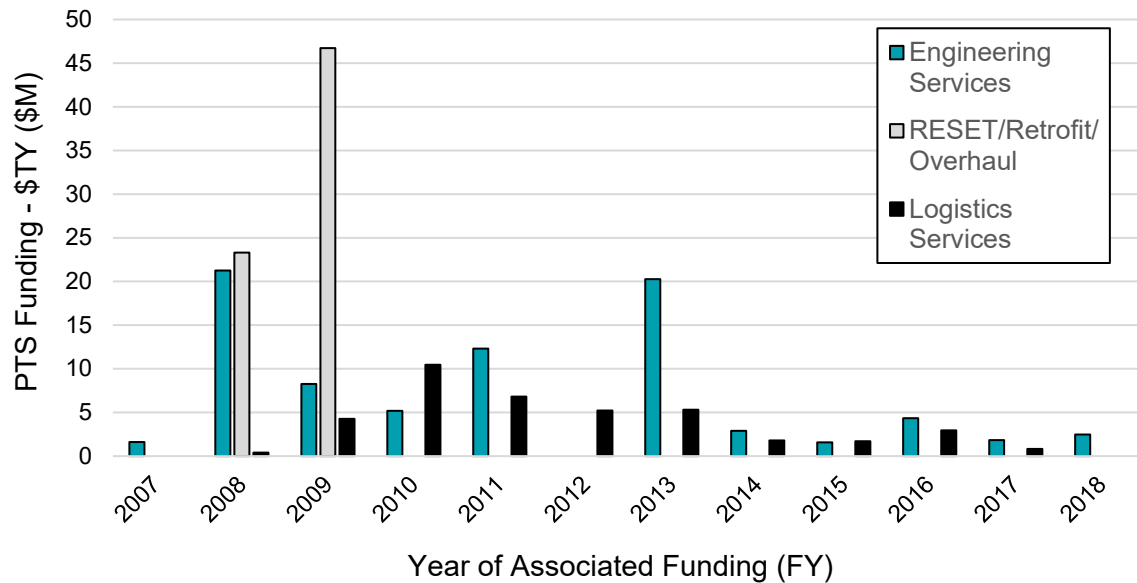
Three highest funded Service Categories for Program 2 from FY07-20



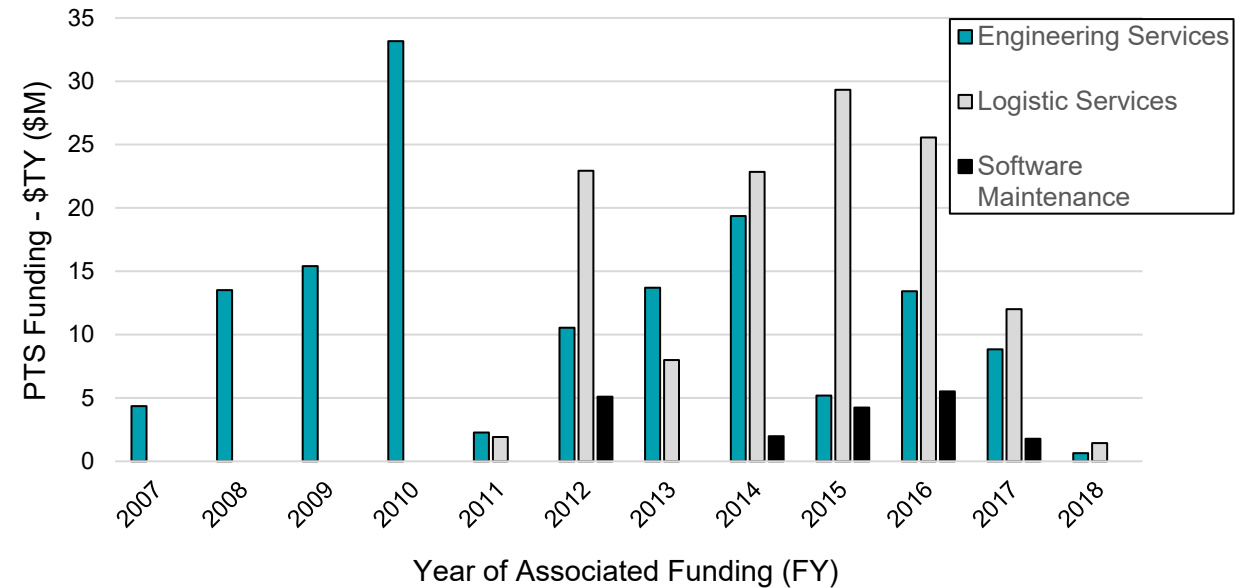
- All three services saw their highest amount of funding occur between FY07-09
- Fielding/Deprocessing/NET funding fraction (~ 20%) of FSR funding
- Matching overall trend of three highest funding service categories from FY07-20
- Fielding and FSR funding surge from FY07-09

