MIL-STD-31000A

Putting The Pieces Together

Prepared By: Mitzi Whittenburg, CPCM
&
Roy Whittenburg

For The Picatinny Chapter of NCMA

Agenda

Introduction to MIL-STD-31000A	Core Standard	Appendices B & C	Closing

• Background
• Better Buying Power 2.0 Tie In
• Benefits
	• Defining a TDP
	• Levels of a TDP
	• 2D & 3D TDPs
	• Option Selection Worksheet
		• Appendix B
		  • Purpose
		  • Use
		• Appendix C
		  • Purpose
		  • Use
			• Conclusions
			• Open Discussion

Introduction

Background: Who we are and what are we talking about

Benefits

BBP 2.0 Tie In

Background

Introduction → Core Standard → Appendices → Closing

Bio

- **Mitzi Whittenburg, CPCM**
  - Project Manager, UTRS
  - Government Support Contractor
- **Experience:**
- 30 years of procurement experience at the corporate headquarters of American Airlines, Northwest Airlines, GE and Cargill; most recently working at a large prime defense contractor – BAE Systems
- **Education**:
- Holds a MBA in Acquisition & Government Contracts and a master's degree in Financial Planning from the University of Dallas and an undergraduate degree from Texas Christian University
- **Accomplishments:**
- Recipient of a 2010 DoD Nunn-Perry award for managing an excellent Mentor-Protégé agreement with a small disadvantaged Native American 8(a) woman-owned business
- Specializes in small business mentoring, procurement analysis and supply chain best practices including leading strategic sourcing teams
- Member of the NCMA Picatinny Chapter Executive Committee and recently published a research paper in the NCMA *Journal of Contract Management* entitled Model-Based Enterprise: An Innovative Technology-Enabled Contract Management Approach

Bio

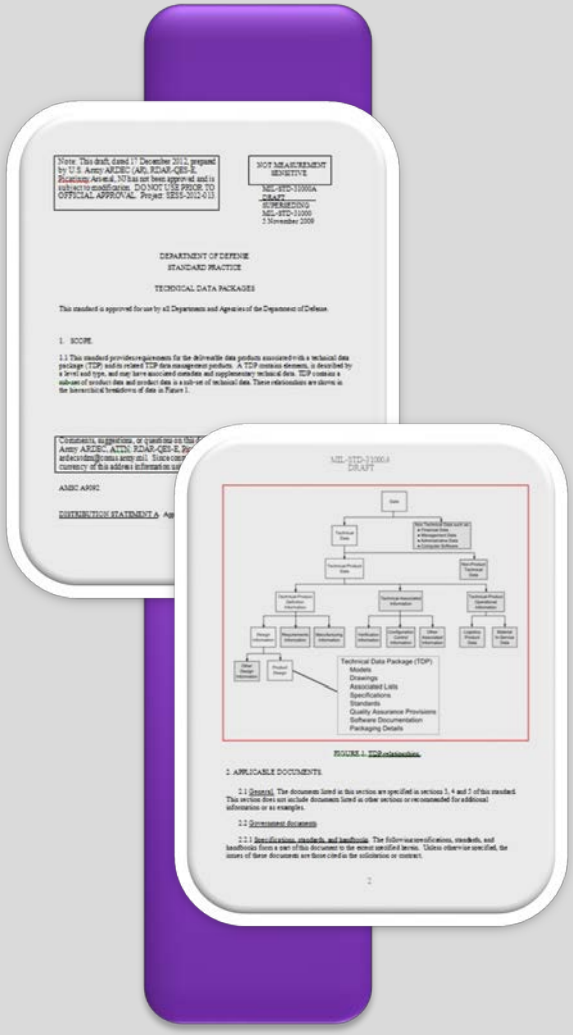
- **Roy Whittenburg**
  - **Project Manager, UTRS**
  - **Government Support Contractor**
- **Experience:**
  - **25 years experience in multiple defense and commercial industries in roles ranging from design engineer to MCAD Architect**
- **Recent projects:**
  - **OSD DMS&T 3D TDP and Certification Program (2012 DMT Achievement Award Winner, Project Manager and Data Deliver Subcommittee Co-Chair)**
  - **Net Centric Model Based Engineering (Army ManTech, Development Technical Lead)**
  - **NIST 3D Validation (Project Manager)**
  - **OSD Industrial Based Innovation Fund Integration and Validation of Next Gen 3D TDP (Technical Lead)**

What are we talking about today?

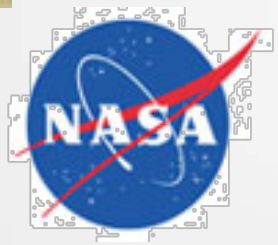
- The DoD is modernizing how it receives technical data for weapons systems
- MIL-STD-31000A defines a Technical Data Package (TDP) and has been modified to support this modernization
- The effort is the cornerstone of moving the DoD to a Model Based Enterprise that can enable substantial efficiency gains, thus cost reductions in this fiscally challenging environment

MIL-STD-31000A

- **The Military Standard defining Technical Data Packages**
- **Previously known as MIL-DTL-31000C**
- **Defines both Drawing Based and 3D TDPs**
- **Used to provide requirements for placing TDPs under contract**



Team Members



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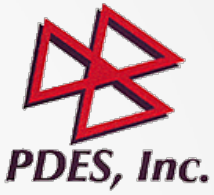

Bottom Line

- The DoD needs to acquire 3D TDPs
- It is up to Contracting Officers to insure this
- Training must be developed for the workforce
- The data acquired must be in a form that insures it can be reused
- The data must meet quality guidelines
- The consequences of not doing this is loss of data rights, increased cost and increased time to mission

Transforming the DoD

From This

To This

Introduction

Better Buying Power 2.0 Tie In:
How MIL-STD-31000A supports this key DoD initiative

Benefits

BBP 2.0 Tie In

Background

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MIL-STD-31000A From a Procurement/Contracting Perspective

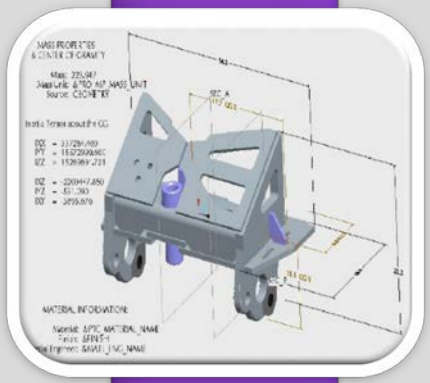
MIL-STD-31000A was released on 26 February 2013. This standard supersedes MIL-STD-31000 which was issued on 05 November 2009. Requirements for the deliverable data products associated with a technical data package (TDP) and its related TDP data management products have been revised by this standard.

From a Procurement perspective this is important because contracting personnel will play a pivotal role in delivering government provided TDPs to the industrial supply base and retrieving contractor generated TDPs as contract deliverables. To accomplish this task, MIL-STD-31000A must be included by reference in future procurement contracts.

How is this different from the past standard – it's all about improvements in technology. Previously the standard communication tool was the 2D drawing which years ago was generated by hand on a drawing board. This process has been upgraded to a Computer Assisted Design (CAD) program; however, the issue remains with the visual being in a 2D format. MIL-STD-31000A helps eliminate this by using 3D Solid Model Data.

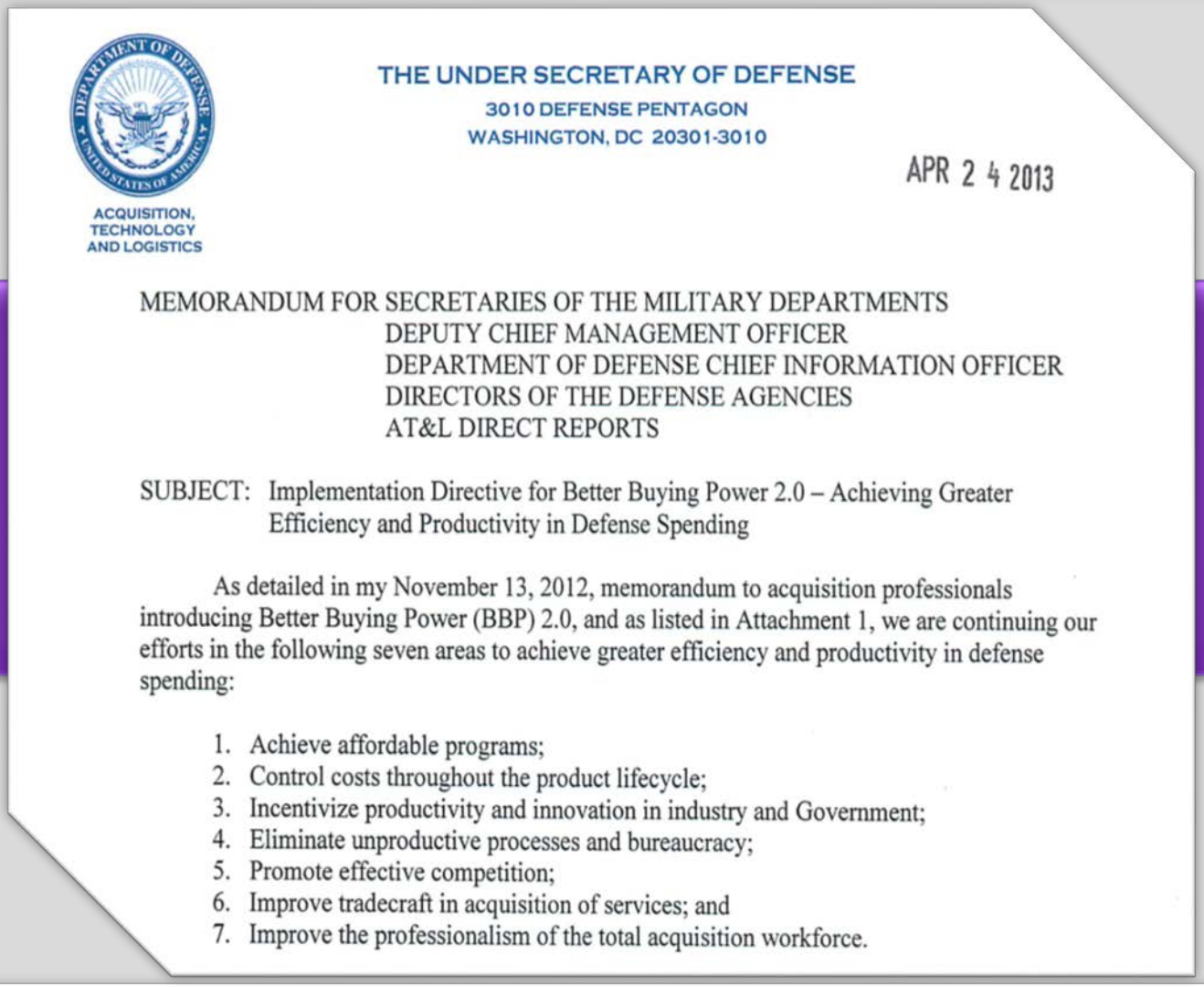
What is MIL-STD-31000A?

A 3D technical data package is a fully defined 3D version of the part, subassembly, assembly or full weapons system which contains annotations, geometry and various meta data. It should be noted that it can also contain associated 2D drawings during the transition phase.



This level of detail will allow the industrial supply base to quote from, as well as manufacture from, a single source of data without re-mastering it. This effort should result in reduced lead times because of data re-use, cost savings through better information provided upfront and improved quality due to less ambiguity around engineering intent.

