Tabular CARDs: Orderly Data for the Cost Community

Presented to ICEAA 2018 Professional Development & Training Workshop

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PRT-237

CARD Background

- The primary objective of the Cost Analysis Requirements Description (CARD) is to succinctly describe the key technical, programmatic, operational, and sustainment characteristics of a program, along with supporting data sources, and provide all of the program information necessary to develop a cost estimate.
- The secondary objective of the CARD is to collect in-depth technical data to support the completion of cost estimates for other programs.
- Tabular CARD is one of many CAPE data capture improvement initiatives.
  - Reduce program office effort through standardized tabular reporting for commodity classes (e.g., ships, aircraft, tracked vehicles, missiles, etc.).
  - Increase value to acquisition community by establishing annual updates to capture changes in program and enhance service cost agency support for service's budget development.
- Commodity CARD tables are available in Excel workbooks on the CADE website
  - Standard commodity work breakdown structure. (Aligns with standard CSDR reporting)
  - Parameters and definitions. (Aligns with the new CSDR Technical Data Report)

Source: Tabular CARD Training February 3, 2017

Policy, Commodity CARD Tables, and Other Reference Material Located on the CADE website: http://cade.osd.mil/policy/card

CARD Guidelines

- The level of detail provided in the CARD depends on the maturity of the program.
- Unknowns: If the maturity of the program at the time of submission precludes the government reference architecture or contractor solution from providing the data at the level required, it is acceptable to fill a cell with "TBD."
- Uncertainties in numerical and schedule data may be better represented by distributions or ranges which bound realistic values .
- Not Applicable: If a field is considered not applicable to the program, fill cell with "NA" and hide the row.
- Work with your Service Cost Agency analyst and your CAPE analyst to expeditiously tailor the tables for your program.

Source: Guidelines for the Preparation and Maintenance of the Cost Analysis Requirements Description

Work with your Service Cost Agency analyst and your CAPE analyst to expeditiously tailor the tables for your program.

Cost Drivers by WBS Described in Tables

WBS Number	WBS Element
1.0	Aircraft
1.1	Air Vehicle
1.1.1	Airframe
1.1.1.1	Airframe IAT&Co
1.1.1.2	Fuselage
1.1.1.3	Wing
1.1.1.4	Empennage
1.1.1.5	Nacelle
1.1.1.6	Other Airframe Components (specify)
1.1.2	Engine/Propulsion
1.1.2.1	Propulsion IAT&Co
1.1.2.2	Propulsion Hardware
1.1.2.3	Propulsion Software Release 1..n (Specify)
1.1.2.3.1	Propulsion Software CSCI 1..n (Specify)
1.2	System Engineering
1.2.1	Software Systems Engineering
1.2.2	Integrated Logistics Support
1.2.3	Other Systems Engineering 1…n (Specify)
1.3	Program Management
1.3.1	Software Program Management
1.3.2	Integrated Logistics Support
1.3.3	Other Program Management 1…n (Specify)
1.4	System Test and Evaluation
1.0	Sustainment Effort
1.1	Unit-Level Manpower
1.1.1	Operations Manpower
1.1.2	Unit-Level Maintenance Manpower
1.1.3	Other Unit-Level Manpower
1.2	Unit Operations
1.2.1	Operating Material
1.2.1.1	Energy (Fuel, POL and Electricity)

PMP Technical Table

WBS/CRS Number	WBS/CRS Element	Parameter Name	Value	Unit of Measure	Unit Qualifer	Estimate or Actual	Source	Notes
1.0	Aircraft							
1.1	Air Vehicle							
		Crew Size		Quantity				
		Length		Feet				

Software Development Table

WBS/CRS Number		1.x.y.1		Release 1				
WBS/CRS Element		WBS/CRS Name			CSCI 1		CSCI n	
Parameter Name	Unit of Measure	Unit Qualifier	Value	Value	Estimated or Actual	Value	Estimated or Actual	
Release Level Context								
Release Begin Date	Date							
Release End Date								
CSCI Level Context								
CSCI Start Date								
CSCI End Date								
Total Software Requirement								
Total External Interface Requirements								
Software Size								
Sizing (SLOC Based)								
Software Language								
Human Generated	SLOC							

Nonhardware Technical Table

WBS/CRS Number	WBS/CRS Element	Parameter Name	Value	Unit of Measure	Unit Qualifier	Estimate or Actual	Source	Notes
1.2	System Engineering							
		Number of Platforms - Integrated		Quantity	Platforms			
		Document Name		Text				
		Provide Quantitative Staffing Data:						
		System Engineering Effort		Hours				
		Staffing - Level		FTE				
		Staffing - Profile		List				
		FTE Factor		Hours				

O&S Table

WBS/CRS Number	WBS Element	Parameter Name	Value	Unit of Measure	Unit Qualifier	Estimate or Actual	Source	Notes
1.0	Sustainment Effort / General							
		System Life		Years, Hours, Miles				
1.2.1.1	Energy							
		Energy Consumption Rate		Gallons, Barrels or Kilowatts				
		Energy Consumption		Gallons, Barrels or Kilowatts				
1.2.1.2	Training Munitions/Expendable Stores							
		For each munition type expended 1…n						
		Number of Training - Weapon Items Expended		Quantity	by Munition Type			

PMP – Prime Mission Product
O&S - Operating and Support

Source: Tabular CARD Training February 3, 2017

Describing Your PMP in Tables

Hardware

- The PMP Technical Table is a list of cost drivers organized by WBS

WBS/CRS Number	WBS/CRS Element	Parameter Name	Value	Unit of Measure	Unit Qualifer	Estimate or Actual	Source	Notes
1.0	Aircraft							
1.1	Air Vehicle							
		Crew Size		Quantity				
		Number Of Engines		Quantity				
		Number Of Main Rotors		Quantity				
				Quantity				
				Quantity				
		Engine Type		List				
		Length		Feet				
		Weight - Maximum Takeoff		Pounds				
		Weight - Maximum Landing		Pounds				
		Weight - Wet		Pounds				
		Weight - Dry		Pounds				
		Speed - Maximum		Knots				
		Range - Maximum		Nautical Miles				
1.1.1	Airframe							
		Material Mix 1…n		Percent	Weight by Material Name			
		Weight		Pounds				
		Technology Readiness Level (TRL)		List				
		Manufacturing Readiness Level (MRL)		List				

Cite pedigree

Enter the parameter's value

Cite specific source for value (e.g. SME name and organization or a specific reference document)

Use Notes column to add any text necessary to amplify anything on this row

SME – Subject Matter Expert

Source: Tabular CARD Training February 3, 2017

Physical, Performance, and Configuration parameters are necessary cost drivers for CERs, scaling, or analogy selection.