Service Category Distribution for Programs 3 and 4

Three highest funded Service Categories for Program 3 from FY07-18



Three highest funded Service Categories for Program 4 from FY07-18



- Reset/Retrofit/Overhaul service effort received ~\$70M in funding across FY08-09 - 100% of service's PTS funding during period of study
- Two spikes in funding for Engineering Services in FY08 and FY13 - 51% of total Engineering Service funding for Program 3

- Static funding level for Software Maintenance from FY12-17
- Logistic Services also has a uniform trend from FY12-17
- Engineering Service funding growth occurring from F07-10 and FY11-14

Recommended Path Forward (1 of 2)

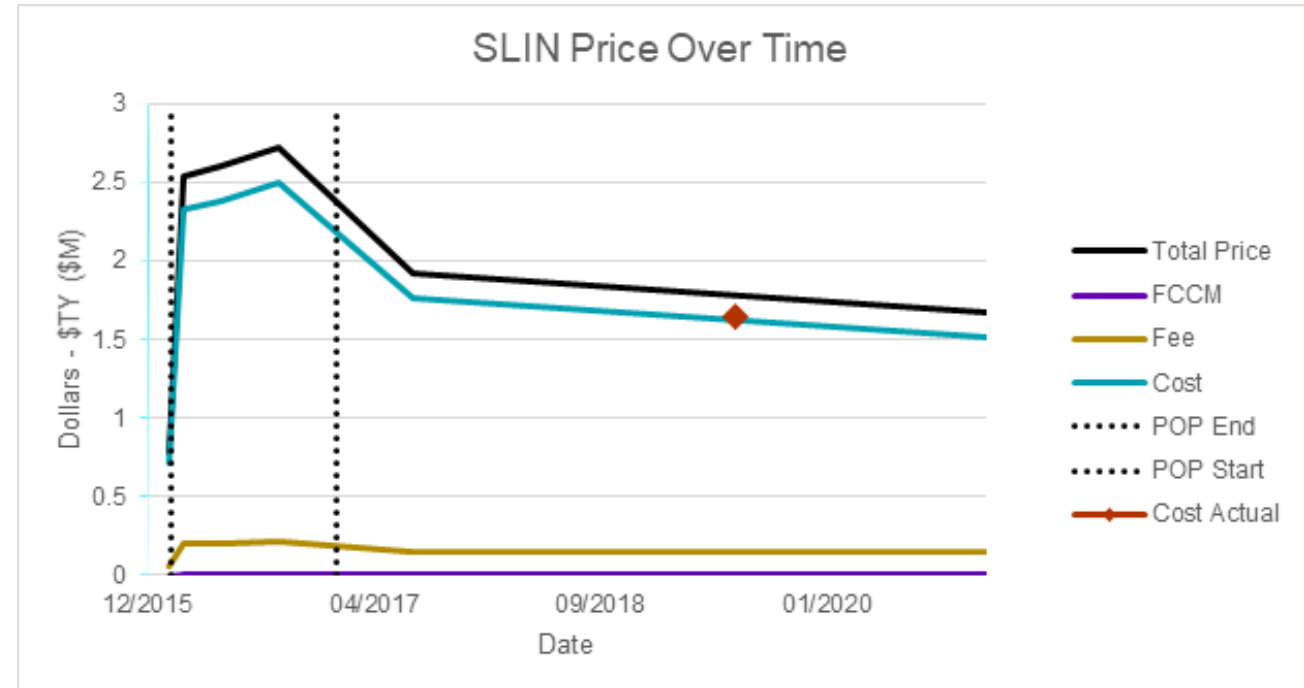
Proposed Solutions

- **Structure the work directives and cost reports around contract -** Streamline analysis by requiring cost reports to be reported at the most granular level. Ensure each work directive translates to a separate SLIN on the contract.
- **Require Contractor to categorize work directive into CES Element -** The contractor will always be the expert in relation to the specific scope of work for a work directive and therefore subsequent contract actions. Adding this requirement overtime could lend itself to more accurate mapping of PTS scopes of work.

Recommended Path Forward (2 of 2)

Future Analysis

- **Integrate completed cost actuals into analysis** – Investigate whether certain service categories are prone to incur cost overruns by comparing cost actuals against contract prices.
- **Time Series Analysis** – Analyze cost and schedules over time by gathering contractual data as it changes modification-by-modification.



Conclusion

- The study shows that through proper contracting procedures, data tagging and continuous data collection, PTS contracts can enhance understanding of how PTS funding is utilized and distributed across appropriations and cost elements
- Before using PTS contract funding profiles from one program to predict the profile of another, consideration must be given to the following:
 - Did major programmatic events impact PTS funding in the past? How likely are those to impact the new program?
 - What drove the phasing of PTS funding on the previous program?
 - What are the similarities and differences between the two programs?
 - Tracked vs. Wheeled
 - Manned vs. Optionally Manned vs Autonomous
 - SW Requirements
 - Mission Objectives
 - Usage Rate