Better Buying Power 2.0 Implementation Directive



ACQUISITION, TECHNOLOGY AND LOGISTICS

THE UNDER SECRETARY OF DEFENSE
3010 DEFENSE PENTAGON
WASHINGTON, DC 20301-3010

APR 2 4 2013

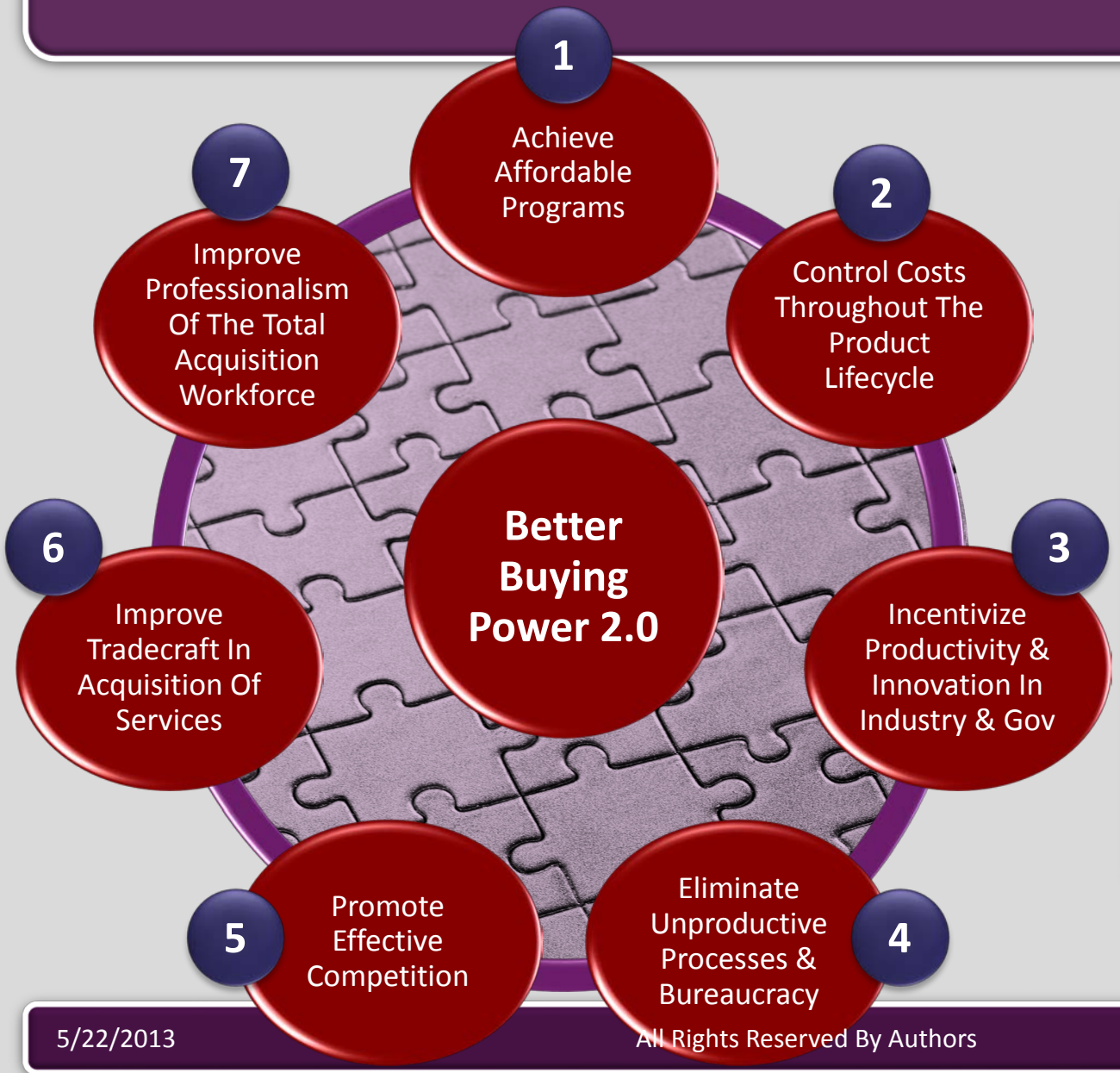
MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS
DEPUTY CHIEF MANAGEMENT OFFICER
DEPARTMENT OF DEFENSE CHIEF INFORMATION OFFICER
DIRECTORS OF THE DEFENSE AGENCIES
AT&L DIRECT REPORTS

SUBJECT: Implementation Directive for Better Buying Power 2.0 – Achieving Greater Efficiency and Productivity in Defense Spending

As detailed in my November 13, 2012, memorandum to acquisition professionals introducing Better Buying Power (BBP) 2.0, and as listed in Attachment 1, we are continuing our efforts in the following seven areas to achieve greater efficiency and productivity in defense spending:

1. Achieve affordable programs;
2. Control costs throughout the product lifecycle;
3. Incentivize productivity and innovation in industry and Government;
4. Eliminate unproductive processes and bureaucracy;
5. Promote effective competition;
6. Improve tradecraft in acquisition of services; and
7. Improve the professionalism of the total acquisition workforce.

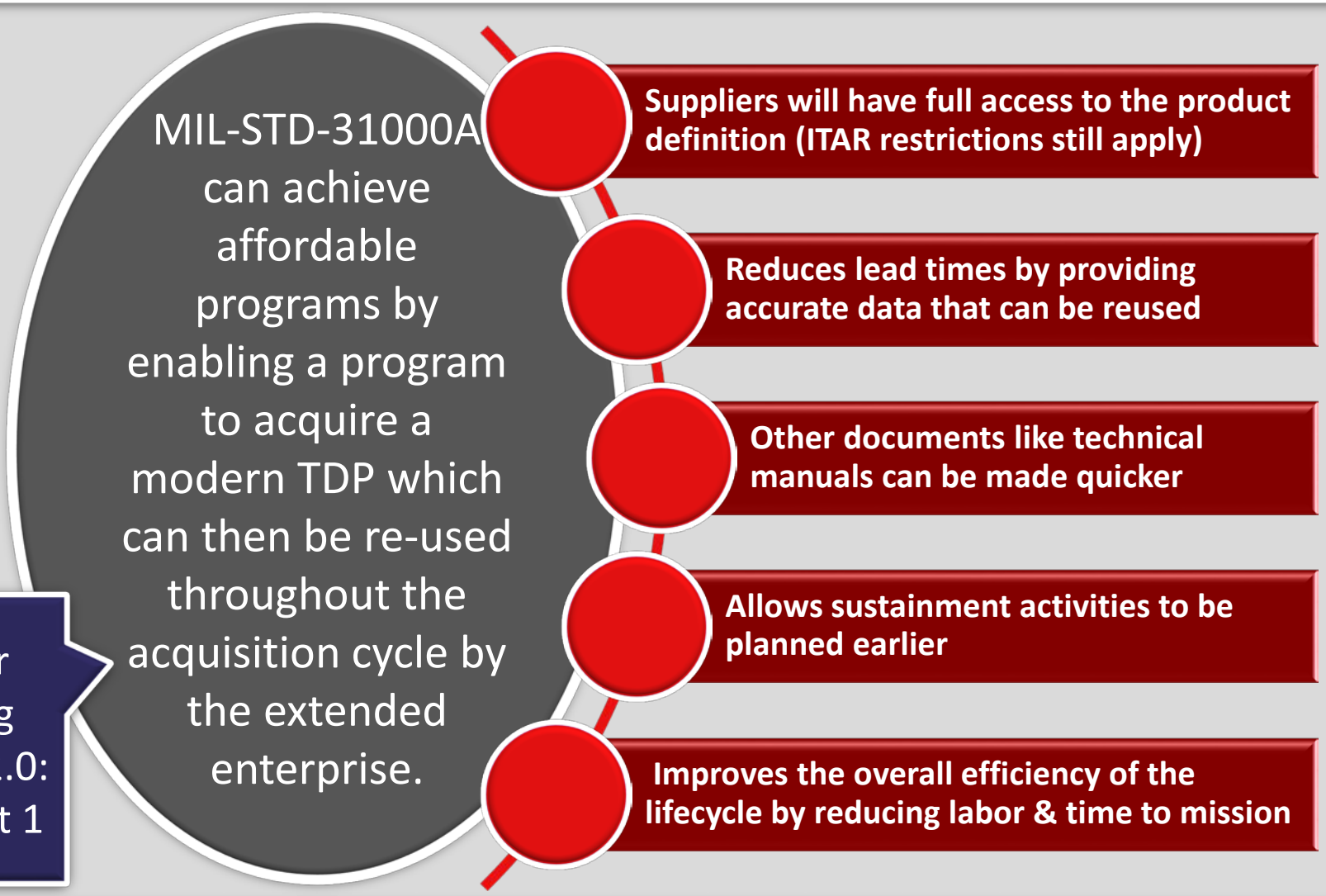
Elements of BBP 2.0



There are seven major elements to Better Buying Power 2.0.

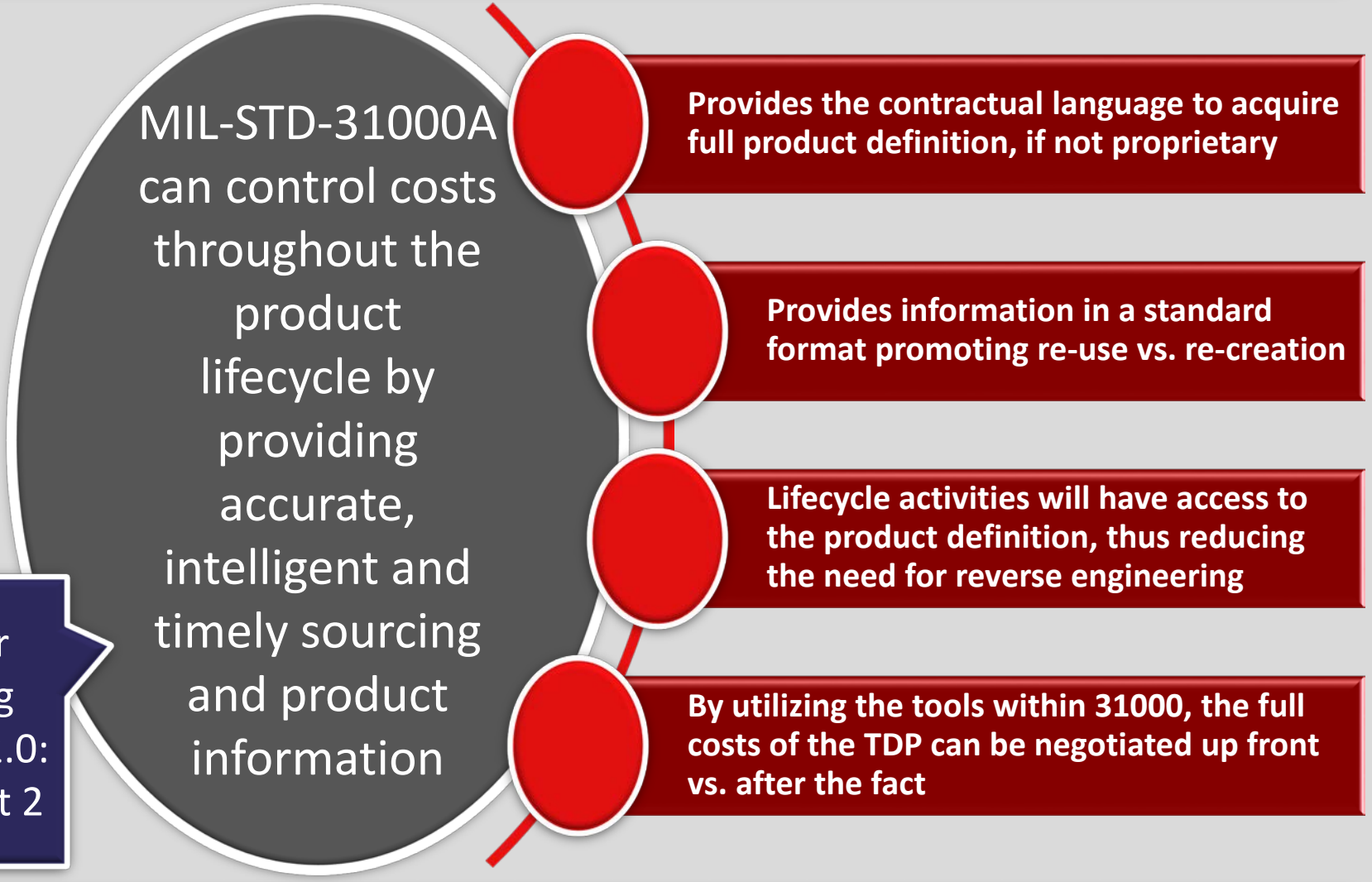
MIL-STD-31000A can strategically support each of these elements.