Describing Your PMP in Tables

Software without the Software Dev Table

- Typically only for Small Software Projects
  - Separate software cost reporting not expected
  - Software size is one of many non-recurring parameters
- Also could be used for pre-MS B CARDs
  - Though as program matures and software is on contract, migrate to use of the Software Table

WBS/CRS Number	WBS/CRS Element	Parameter Name	Value	Unit of Measure	Unit Qualifier	Estimate or Actual	Source	Notes
1.1.4	Guidance							
…	…							
1.1.4.4	Guidance Software Release 1…n (Specify)							
1.1.4.4.1	Guidance Software Release 1…n CSCI 1…n (Specify)							
		Software Language		Text				
		Product Size - Delivered		SLOC				
		Product Size - Effective		SLOC				
		ESLOC Equation		Text				
		New Code		SLOC				
		Modified Code		SLOC				
		Reused Code		SLOC				
		Carryover Code		SLOC				
		Auto-generated code		SLOC				

Enter parameter values

Source: Tabular CARD Training February 3, 2017

O&S Table

General Instructions

WBS/CRS Number	WBS/CRS Element	Parameter Name	Value	Unit of Measure	Estimate or Actual	Source	Notes

Organized by WBS

The parameter's name, value, and units

Cite reference document as applicable

Cite reference document as applicable

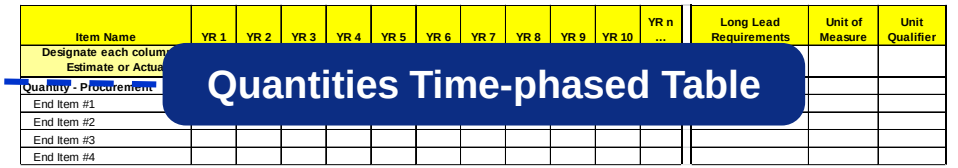
Use Notes column to add any text necessary to amplify anything on this row.

- Similar to Hardware PMP Technical Table: fixed columns with rows of parameters organized by WBS
- While the Acquisition and Manpower Tables had some time-phased O&S information, this table is for remaining static or steady-state parameters
- Tailor rows as needed to convey pertinent sustainment cost drivers for your system
- Typically only a single O&S Table is needed

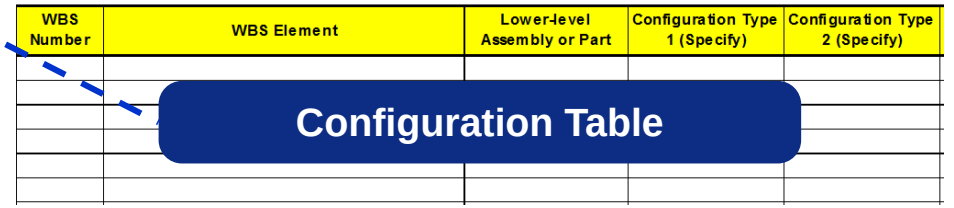
Source: Tabular CARD Training February 3, 2017

Quantity Described in Tables

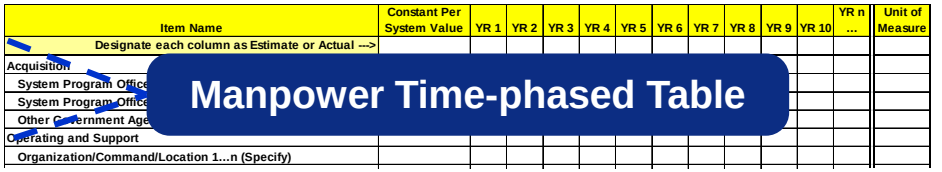
WBS Number	WBS Element
1.0	Aircraft
1.1	Air Vehicle
1.1.1	Airframe
1.1.1.1	Airframe IAT&Co
1.1.1.2	Fuselage
1.1.1.3	Wing
1.1.1.4	Empennage
1.1.1.5	Nacelle
1.1.1.6	Other Airframe Components (specify)
1.1.2	Engine/Propulsion
1.1.2.1	Propulsion IAT&Co
1.1.2.2	Propulsion Hardware
1.1.2.3	Propulsion Software Release 1..n (Specify)
1.1.2.3.1	Propulsion Software CSCI 1..n (Specify)
1.2	System Engineering
1.2.1	Software Systems Engineering
1.2.2	Integrated Logistics Support
1.2.3	Other Systems Engineering 1…n (Specify)
1.3	Program Management
1.3.1	Software Program Management
1.3.2	Integrated Logistics Support
1.3.3	Other Program Management 1…n (Specify)
1.4	System Test and Evaluation
1.0	Sustainment Effort
1.1	Unit-Level Manpower
1.1.1	Operations Manpower
1.1.2	Unit-Level Maintenance Manpower
1.1.3	Other Unit-Level Manpower
1.2	Unit Operations
1.2.1	Operating Material
1.2.1.1	Energy (Fuel, POL and Electricity)



Configured end-item quantity by year (parent level)



Child level quantity per end-item



Full Time Equivalents in Acquisition

(typically for Government PM office staff)

Operational manpower for O&S

Source: Tabular CARD Training February 3, 2017

Quantity Time-Phased Table

General Instructions

List all program fiscal years.
Avoid using Prior and To-complete columns - be explicit

Designate each column as estimate or actual

Item Name	YR 1	YR 2	YR 3	YR 4	YR 5	YR 6	YR 7	YR 8	YR 9	YR 10	YR n ...	Long Lead Requirements	Unit of Measure	Unit Qualifier
Designate each column as Estimate or Actual --->														
Quantity - Procurement														
End Item #1														
End Item #2														
End Item #3														
End Item #4														
…														
Training Item #1														
Training Item #2														
…														
Support Equipment Item #1														
Support Equipment Item #2														
…														

Enter annual quantity

Enter text describing long-lead requirements or any else pertinent to resource spreading

Tailor rows to reflect program's PMP End Items, Training Items, and Support Equipment

Cite quantity units as aircraft, missiles, systems, installations, pods, kits, etc

- Use table for anything usefully described as a series of annual values, e.g., Training and Support Equipment as shown (Note Manpower has its own table)

Source: Tabular CARD Training February 3, 2017

Quantity is a necessary cost driver. Quantity by year necessary for phasing estimate and performing learning curve calculations. Cumulative quantity necessary for O&S cost calculations.

Configuration Table

General Instruction

UNCLASSIFIED, FOR OFFICIAL USE ONLY
CARD Tables
Configuration Table

Name columns for each configuration. Insert columns as needed.

WBS Number	WBS Element	Lower-level Assembly or Part	Configuration Type 1 (Specify)	Configuration Type 2 (Specify)	Configuration Type 3 (Specify)	Configuration Type 4...n (Specify)

Enter WBS Number

Enter WBS Element

If necessary to fully convey the configured items, use this column for assembly/part designation or part number.

Enter quantity per assembly.

Source: Tabular CARD Training February 3, 2017

Necessary to map subsystems/component quantity-next-higher-assembly to end item quantity. This identifies end item composition (both uniqueness and commonality) as well the total subsystem quantity to permit proper rate/learning curve analysis.

Table-to-Table Quantity Thread

1 of 2

Configuration Table

WBS Element	Production Representative AUR	Instrumented Roundless Warhead	Captive Carry Sensor Suite	AGM-nnn Model C	AGM-nnn Model D
Missile System					
Air Vehicle					
Airframe					
Airframe Common to all Models	1	1		1	1
Airframe Unique to Model C	1	1		1	
Airframe Unique to Model D					1
Propulsion	1	1		1	1
Power and Distribution	1	1		1	1
Guidance	1	1	1	1	1
Navigation	1	1	1	1	1
Controls	1	1		1	1
Communications	1	1	1	1	1
Payload	1			1	1
On Board Test Equipment		1			

Acquisition Quantities Time-Phased Table

Item Name	2017	2018	2019	2020	2021	2022
Quantity - Prototype						
Production Representative AUR		120				
Instrumented Roundless Warhead	20					
Captive CarrySensor Suite	5					
Quantity - Procurement						
AGM-nnn Model C				90	500	500
AGM-nnn Model D						50

- The columns on the Configuration Table should match the rows on the time-phased Quantity Table. (Think: matrix math will provide the total quantity by child element.)

Source: Tabular CARD Training February 3, 2017

Table-to-Table Quantity Thread

2 of 2

Configuration Table

WBS Element	AGM-nnn Model C	AGM-nnn Model D
Missile System		
Air Vehicle		
Airframe		
Airframe Common to all Models	1	1
Airframe Unique to Model C	1	
Airframe Unique to Model D		1
Propulsion	1	1
Power and Distribution	1	1
Guidance	1	1
Navigation	1	1
Controls	1	1
Communications	1	1
Payload	1	1
On Board Test Equipment		

PMP Hardware Technical Table

WBS/CRS Element	Parameter Name	Value	Unit of Measure	Unit Qualifier
Missile System				
Air Vehicle				
Airframe				
Airframe Common to all Models				
	Weight		Pounds	Total
	Material Mix 1…n		Percent Weight	Material Name
Airframe Unique to Model C				
	Weight		Pounds	Total
	Material Mix 1…n		Percent Weight	Material Name
	Wing Chord		Inches	
	Oswald Efficiency Factor		Dimensionless	
	Zero Lift Drag Coefficient		Dimensionless	
	Number of Surfaces - Movable		Quantity	Surfaces
Airframe Unique to Model D				
	Weight		Pounds	Total
	Material Mix 1…n		Percent Weight	Material Name
	Wing Chord		Inches	
	Oswald Efficiency Factor		Dimensionless	
	Zero Lift Drag Coefficient		Dimensionless	
	Number of Surfaces - Movable		Quantity	Surfaces

- Think ahead also to the WBS and how the cost, quantity, and technical data will tie together

Source: Tabular CARD Training February 3, 2017

Manpower Time-Phased Table
General Instructions

List all program fiscal years.
Avoid using Prior and To-complete columns - be explicit

Designate each column as estimate or actual

Item Name	Constant Per System Value	YR 1	YR 2	YR 3	YR 4	YR 5	YR 6	YR 7	YR 8	YR 9	YR 10	YR n ...	Unit of Measure
Designate each column as Estimate or Actual --->													
Acquisition													
System Program Office (Summary Breakout)													
System Program Office (Expanded Functional Breakout)													
Other Government Agencies													
Operating and Support													
Organization/Command/Location 1...n (Specify)													
Operate													
Maintain													
Support													
Train													
Sustaining/Systems Engineering													
Program Management													

Enter annual quantity

If applicable, express on a per system or per organization basis. Use Note column to further describe

Recommend use Full Time Equivalents (FTE). Use Notes column to elaborate on FTE definition

Tailor rows to reflect organizations and functional breakouts for the program (Major categories shown here – breakouts on next chart)

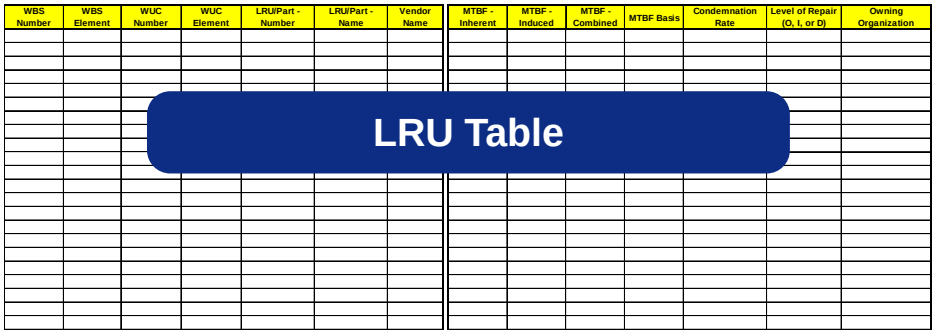
- Use table to lay out annual headcount

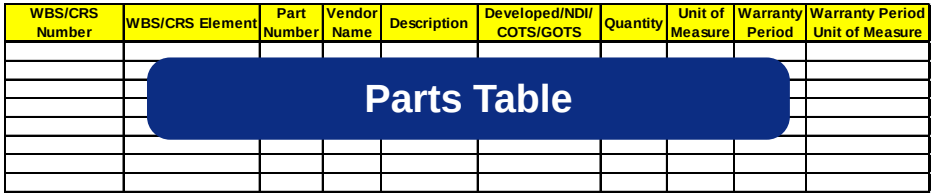
Source: Tabular CARD Training February 3, 2017

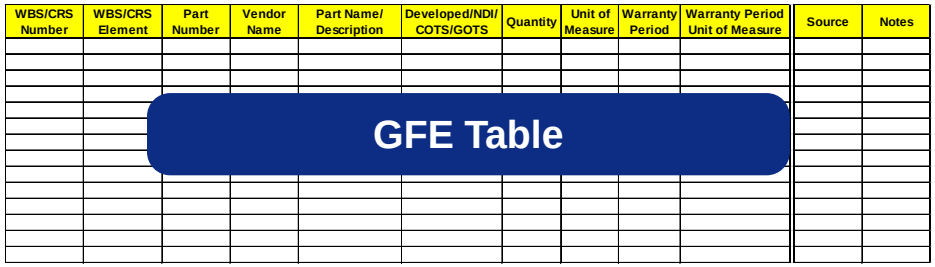
Necessary to estimate manpower costs.