BBP2.0 Achieve Affordable Programs And MIL-STD-31000A



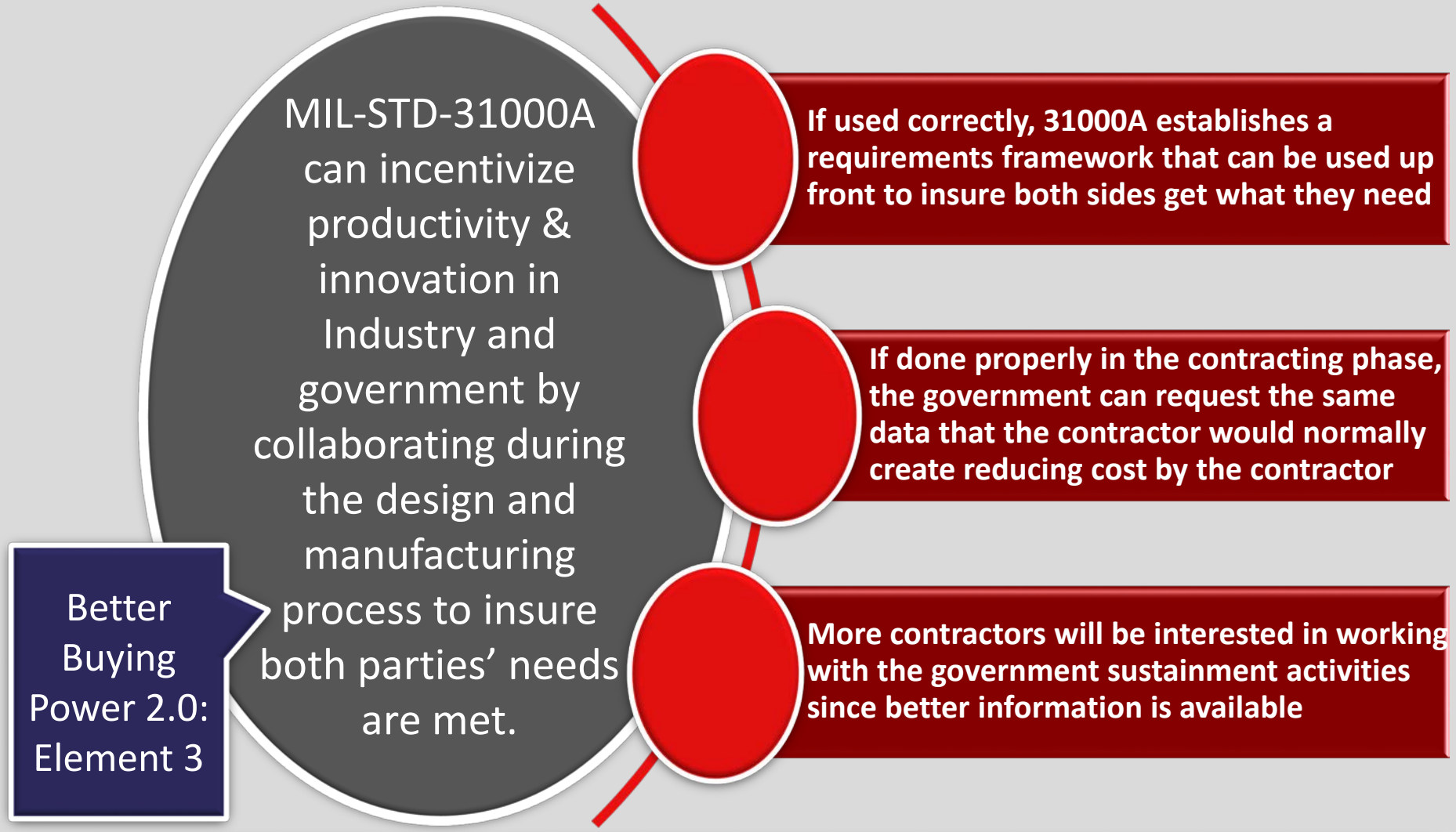
Better Buying Power 2.0: Element 1

BBP2.0 Control Costs And MIL-STD-31000A

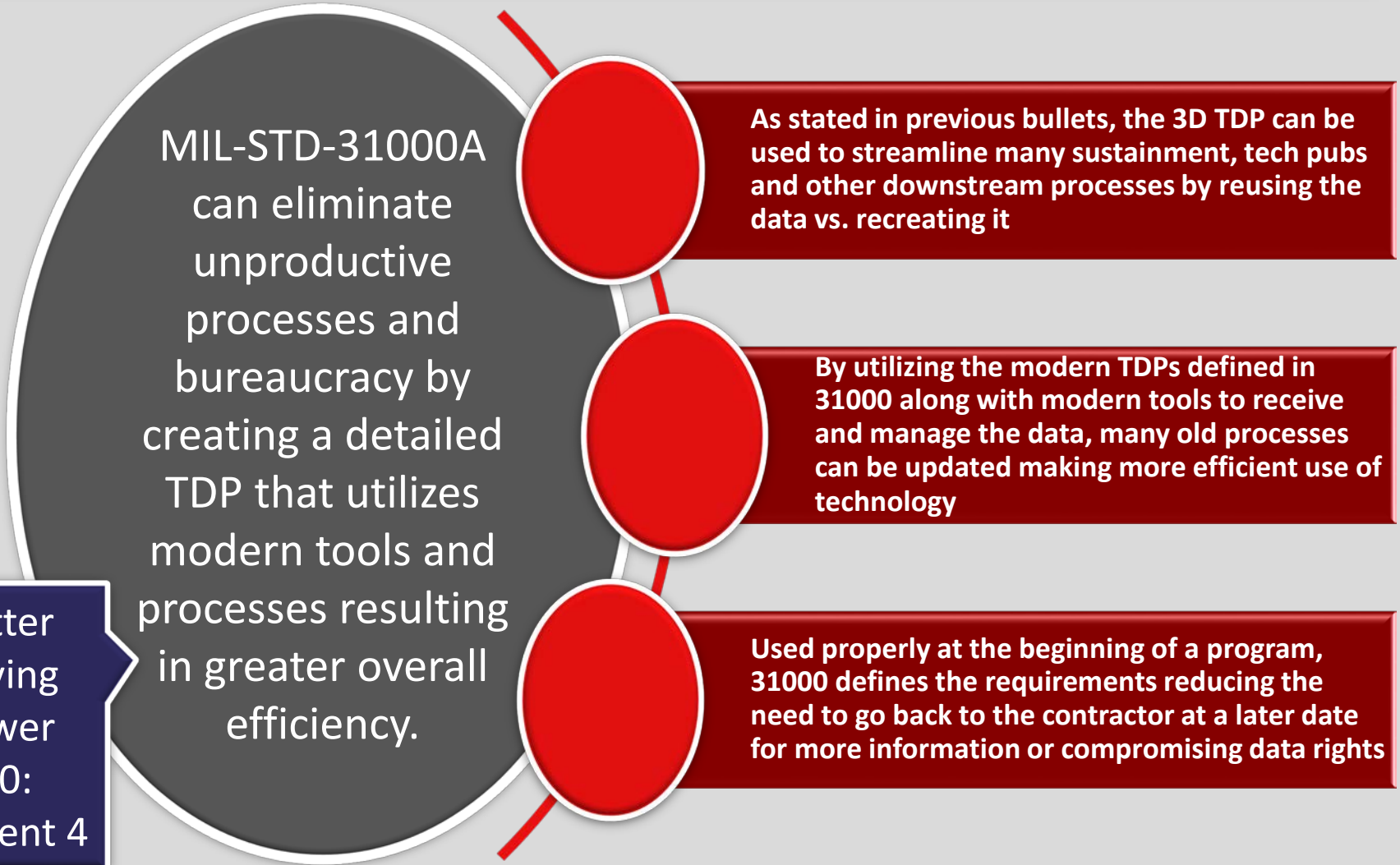


Better Buying Power 2.0: Element 2

BBP2.0 Incentivize Productivity & Innovation And MIL-STD-31000A

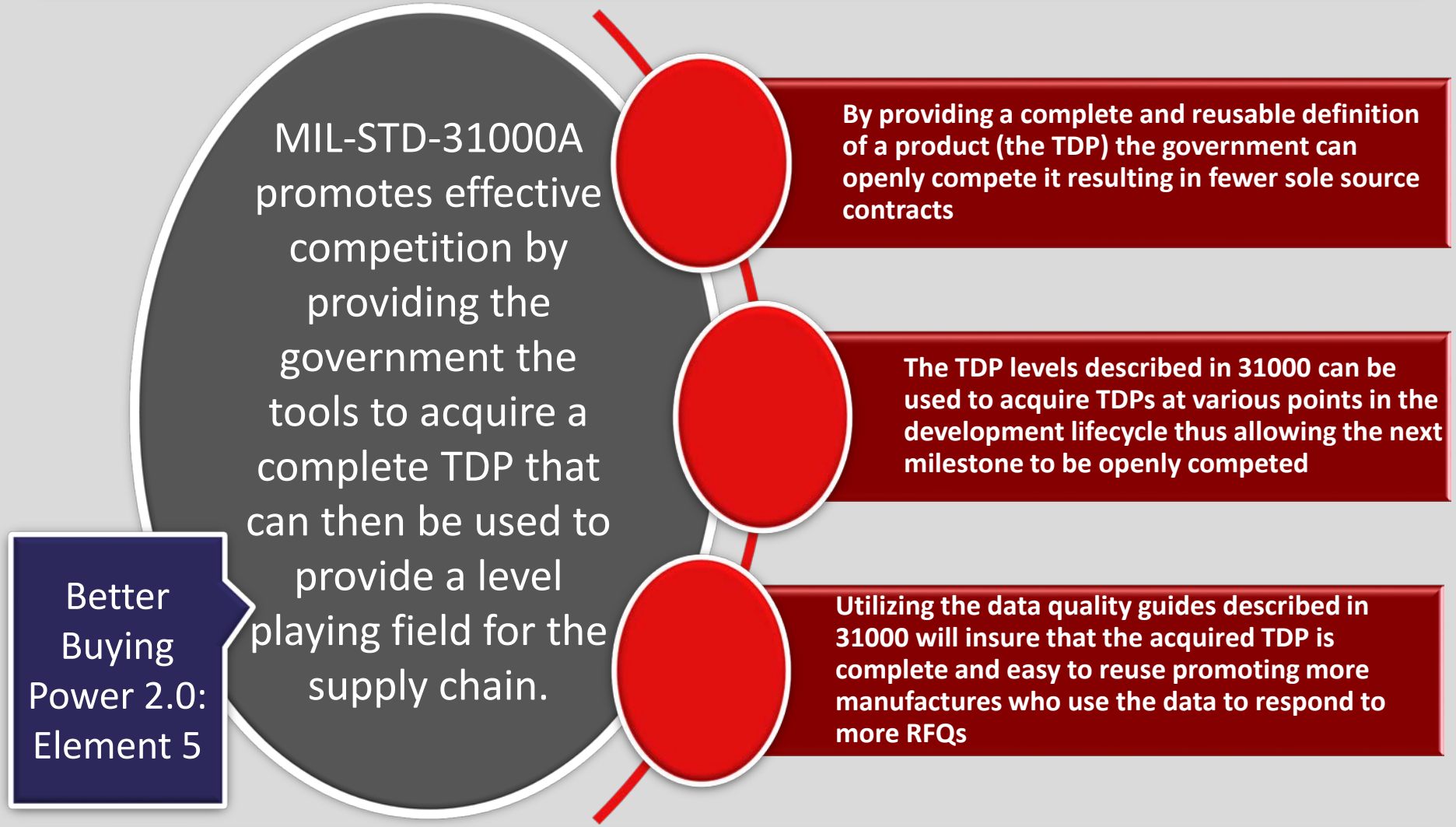


BBP2.0 Eliminate Unproductive Processes and Bureaucracy And MIL-STD-31000A



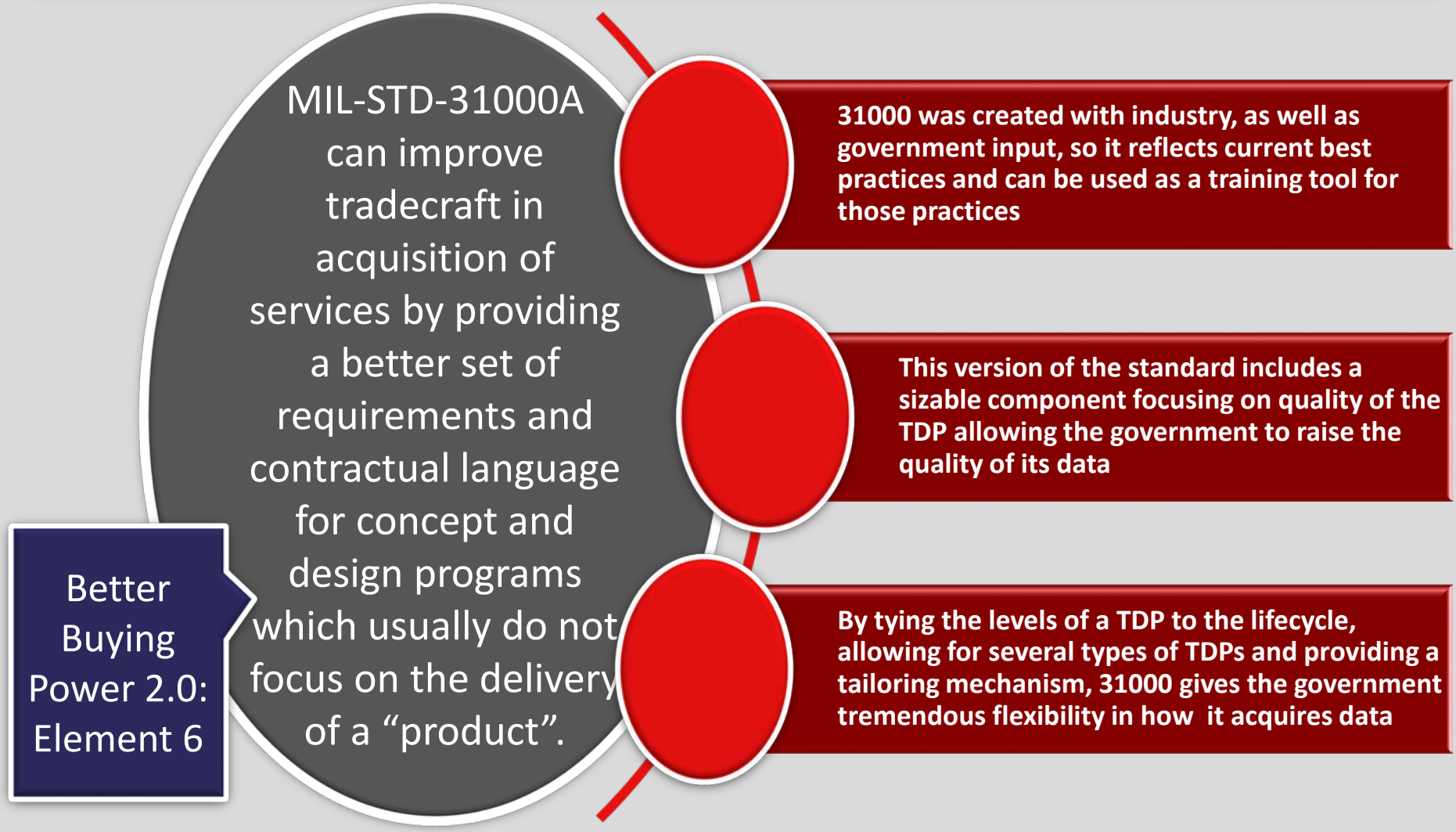
Better Buying Power 2.0: Element 4

BBP2.0 Promote Effective Competition And MIL-STD-31000A

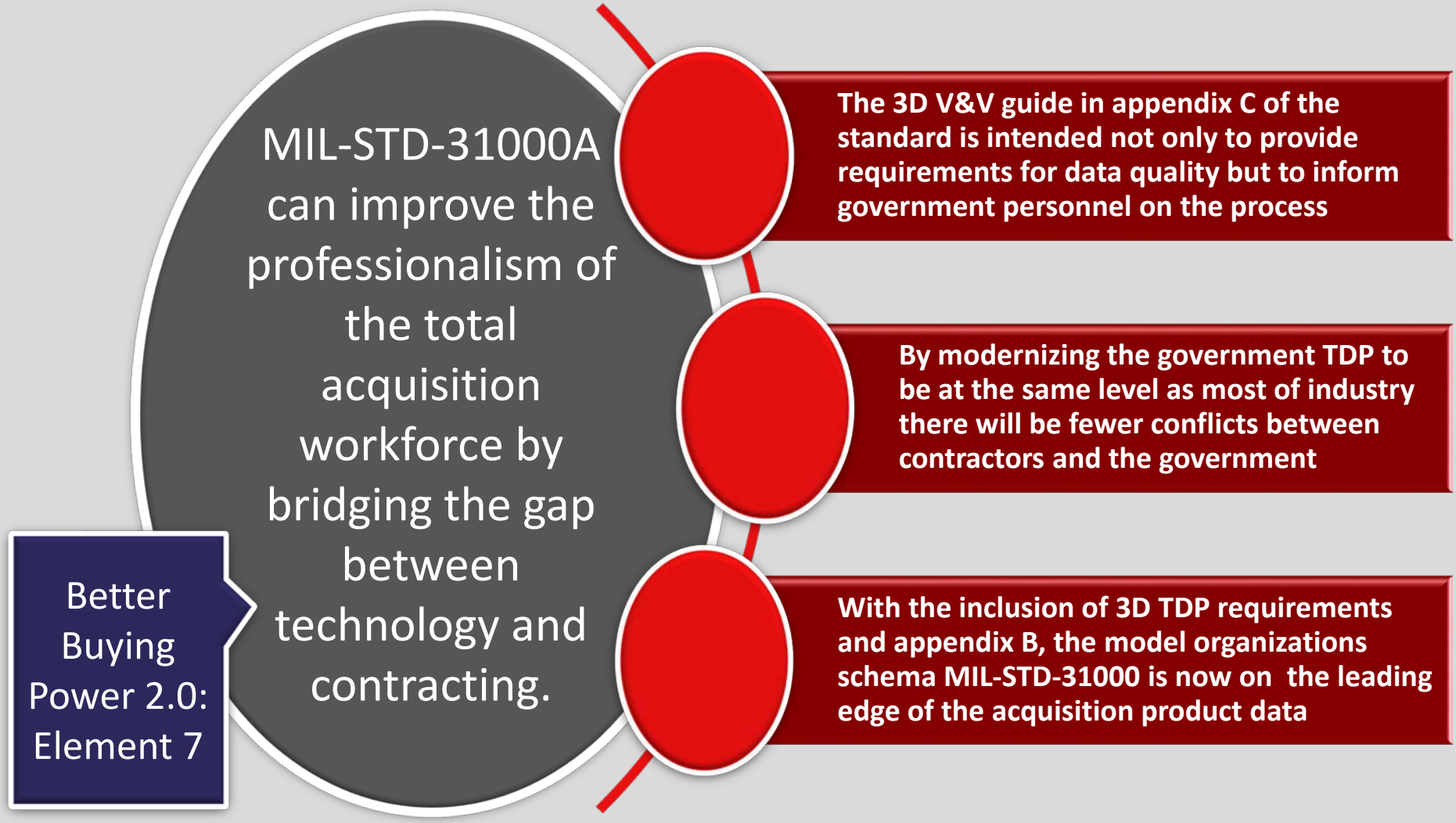


Better Buying Power 2.0: Element 5

BBP2.0 Improve Tradecraft In Acquisition Of Services And MIL-STD-31000A



BBP2.0 Improve the Professionalism Of The Total Acquisition Workforce And MIL-STD-31000A



Summary