Detail Described in Tables

- When program matures to the point when an understanding of removables is complete, describe each on the LRU Table
- For COTS-heavy programs or selected COTS-heavy WBS elements provide BOM via the Parts Table
- Describe Government Furnished Equipment on the GFE Table







Source: Tabular CARD Training February 3, 2017

LRU Level Table

Removable Unit Name or Number is primary row identifier

Estimated or actual hours or miles between failures

Percentage of time that a repairable item can not be repaired and will have to be replaced

WBS Number	WBS Element	WUC Number	WUC Element	LRU/Part - Number	LRU/Part - Name	Vendor Name

MTBF - Inherent	MTBF - Induced	MTBF - Combined	MTBF Basis	Condemnation Rate	Level of Repair (O, I, or D)	Owning Organization

Four columns to the left are available to tag each LRU to WBS or WUC as may be useful

Specify MTBF unit of measure (e.g. hours or miles)

If Level of Repair and Analysis has taken place, enter the associated maintenance level (Organizational, Intermediate or Depot) conducting the repair. Else omit.

- Describe removables such as LRUs on this table

Source: Tabular CARD Training February 3, 2017

Source and Notes Columns to the right (not shown)

LRU – Line Replaceable Unit
WUC – Work Unit Code
MTBF – Mean Time Between Failures

Detail necessary for maintenance estimating.

Part Level Table

WBS/CRS Number	WBS/CRS Element	Part Number	Vendor Name	Description	Developed/NDI/ COTS/GOTS	Quantity	Unit of Measure	Warranty Period	Warranty Period Unit of Measure

Two columns to the left are available to tag each part to WBS as may be useful

Part Number is primary row identifier

Nonrecurring Price	Unit Price	Price Total	Warranty Price	Warranty Unit Price	Estimate or Negotiated	Competitively Sourced (Y/N)	Contract Type	SBIR (Y/N)	Stepladder Low Quantity	Stepladder High Quantity	Stepladder Price

If a priced bill of materials is provided, enter values for these columns.

If tiered (stepladder) pricing is available, repeat this three-column set as needed to convey completely.

- Priced BOM as needed. Also any part list, e.g.:
  - High-dollar items
  - Anything with a known tiered pricing schedule

Source and Notes Columns to the right (not shown)

Source: Tabular CARD Training February 3, 2017

BOM – Bill of Materials

Detail necessary for performing component analysis or COTS-heavy estimating.

GFE Table

Part Number is primary row identifier

... or Part Name

WBS/CRS Number	WBS/CRS Element	Part Number	Vendor Name	Part Name/ Description	Developed/NDI/ COTS/GOTS	Quantity	Unit of Measure	Warranty Period	Warranty Period Unit of Measure	Source	Notes

Two columns to the left are available to tag each item to WBS as may be useful

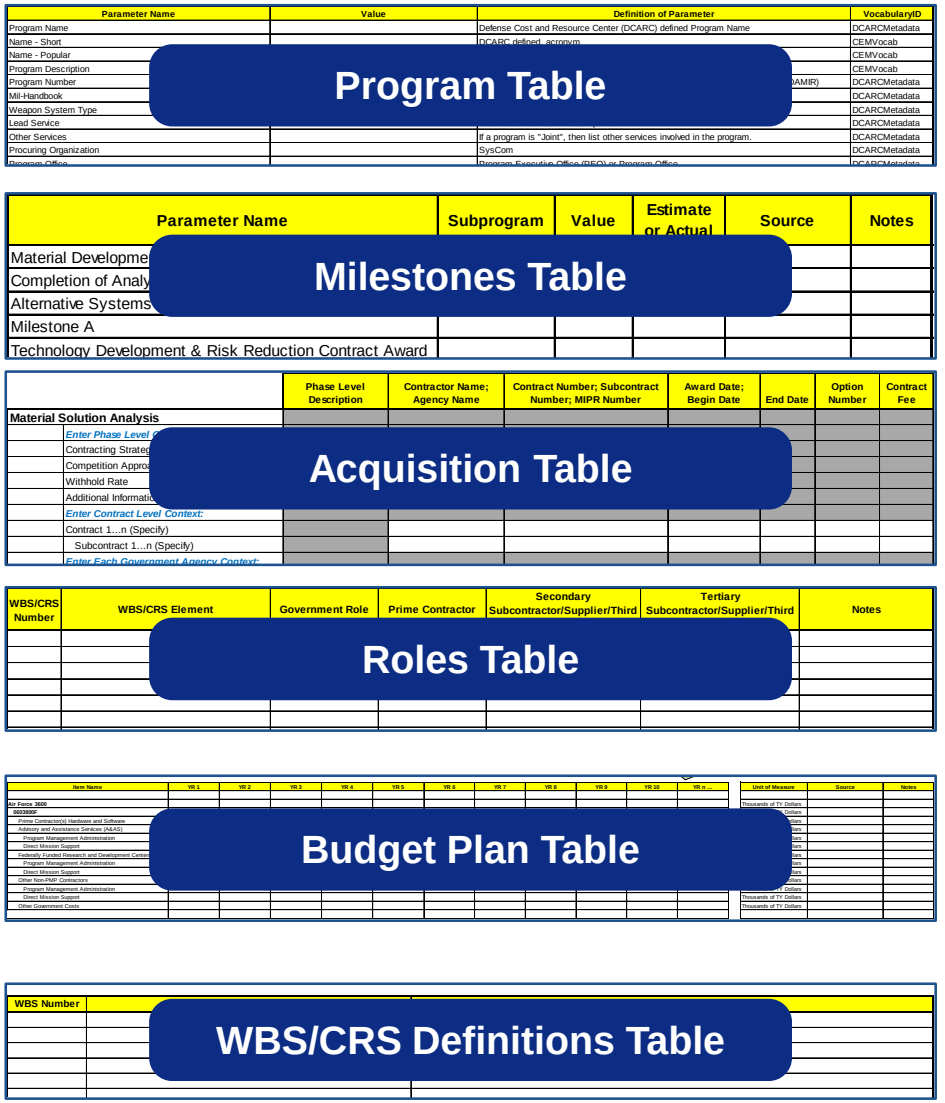
- Simply list the Government Furnished Equipment (GFE)
- If GFE comes with a warranty, provide that information as well.

Source: Tabular CARD Training February 3, 2017

Detail necessary for identifying items that will not be part of contractor's cost.

Program Overview in Tables

- Additional Tables used to provide essential program context



Source: Tabular CARD Training February 3, 2017

Milestone Table

General Instructions

Enter values as month, date, and year

Cite source of value IMS, TEMP, etc.

Parameter Name	Subprogram	Value	Estimate or Actual	Source	Notes
Material Development Decision					
Completion of Analysis of Alternatives (AoA) or Equivalent					
Alternative Systems Review (ASR)					
Milestone A					
Technology Development & Risk Reduction Contract Award					
Capability Development Document-Validation (CDD-V)					
System Requirements Review (SRR)					
System Functional Review (SFR)					
Development RFP Release Decision Point					
Preliminary Design Review (PDR)					
Milestone					
EMD Co					
Critical D					
Risk Reduction Build					
Development Test & Evaluation Begin					

Tailor as required to add rows, hide rows, capture subprogram

Show by subprogram if needed

Designate each Date as Estimated or Actual

IMS – Integrated Master Schedule
TEMP – Test and Evaluation Master Plan

Source: Tabular CARD Training February 3, 2017

Dates needed to time-phase and inflate estimate. Durations needed to estimate time-sensitive costs.

Acquisition Table

General Instructions

Describe characteristics of each phase by row

		Phase Level Description	Contractor Name; Agency Name	Contract Number; Subcontract Number; MIPR Number	Award Date; Begin Date	End Date	Option Number	Contract Fee
Material Solution Analysis								
	Enter Phase Level Context:							
	Contracting Strategy							
	Competition Approach							
	Withhold Rate							
	Additional Information							
	Enter Contract Level Context:							
	Contract 1…n (Specify)							
	Subcontract 1…n (Specify)							
	Enter Each Government Agency Context:							
	Program Office Support 1…n (Specify)							
	Test Agency 1…n (Specify)							
	Other Government Agency MIPR 1…n (Specify)							

Describe characteristics of each contract within each phase

Specify each contract and agency participant in this column. Copy and insert/paste rows as needed.

Describe characteristics of each agency participant within each phase

Source: Tabular CARD Training February 3, 2017

Begin/end dates needed to estimate time-sensitive costs. Contract info necessary to link to CSDRs. Lot information needed to perform learning curves.

Roles Table

General Instruction

Provide Name of Key Subcontractor/Supplier/Third Party etc

WBS/CRS Number	WBS/CRS Element	Government Role	Prime Contractor	Secondary Subcontractor/Supplier/Third Party	Tertiary Subcontractor/Supplier/Third Party	Notes

Enter WBS Number

Enter WBS Element

Designate if each WBS element is Government or Prime Contractor responsibility with contractor name or Government agency

Enter additional clarifying text as needed e.g. contracting relationship

Source: Tabular CARD Training February 3, 2017

Necessary to identify GFE items and to calculate contract loads by vendor tier.

Budget Plan Table

General Instructions

Enter Fiscal Years.
Avoid Prior and To-Complete.
Insert columns as needed

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CARD Tables
Budget Plan CARD Table

Enter annual costs (planned budget)

List all program years. Avoid using Prior and To-complete columns - be explicit.

Item Name	YR 1	YR 2	YR 3	YR 4	YR 5	YR 6	YR 7	YR 8	YR 9	YR 10	YR n ...	Unit of Measure	Source	Notes
Air Force 3600												Thousands of TY Dollars		
0603800F												Thousands of TY Dollars		
Prime Contractor(s) Hardware and Software												Thousands of TY Dollars		
Advisory and Assistance Services (A&AS)												Thousands of TY Dollars		
Program Management Administration												Thousands of TY Dollars		
Direct Mission Support												Thousands of TY Dollars		
Federally Funded Research and Development Ce DC)												Thousands of TY Dollars		
Program Management Administration												Thousands of TY Dollars		
Direct Mission Support												Thousands of TY Dollars		
Other Non-PMP Contractors												Thousands of TY Dollars		
Program Management Administration												Thousands of TY Dollars		
Direct Mission Support												Thousands of TY Dollars		
Other Government Costs												Thousands of TY Dollars		

Enter each Appropriation in bold.

Enter each PE Code and indent underneath each appropriation.

Enter category breakout and indent underneath PE Code.

(Use Excel's Indent function - do not enter leading spaces in the cell)

Enter each Appropriation and Program Element Code.
Add categories as underneath each.
Insert rows as needed

Enter values

Cite source.
POM, PB, etc

POM – Program Objective Memorandum
PB – President's Budget

Source: Tabular CARD Training February 3, 2017

A necessary location for budget data to reside.

WBS/CRS Definitions Table

General Instructions

- Enter complete program Work Breakdown Structure and Dictionary

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CARD Tables
WBS/CRS DEFINTIONS

WBS Number	WBS Element	WBS Defintion

Source: Tabular CARD Training February 3, 2017

Necessary to understand content.