MIL-STD-31000A achieves Better Buying Power 2.0

- By utilizing technology to increase competition, reduce sourcing costs, shorten lead time and improve quality throughout the product lifecycle
- By modernizing the TDP process to be equivalent to industry and raising the bar on how the government acquires TDPs

Introduction

Benefits: Why do we want to use this standard?

- Benefits
- BBP 2.0 Tie In
- Background

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The Problem…

There are many problems centered around the TDP, here are some examples:

Legacy Systems

- 2D TDP, if any
- Outdated
- Hard to manufacture from

No TDP

- Never Purchased
- Deemed too expensive
- Resides at the OEM

No Current OEM

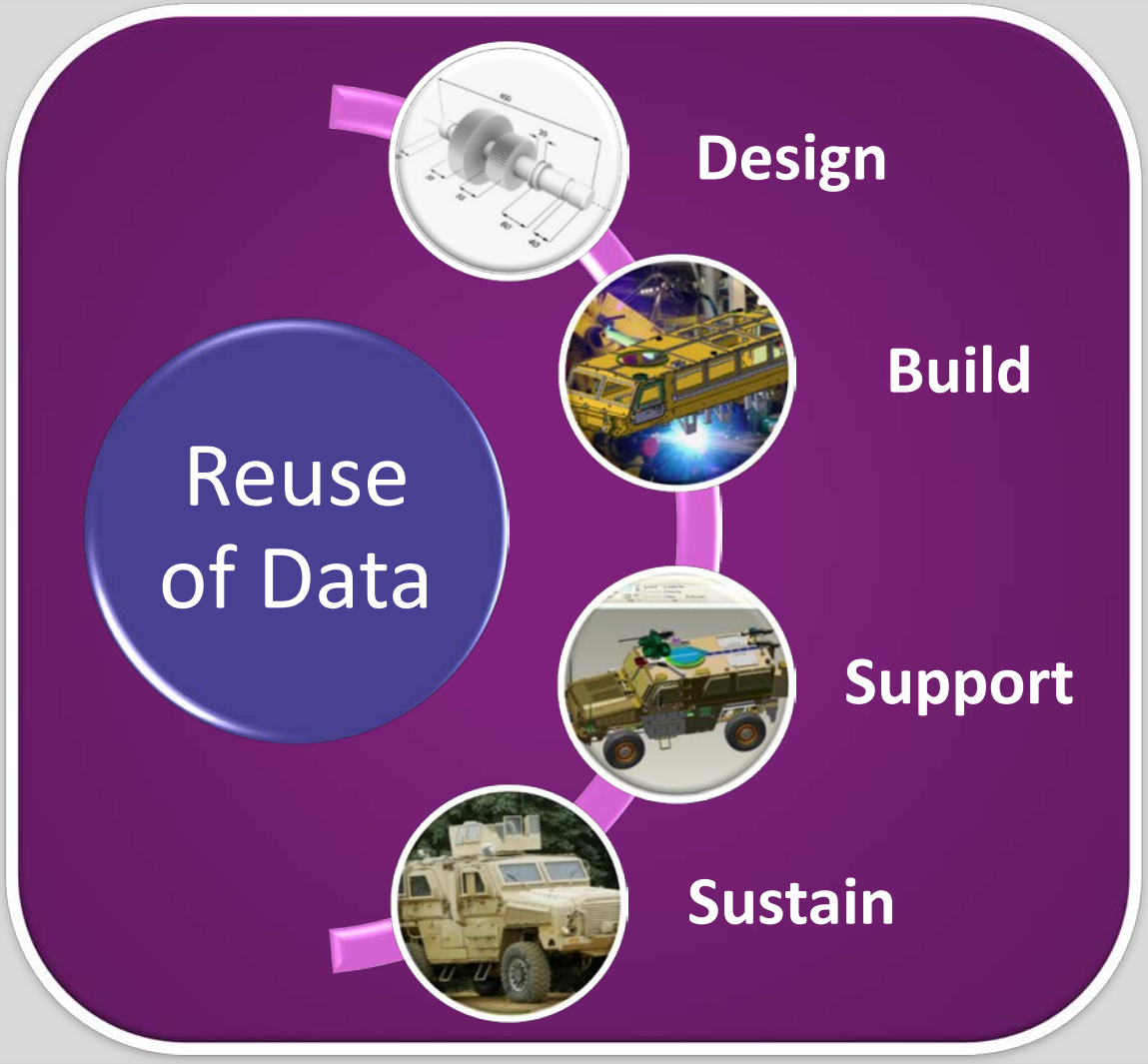
- Original OEM out of business
- TDPs, if available are incomplete