Tables in the CARD Workbook

- PMP Description (Supports parametric, analogy, and scaling methods)
  - PMP Hardware Technical Table
  - Software Development Table
- Quantity (Supports cost improvement curve methods and estimate time-phasing)
  - Quantities and O&S Time-phased Table
  - Configuration Table
- Manpower (Supports staff-loading methods)
  - Manpower Time-Phased Table
- Common Elements (Supports direct estimating of non-PMP elements)
  - Nonhardware Technical Table
- Detailed Information (Supports contract loading, build-up, and BOM methods)
  - LRU Table
  - Part Level Table
  - GFE Table
- O&S (Supports O&S methods)
  - O&S Table
  - Manpower Time-Phased Table
  - Software Maintenance Table
  - Quantities and O&S Time-phased Table
  - PMP Hardware Technical Table
- General program description, phases, and contracting approach (Provides essential context information)
  - Program, Milestone, Acquisition, Roles, Budget Plan, WBS/CRS Definitions Tables

Some tables are dual-purposed and are listed twice

Source: Tabular CARD Training February 3, 2017

Repeating Tables in a CARD Workbook

- Tables (workbook sheets) may be replicated as needed to describe the program or simply for convenient organization
  - The PMP Technical can be split into WBS segments

    PMP Technical-Aircraft | PMP Technical-Engine | PMP Technical-Avionics
  - Or separate models

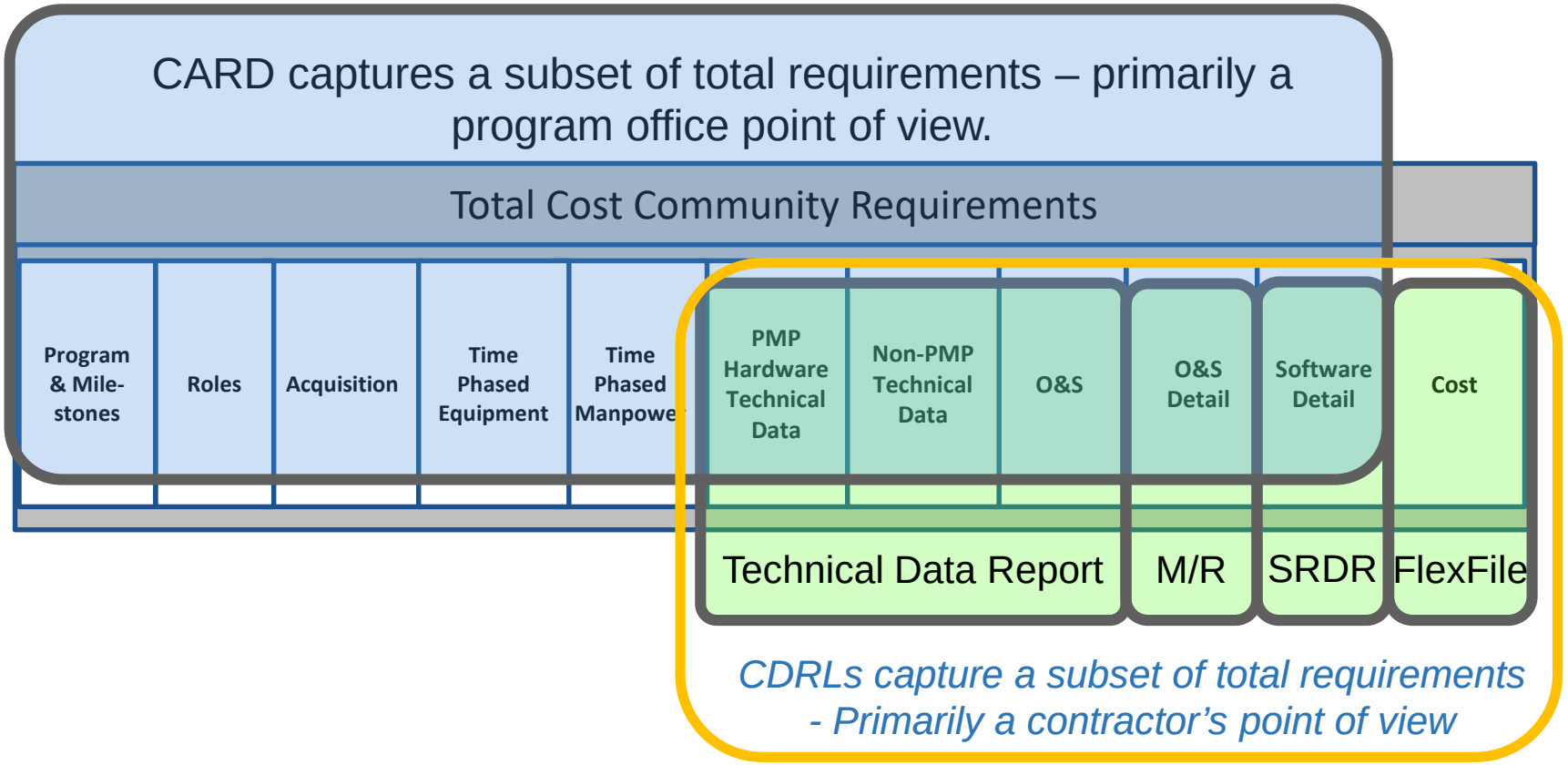
    PMP Technical-AGM-999A | PMP Technical-AGM-999B
  - The Nonhardware Technical can be split by phase (or contract, or lot)

    Nonhardware-TMRR | Nonhardware-EMD | Nonhardware-LRIP
  - The Software Development Table must be repeated for each WBS element