Sustainment

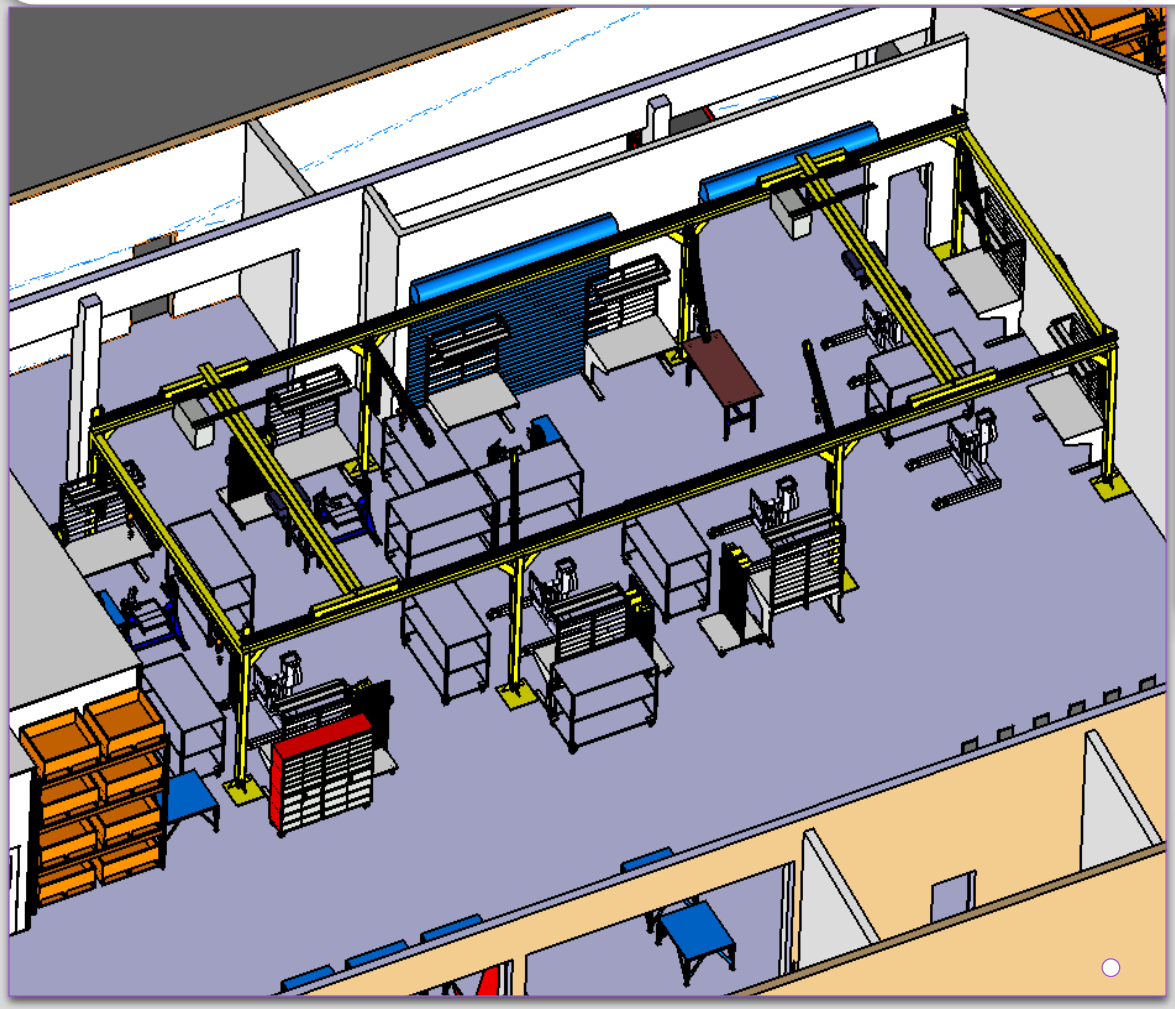
- TDP may, or may not, exist
- Must reverse engineer
- Late in the lifecycle

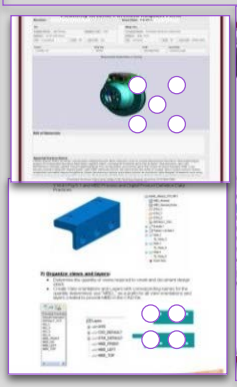
3D TDP Reuse

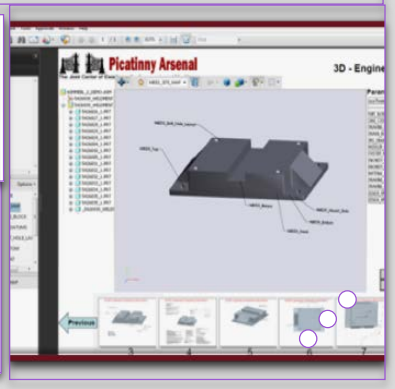
A 3D TDP enables the reuse of data throughout the lifecycle, without it the data must be reverse engineered or re-mastered



Examples Of Data Reuse







Virtual Manufacturing

Digital Work Instructions

3D PDF Micro TDP

Tech Pubs

E Sourcing

The Cost Of A Drawing Based TDP

Acquisition

- Inability to source
- Increased cost of changes
- Data re-mastered for MFG
- Increased ambiguity
- Schedule delays

Sustainment

- Reverse engineered TDP
- Depot start up delays
- Tech pubs delayed
- Decreased readiness
- Increase rework

Studies show that 50% of an engineer's time is lost due to dealing with "bad" data

The Core Standard

Defining a TDP: What is it? What is it made of?

- Worksheets
- 2D & 3D TDPs
- TDP Levels
- Defining a TDP

Introduction | **Core Standard** | Appendixes | Closing

TDP – The Heart Of The Standard

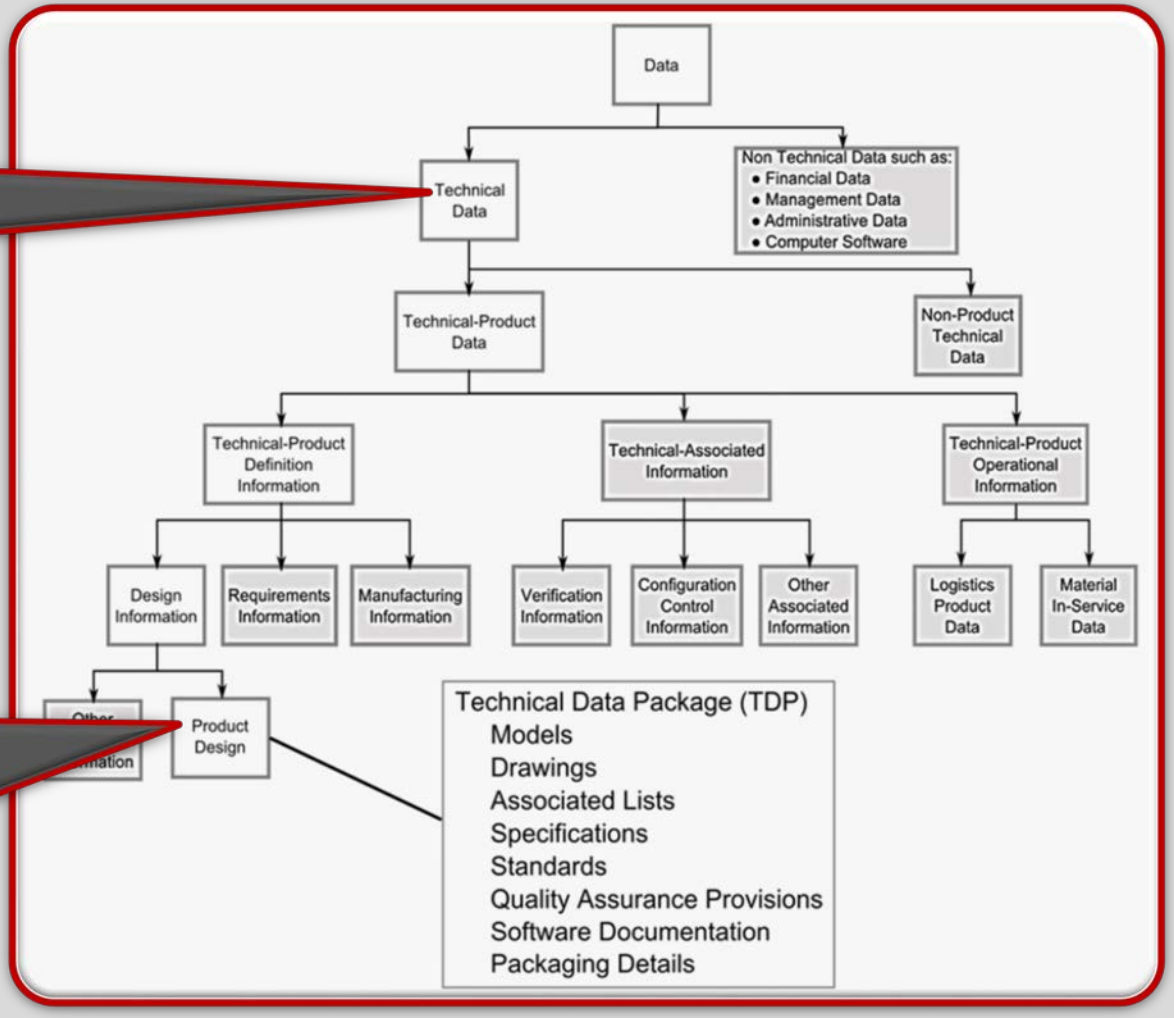
MIL-STD-31000A defines a TDP as:

"A technical description of an item adequate for supporting an acquisition, production, engineering, and logistics support (e.g. Engineering Data for Provisioning, Training, and Technical Manuals). The description defines the required design configuration or performance requirements, and procedures required to ensure adequacy of item performance. It consists of applicable technical data such as models, drawings, associated lists, specifications, standards, performance requirements, QAP, software documentation and packaging details."