    Software Dev-Avionics | Software Dev-Weapons | Software Dev-Training

Source: Tabular CARD Training February 3, 2017

CARD and CADE Technical Data Intersection



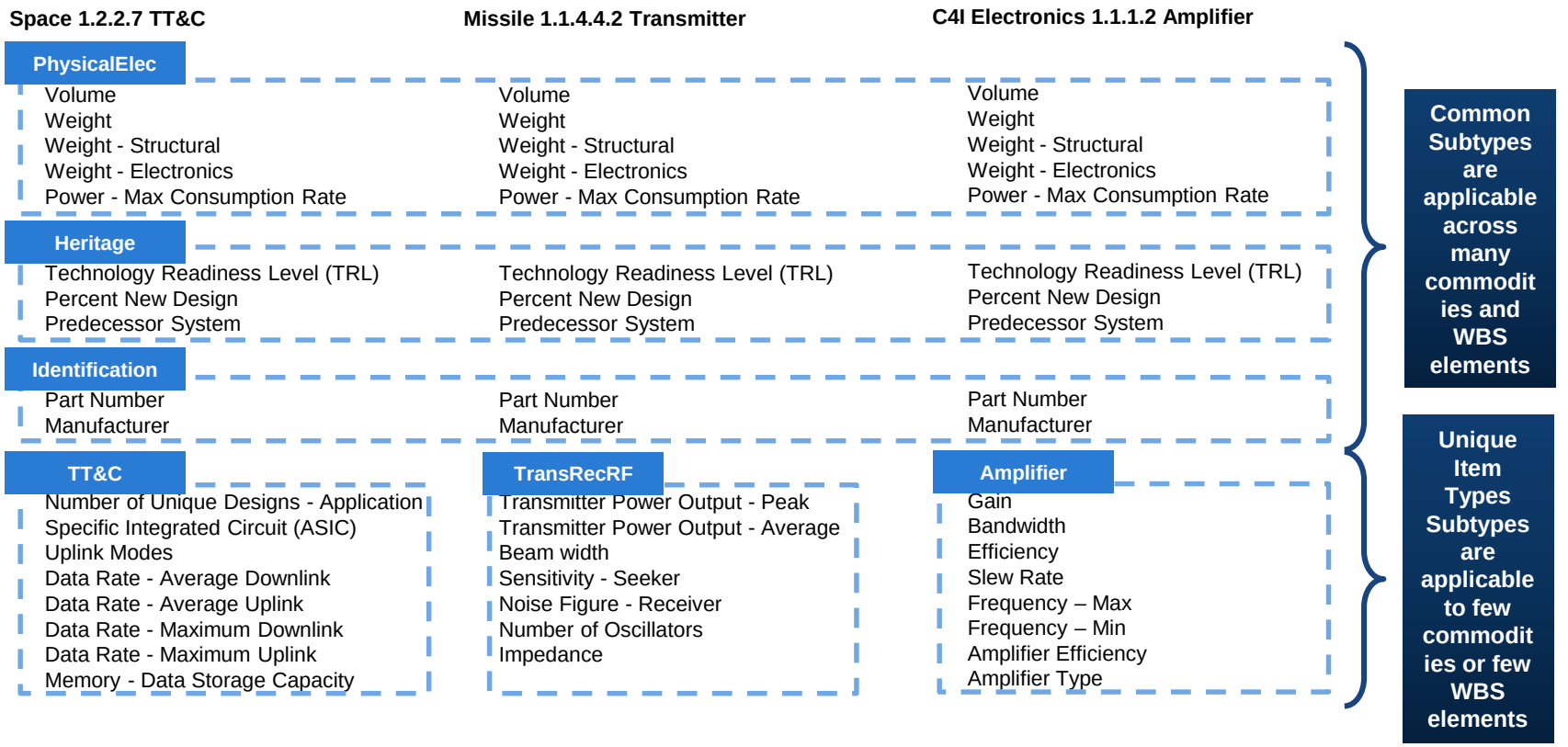
CDRL – Contract Data Requirement List
M/R – Maintenance and Repair
SRDR – Software Resources Data Report

Source: Technical Data Reporting DID Training - Nov. 2017

Purposeful Technical Data Overlap

Technical Data Item Types

- Grouped Parameters Create Item Types and SubTypes



Item Types are Unique to a Type of WBS Element
Subtypes are Common to Many WBS Elements

Source: Technical Data Reporting DID Training - Nov. 2017

Example

- An Example Aircraft Program WBS with Item Types

WBS Code	WBS Element Name	Item Type
1.0	XYZ System	
1.1	BR549 Aircraft	AirVehicle
1.1.1	Electronic Systems	Avionics
1.1.1.1	LRU Navigation	Navigation
1.1.1.2	LRU Mission	ElecBox
1.1.2	Airframe	Airframe
1.1.3	Engine	EngineTurbine

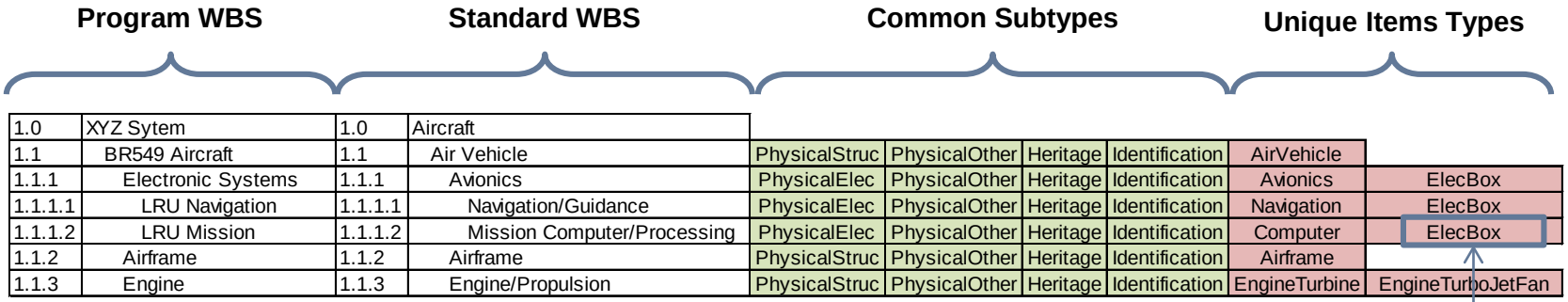
Example on the following slides will focus on this WBS element

Item Type Modularizes Data

Source: Technical Data Reporting DID Training - Nov. 2017

Example Item Types

- Technical Vocabulary is Comprised of Item Types



Program WBS		Standard WBS		Common Subtypes				Unique Items Types	
1.0	XYZ Sytem	1.0	Aircraft						
1.1	BR549 Aircraft	1.1	Air Vehicle	PhysicalStruc	PhysicalOther	Heritage	Identification	AirVehicle	
1.1.1	Electronic Systems	1.1.1	Avionics	PhysicalElec	PhysicalOther	Heritage	Identification	Avionics	ElecBox
1.1.1.1	LRU Navigation	1.1.1.1	Navigation/Guidance	PhysicalElec	PhysicalOther	Heritage	Identification	Navigation	ElecBox
1.1.1.2	LRU Mission	1.1.1.2	Mission Computer/Processing	PhysicalElec	PhysicalOther	Heritage	Identification	Computer	ElecBox
1.1.2	Airframe	1.1.2	Airframe	PhysicalStruc	PhysicalOther	Heritage	Identification	Airframe	
1.1.3	Engine	1.1.3	Engine/Propulsion	PhysicalStruc	PhysicalOther	Heritage	Identification	EngineTurbine	EngineTurboJetFan