TDP In The Hierarchy Of Data

Technical Data Includes Many Types of Data

The TDP is a subset of Product Design Data which is on the bottom tier of data



What A TDP Is Not

The TDP does not include:

- Manufacturing information
- Requirements information
- Test information
- Logistics product information

The TDP is basically about the product definition not how the product is made or supported

The Core Standard

Levels of a TDP: The different types of TDPs

- Worksheets
- 2D & 3D TDPs
- TDP Levels
- Defining a TDP

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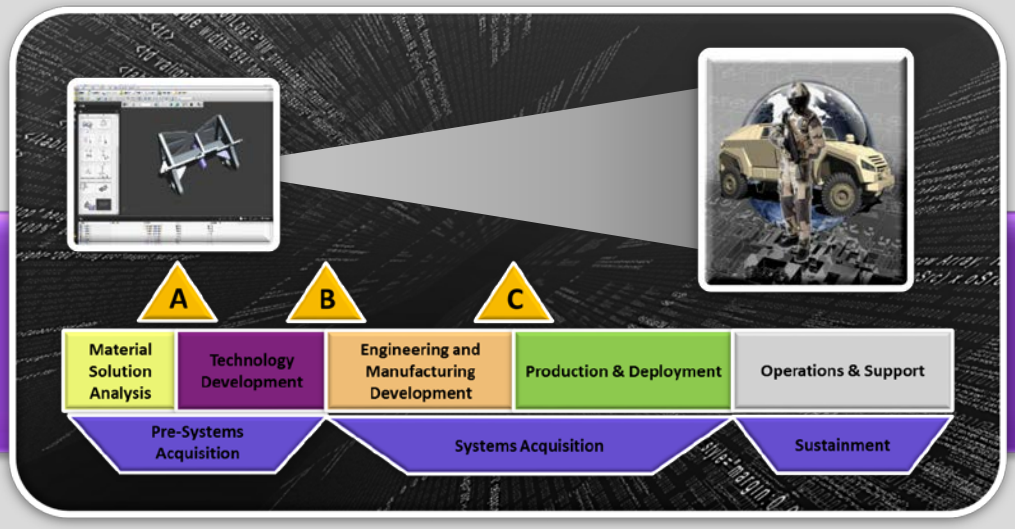
The New Levels

- The old MIL-DTL-31000 used numeric levels (1, 2, and 3) to describe ascending levels of detail, where a level 3 would fully define a product
- MIL-STD-31000 ties this concept to the lifecycle
  - Conceptual Level
  - Developmental Level
  - Production Level



Definition: Conceptual Level

Conceptual Level. - A conceptual design TDP shall consist of those TDP elements necessary to define design concepts in graphic form, and include appropriate textual information required for analysis and evaluation of those concepts. The data will generally consist of simple sketches/models, artist renderings and/or basic textual data. The data may consist of the system performance specification and can be supported by Conceptual design drawings and/or models as specified by the contract.

Definition: Developmental Level

Developmental Level. - A developmental prototype TDP shall consist of those TDP elements necessary to provide sufficient data to support the analysis of a specific design approach, the fabrication of prototype materiel for test or experimentation, and limited production by the original design organization or with assistance from the original design organization. The data may consist of the unique item specifications. for all system component Configuration Items (CIs) and can be supported by developmental design drawings and/or models along with any required associated lists as specified by the contract.

Definition: Production Level

Production Level. - A production level TDP shall consist of those TDP elements necessary to provide the design, engineering, manufacturing, inspection, packaging and quality assurance provisions information necessary to enable the procurement or manufacture of an item. The product shall be defined to the extent necessary for a competent manufacturer to produce an item, which duplicates the physical, interface, and functional characteristics of the original product, without additional design engineering effort or recourse to the current design activity. Production data shall reflect the approved, tested, and accepted configuration of the defined delivered item. The data may consist of product drawings and/or models along with all required associated lists; SIE drawings and/or models along with all required associated lists; ST drawings and/or models along with all required associated lists; specifications; software documentation; SPI drawings and/or models along with all required associated lists; and QAP as specified by the contract.

Level Comparison

Conceptual

- Designed for the end of the pre-acquisition phase
- Lowest amount of detail
- Concepts only, not able to build to

Developmental

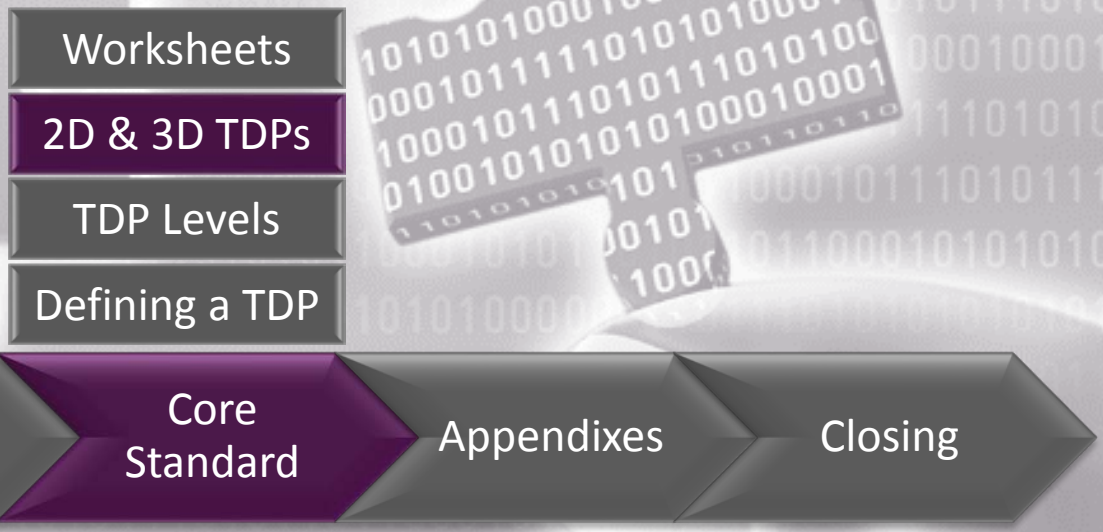
- Represents the midpoint of the systems acquisition phase
- Good level of detail
- May or may not be able to build to

Production

- Represents the entry into the production
- Highest level of detail with full product definition
- Can support product build

The Core Standard

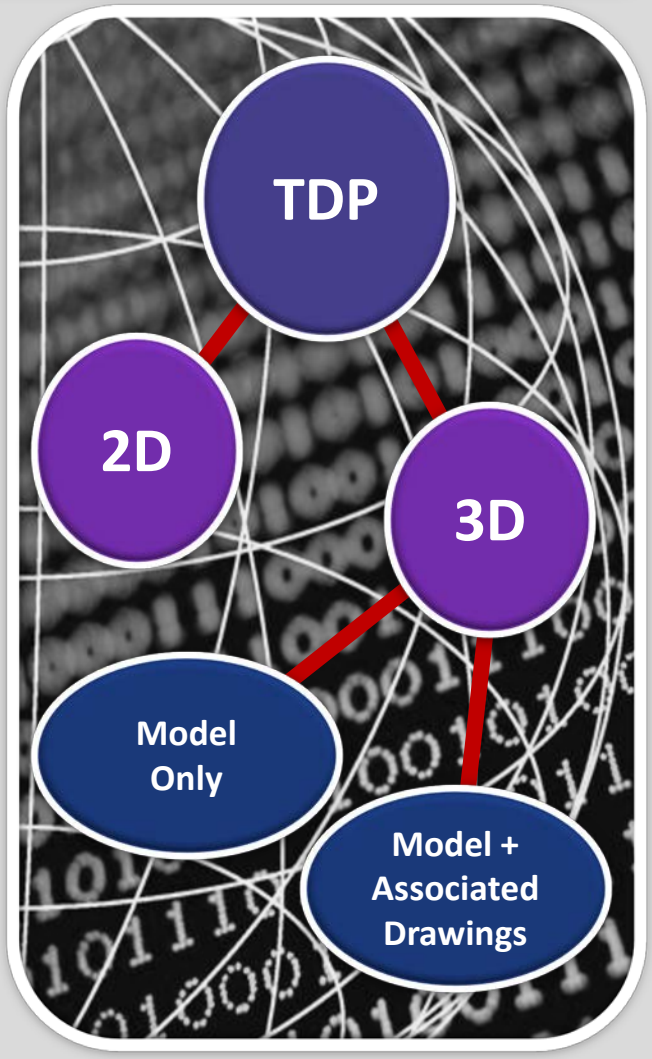
2D and 3D TDPs: Supporting both old and new styles of TDPs



Types Of A TDP

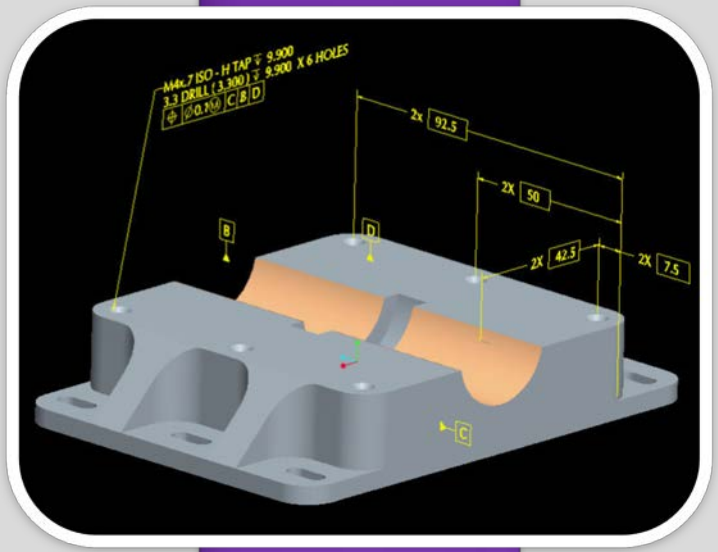
MIL-STD-31000A supports two basic types of TDPs:

- 2-Dimensional (2D)
  - Traditional drawings and document based
- 3-Dimensional (3D)
  - There are two subsets of 3D TDPS
    - Model Only
    - Models With Associated 2D drawings



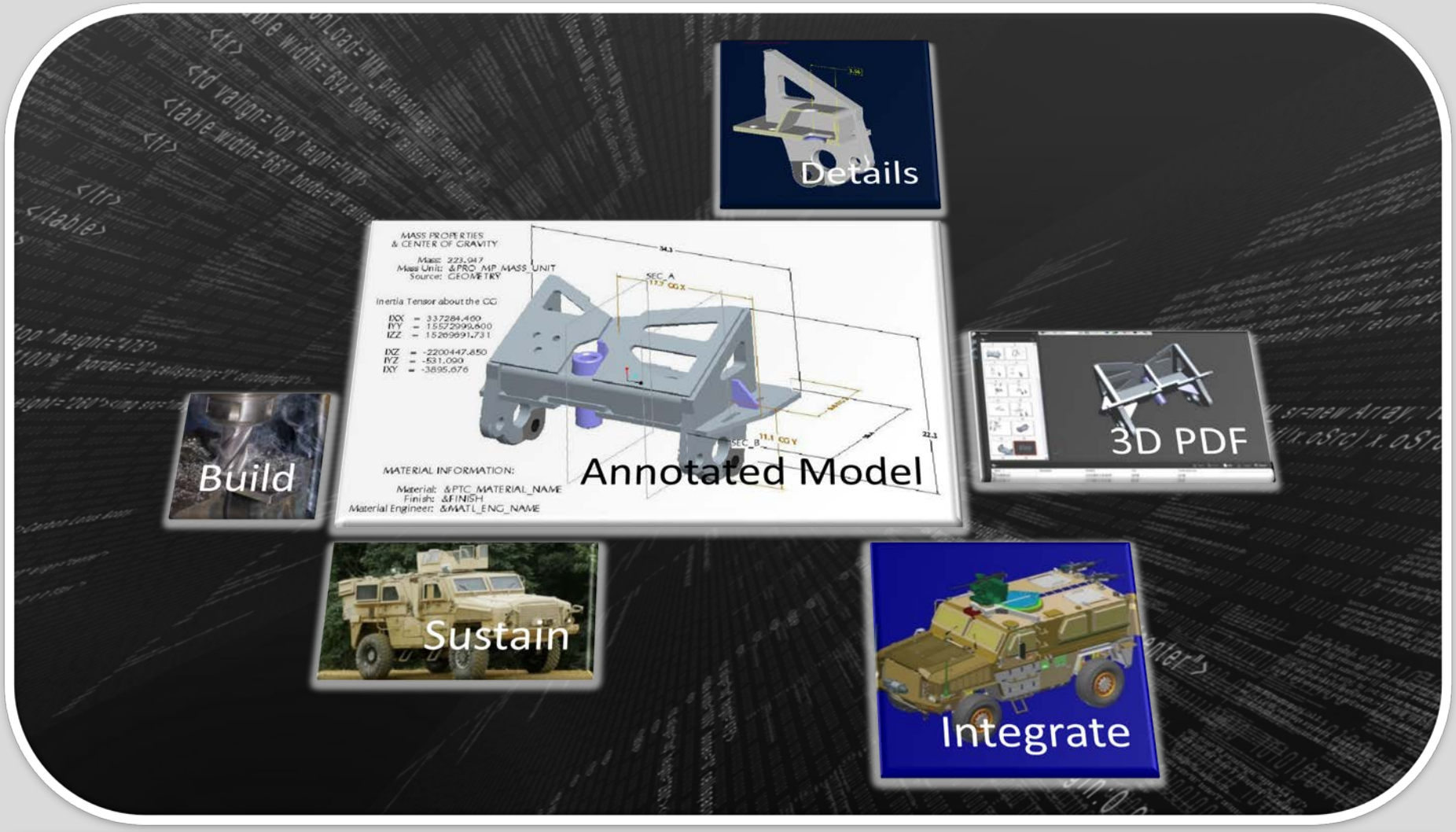
What is a 3D TDP?

- A set of technical data based upon a 3D Solid Model (aka an Annotated Model) that provides the product definition of an item
- It replaces a traditional drawing based TDP
- Can contain many types of related data



Provides a foundation for reuse downstream

3D Foundation



Comparison Of TDP Types

2D TDP

- Consists of traditional 2D drawings for the product definition
- Also has other document based TDP elements
- Traditionally has no “intelligence” or data relationships

3D TDP

Model Only

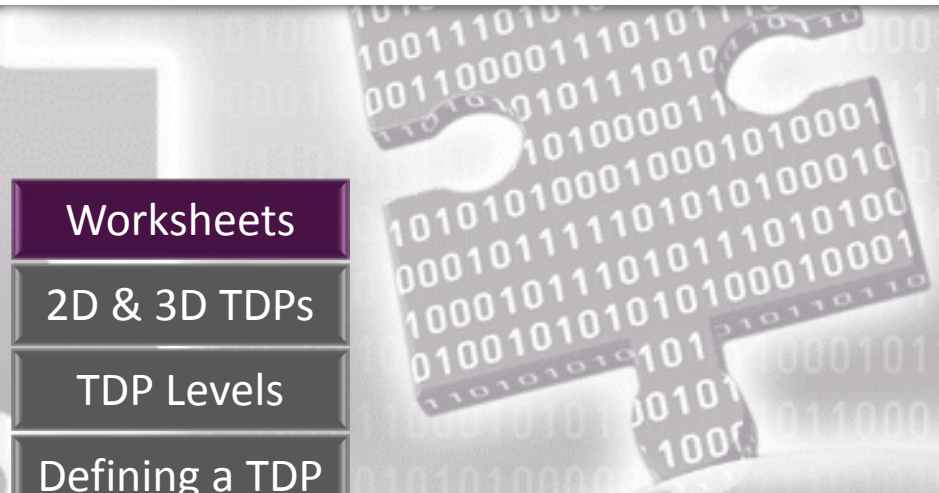
- Uses only the 3D CAD model for product definition
- Can contain supplemental document based TDP elements
- Contains many relationships and intelligent data

Model Plus Associated Drawings

- Uses the 3D model as the master but also has linked drawings
- Can contain supplemental document based TDP elements
- Same intelligence as model only and the drawings are driven by the model

The Core Standard

The Option Selection Worksheets:
The primary way to use the standard



- Worksheets
- 2D & 3D TDPs
- TDP Levels
- Defining a TDP

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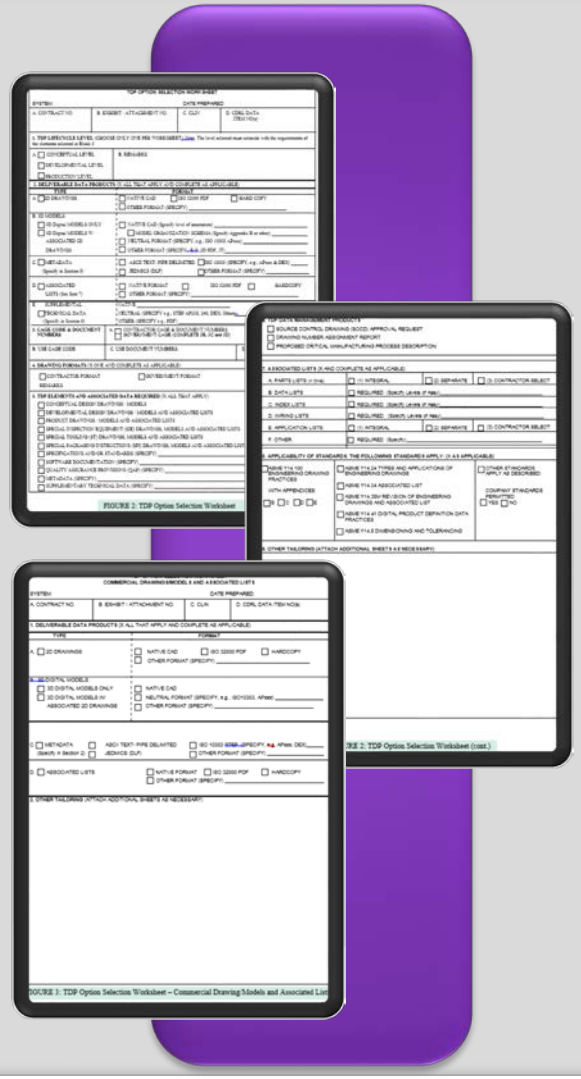
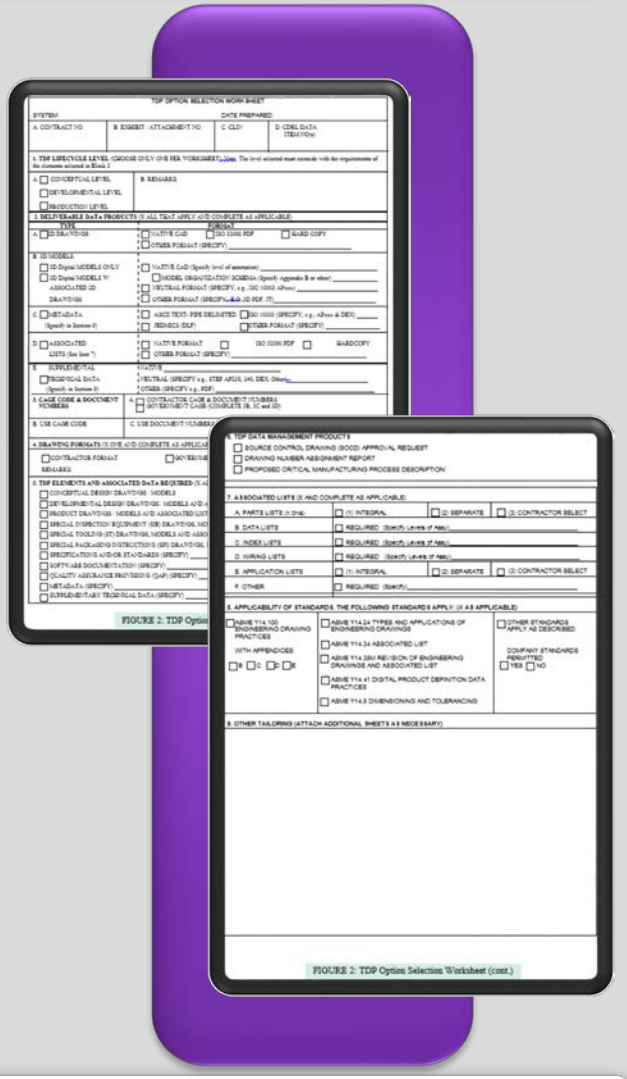
Option Selection Worksheets

- Understanding that each contract/program has different needs MIL-STD-31000A has incorporated the Option Selection Worksheets
- These Worksheets allows the user to select which TDP elements are needed for their effort
- The worksheets should be included as part of the SOW or CDRL
- Appendix A provides detailed explanations of each block contained with in the worksheet



The Option Selection Worksheet

- There are two worksheets the first of which covers the primary TDP Elements
- It contains 9 sections spread over 2 pages
- These sections focus on what elements are needed and there corresponding formats



Section 1

TDP OPTION SELECTION WORKSHEET

SYSTEM: DATE PREPARED:

A. CONTRACT NO.	B. EXHIBIT / ATTACHMENT NO.	C. CLIN	D. CDRL DATA ITEM NO(s)

1. TDP LIFECYCLE LEVEL (CHOOSE ONLY ONE PER WORKSHEET) Note: The level selected must coincide with the requirements of the elements selected in Block 5.

A.	B. REMARKS:
☐ CONCEPTUAL LEVEL ☐ DEVELOPMENTAL LEVEL ☐ PRODUCTION LEVEL	

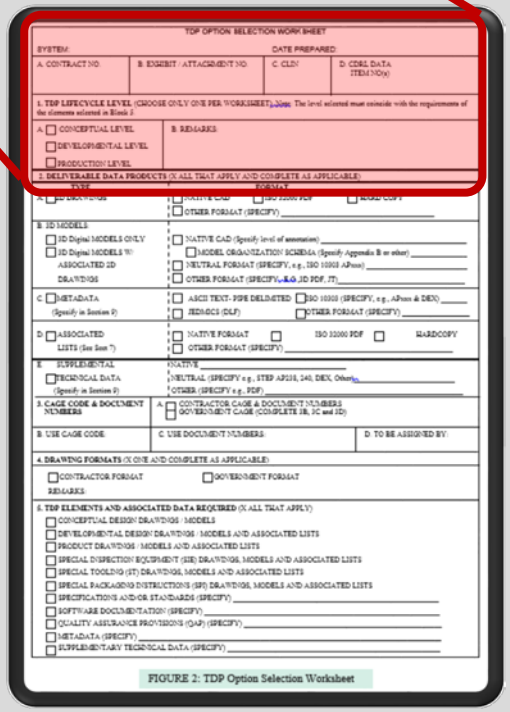


FIGURE 2: TDP Option Selection Worksheet

- This section covers the high-level contract information
- Most importantly it defines what level of TDP is being acquired:
  - Conceptual
  - Developmental
  - Production

Section 2

2. DELIVERABLE DATA PRODUCTS (X ALL THAT APPLY AND COMPLETE AS APPLICABLE)

TYPE	FORMAT
A. ☐ 2D DRAWINGS	☐ NATIVE CAD ☐ ISO 32000 PDF ☐ HARD COPY ☐ OTHER FORMAT (SPECIFY) _____
B. 3D MODELS: ☐ 3D Digital MODELS ONLY ☐ 3D Digital MODELS W/ ASSOCIATED 2D DRAWINGS	☐ NATIVE CAD (Specify level of annotation) _____ ☐ MODEL ORGANIZATION SCHEMA (Specify Appendix B or other) _____ ☐ NEUTRAL FORMAT (SPECIFY, e.g., ISO 10303 APxxx) _____ ☐ OTHER FORMAT (SPECIFY, E.G.,3D PDF, JT)_____
C. ☐ METADATA (Specify in Section 9)	☐ ASCII TEXT- PIPE DELIMITED ☐ ISO 10303 (SPECIFY, e.g., APxxx & DEX) _____ ☐ JEDMICS (DLF) ☐ OTHER FORMAT (SPECIFY) _____
D. ☐ ASSOCIATED LISTS (See Sect 7)	☐ NATIVE FORMAT ☐ ISO 32000 PDF ☐ HARDCOPY ☐ OTHER FORMAT (SPECIFY) _____
E. SUPPLEMENTAL ☐ TECHNICAL DATA (Specify in Section 9)	NATIVE _____ NEUTRAL (SPECIFY e.g., STEP AP238, 240, DEX, Other)_____ OTHER (SPECIFY e.g., PDF) _____