				Core by Phase				Anticipated Availability						
ITEM TYPE	SUBTYPE	PARAMETER NAME	UNIT OF MEASURE	Dev	Prod	O&S	Final Authoritative Data Source For Actuals	MS A	PDR	MS B	CDR	MS C	DEFINITION	VocabularyID
ElecBox		Clock Speed	Megahertz	X	X		Contractor			X	X	X	The rate at which the processor can complete a processing	CADEVocab0887
ElecBox		ASIC - Gate Count	Quantity	X	X		Contractor				X	X	Enter Avg Application Specific Integrated Circuit (ASIC) gate	CADEVocab0315
ElecBox		FPGA - Gate Count	Quantity	X	X		Contractor				X	X	FPGA gate count NOT including memory	CADEVocab0317
ElecBox		Transmitter Power Output - Peak	Watts	X	X		Contractor		X	X	X	X	The Peak Transmitter Power Out.	CADEVocab1393
ElecBox		Number of Receiver Channels	Quantity	X	X		Contractor		X	X	X	X	This parameter is the Total Number of independent RF receivers	CADEVocab0292
ElecBox		Type of Modulation	List	X	X		Contractor		X	X	X	X	The type of Signal Modulation.	CADEVocab0296
ElecBox	PhysicalElec	Volume	Cubic Feet	X	X	X	Contractor		X	X	X	X	Physical volume of the item.	CADEVocabPhSW000
ElecBox	PhysicalElec	Weight	Pounds	X	X	X	Contractor	X	X	X	X	X	Physical weight of the item.	CADEVocabSWAP000
ElecBox	PhysicalElec	Power - Maximum Consumption Rate	Watts	X	X	X	Contractor		X	X	X	X	Maximum rate of power consumption by the item.	CADEVocabSWAP001
ElecBox	PhysicalElec	Weight - Structural	Pounds		X		Contractor				X	X	The item's mechanical/structural weight.	CADEVocabSWAP000
ElecBox	PhysicalElec	Weight - Electronics	Pounds		X		Contractor				X	X	The item's electronics weight.	CADEVocabSWAP001
ElecBox	Heritage	New Design	Percent	X			Contractor	X	X	X	X	X	The extent of the item's design that is new on a 0-100% scale as	CADEVocabHrtg0001
ElecBox	Heritage	Technology Readiness Level (TRL)	List	X			Government	X	X	X	X	X	Technology Readiness Levels (TRL)are a set of nine graded	CADEVocabHrtg0002
ElecBox	Identification	NSN	Name/Number		X	X	Government				X	X	The item's National Stock Number. A 13-digit number consisting	CADEVocabIdnt0001
ElecBox	Operational	Maintenance Level	List		X	X	Government		X	X	X	X	The maintenance echelon(s) the contractor is supporting (e.g.	CADEVocabOprn0001
ElecBox	Operational	Mean Time Between Failure (MTBF)	Hours		X	X	Contractor				X	X	The item's MTBF. Mean time between failures (MTBF) is the	CADEVocabOprn0002
ElecBox	Operational	Mean Time To Repair (MTTR)	Hours		X	X	Contractor				X	X	The item's MTTR. Mean time to repair (MTTR) is the average	CADEVocabOprn0003

Source: Technical Data Reporting DID Training - Nov. 2017

Example MS B CARD

WBS Number	WBS Element	Parameter Name	Value	Low	High	Margin	Unit of Measure	Unit Qualifier	Estimate or Actual	Objective	Threshold	Source
1.0	XYZ System											
1.1	BR549 Aircraft											
		Combat Radius	100	80	100		Nautical Miles		Estimate	110	90	Lead Engineer (June 2014), draft CONOPS
		Absolute Ceiling	25,000	25,000	30,000		Feet		Estimate	27,000	22,000	Lead Engineer (June 2014), draft CONOPS
		Weight	99,500				Pounds		Estimate	98,000	106,000	CCD Oct 2016
1.1.1.2	LRU Mission											
		Clock Speed	800				Megahertz		Estimate			Systems Engineering Plan (SEP)
		ASIC - Gate Count	300,000	300,000	350,000		Quantity	Gates	Estimate			COTS Brochure, Lead Engineer (June 2014), Systems
		FPGA - Gate Count	275,000	275,000	325,000		Quantity	Gates	Estimate			Lead Engineer (June 2014), Systems Engineering Plan (SEP)
		Type of Modulation	AM				List		Estimate			Lead Engineer (June 2014), draft CONOPS
		Volume	1	0.9	1.1		Cubic Feet		Estimate			Lead Engineer (June 2014), Systems Engineering Plan (SEP)
		Weight	20	18	21		Pounds		Estimate			CDD (May 2014)
		Power - Maximum Consumption	18	17	25		Watts		Estimate			Lead Engineer (June 2014), Systems Engineering Plan (SEP)
		New Design	100				Percent		Estimate			Lead Engineer (June 2014), Systems Engineering Plan (SEP)
		Technology Readiness Level (TRL)	4				List		Actual			TRL Assessment June 2014

Assessing TRL is an inherently Government function. Will not be on the TDR.

Low and High values often in early CARDs but TDR contains point estimates.

Few actuals in early CARDs.

Objective/ Threshold stated at high levels of the WBS.

Government Ref Architecture documents and Government SMEs cited.

TDR – Technical Data Report
SME – Subject Matter Expert

Source: Technical Data Reporting DID Training - Nov. 2017

Example MS C CARD

WBS Number	WBS Element	Parameter Name	Value	Low	High	Margin	Unit of Measure	Unit Qualifier	Estimate or Actual	Objective	Threshold	Source
1.0	XYZ System											
1.1	BR549 Aircraft											
		Combat Radius	98				Nautical Miles		Actual	110	90	DT&E Flight #12 Nov 2021
		Absolute Ceiling	25000				Feet		Actual	27,000	22,000	DT&E Flight #14 Nov 2021
		Weight	105,000				Pounds		Actual	98,000	106,000	Mass Properties First DeliveryL B010 May 2021
1.1.1.2	LRU Mission											
		Clock Speed	800				Megahertz		Actual			TDR First Delivery Submission
		ASIC - Gate Count	300,000				Quantity	Gates	Actual			TDR First Delivery Submission
		FPGA - Gate Count	278,000				Quantity	Gates	Actual			TDR First Delivery Submission
		Type of Modulation	AM				List		Actual			Lead Engineer (June 2014), draft CONOPS
		Volume	1				Cubic Feet		Actual			TDR First Delivery Submission
		Weight	20				Pounds		Actual			Mass Properties First DeliveryL B010 May 2021
		Power - Maximum Consumption	18				Watts		Actual			TDR First Delivery Submission
		New Design	100				Percent		Actual			TDR First Delivery Submission
		Technology Readiness Level (TRL)	7				List		Actual			TRL Assessment June 2021

Low and High values sparse in later CARDs.

More actuals in later CARDs.

TDR cited as source in many cases.

Source: Technical Data Reporting DID Training - Nov. 2017

Closing Slide

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