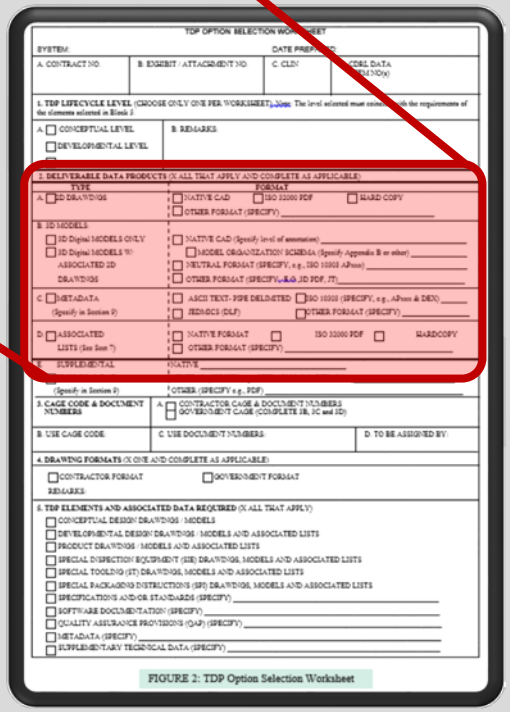


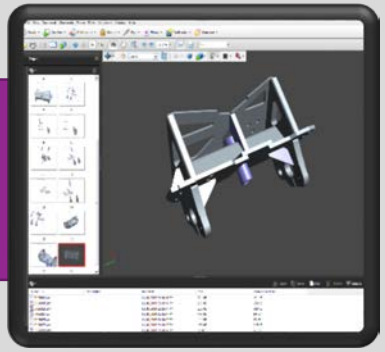
FIGURE 2: TDP Option Selection Worksheet

- This section begins the selection of what TDP elements are required
- It also shows in what format the information should be delivered

Section 2 Continued

- There are 5 element types described
  - Drawings
  - Models
  - Metadata
  - Associated Lists
  - Supplemental Technical Data
- Each element has an associated format selection area as well

OR



General Recommendations Are:

- If Drawings are required they should be associated to the model
- Require models whenever possible
- Try to obtain the Native, Neutral, and Lightweight File
- Whenever possible deliverables should be in a standard based format

Section 3

3. CAGE CODE & DOCUMENT NUMBERS	A. ☐ CONTRACTOR CAGE & DOCUMENT NUMBERS ☐ GOVERNMENT CAGE (COMPLETE 3B, 3C and 3D)	
B. USE CAGE CODE:	C. USE DOCUMENT NUMBERS:	D. TO BE ASSIGNED BY:

- This section defines what CAGE code should be used by the TDP
- It also defines what document numbers should be used by the TDP and who is responsible for assigning them (contractor or government)

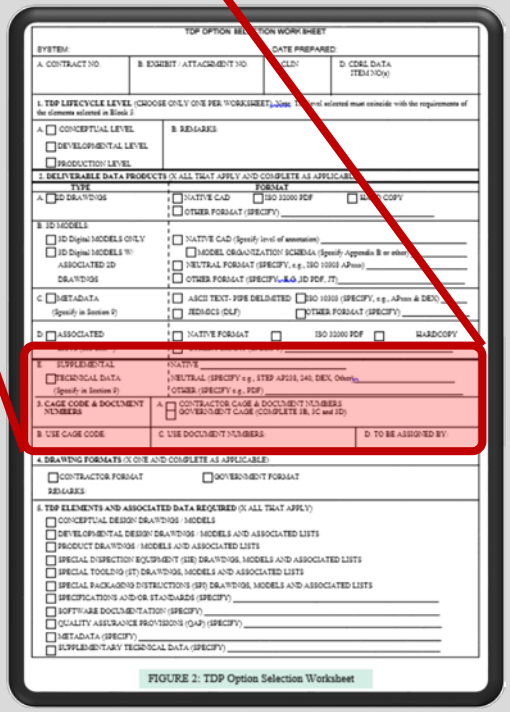

TDP OPTION SELECTION WORK SHEET

FIGURE 2: TDP Option Selection Worksheet

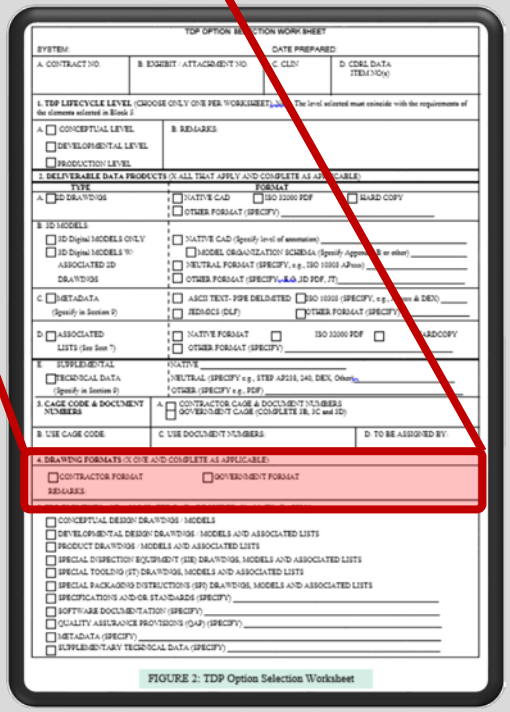
Section 4

4. DRAWING FORMATS (X ONE AND COMPLETE AS APPLICABLE)

☐ CONTRACTOR FORMAT ☐ GOVERNMENT FORMAT

REMARKS: _____

- If either associative or stand-a-lone drawings are required this section defines who's drawing format should be used
- The choices here are the contractors or the government
- Additional remarks can be added to provide more requirements
- Format refers to the basic template use on a drawing as place holders for general information and layout


TDP OPTION SELECTION WORKSHEET

SYSTEM: DATE PREPARED:

A. CONTRACT NO. | B. EXHIBIT / ATTACHMENT NO. | C. CLIN | D. CDRL DATA ITEM NO(s)

1. TDP LIFECYCLE LEVEL (CHOOSE ONLY ONE PER WORKSHEET) ... The level selected must coincide with the requirements of the elements selected in Block 3

A. ☐ CONCEPTUAL LEVEL ☐ DEVELOPMENTAL LEVEL ☐ PRODUCTION LEVEL — B. REMARKS:

2. DELIVERABLE DATA PRODUCTS (X ALL THAT APPLY AND COMPLETE AS APPLICABLE)

TYPE	FORMAT
A. ☐ 2D DRAWINGS	☐ NATIVE CAD ☐ ISO 32000 PDF ☐ HARD COPY ☐ OTHER FORMAT (SPECIFY)
B. 3D MODELS	
☐ 3D Digital MODELS ONLY	☐ NATIVE CAD (Specify level of annotation)
☐ 3D Digital MODELS W/ ASSOCIATED 2D DRAWINGS	☐ MODEL ORGANIZATION SCHEMA (Specify Appendix B or other) ☐ NEUTRAL FORMAT (SPECIFY, e.g., ISO 10303 AP###) ☐ OTHER FORMAT (SPECIFY, e.g., JD PDF, JT)
C. ☐ METADATA (Specify in Section 9)	☐ ASCII TEXT- PIPE DELIMITED ☐ ISO 10303 (SPECIFY, e.g., ### & DEX) ☐ JEDMICS (DLF) ☐ OTHER FORMAT (SPECIFY)
D. ☐ ASSOCIATED LISTS (See Item 7)	☐ NATIVE FORMAT ☐ ISO 32000 PDF ☐ HARDCOPY ☐ OTHER FORMAT (SPECIFY)
E. SUPPLEMENTAL TECHNICAL DATA (Specify in Section 9)	NATIVE ☐ NEUTRAL (SPECIFY e.g., STEP AP210, 240, DEX, Other) ☐ OTHER (SPECIFY e.g., PDF)
3. CAGE CODE & DOCUMENT NUMBERS	A. ☐ CONTRACTOR CAGE & DOCUMENT NUMBERS ☐ GOVERNMENT CAGE (COMPLETE 3B, 3C and 3D)
B. USE CAGE CODE	C. USE DOCUMENT NUMBERS: D. TO BE ASSIGNED BY:

4. DRAWING FORMATS (X ONE AND COMPLETE AS APPLICABLE)

☐ CONTRACTOR FORMAT ☐ GOVERNMENT FORMAT

REMARKS:

☐ CONCEPTUAL DESIGN DRAWINGS / MODELS
☐ DEVELOPMENTAL DESIGN DRAWINGS / MODELS AND ASSOCIATED LISTS
☐ PRODUCT DRAWINGS / MODELS AND ASSOCIATED LISTS
☐ SPECIAL INSPECTION EQUIPMENT (SIE) DRAWINGS, MODELS AND ASSOCIATED LISTS
☐ SPECIAL TOOLING (ST) DRAWINGS, MODELS AND ASSOCIATED LISTS
☐ SPECIAL PACKAGING INSTRUCTIONS (SPI) DRAWINGS, MODELS AND ASSOCIATED LISTS
☐ SPECIFICATIONS AND/OR STANDARDS (SPECIFY) _____
☐ SOFTWARE DOCUMENTATION (SPECIFY) _____
☐ QUALITY ASSURANCE PROVISIONS (QAP) (SPECIFY) _____
☐ METADATA (SPECIFY) _____
☐ SUPPLEMENTARY TECHNICAL DATA (SPECIFY) _____

FIGURE 2: TDP Option Selection Worksheet

Section 5

5. TDP ELEMENTS AND ASSOCIATED DATA REQUIRED (X ALL THAT APPLY)

- ☐ CONCEPTUAL DESIGN DRAWINGS / MODELS
- ☐ DEVELOPMENTAL DESIGN DRAWINGS / MODELS AND ASSOCIATED LISTS
- ☐ PRODUCT DRAWINGS / MODELS AND ASSOCIATED LISTS
- ☐ SPECIAL INSPECTION EQUIPMENT (SIE) DRAWINGS, MODELS AND ASSOCIATED LISTS
- ☐ SPECIAL TOOLING (ST) DRAWINGS, MODELS AND ASSOCIATED LISTS
- ☐ SPECIAL PACKAGING INSTRUCTIONS (SPI) DRAWINGS, MODELS AND ASSOCIATED LISTS
- ☐ SPECIFICATIONS AND/OR STANDARDS (SPECIFY) _____
- ☐ SOFTWARE DOCUMENTATION (SPECIFY) _____
- ☐ QUALITY ASSURANCE PROVISIONS (QAP) (SPECIFY) _____
- ☐ METADATA (SPECIFY) _____
- ☐ SUPPLEMENTARY TECHNICAL DATA (SPECIFY) _____

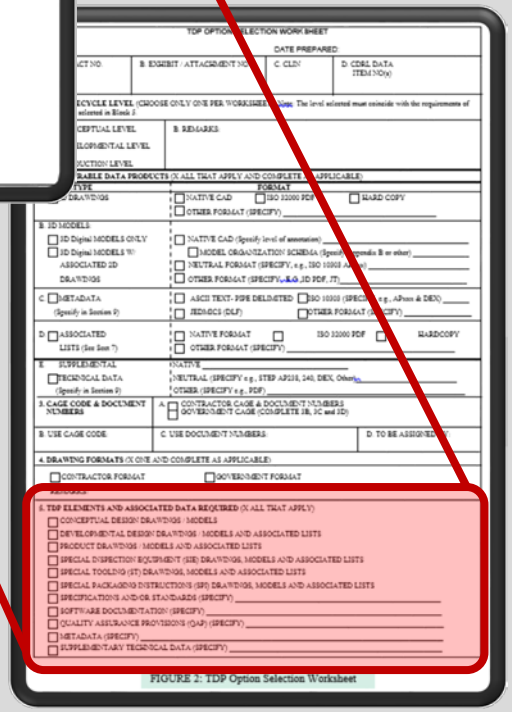

TDP OPTION SELECTION WORKSHEET

FIGURE 2: TDP Option Selection Worksheet

- This section defines the specific elements that are required by the TDP
- Choose all that apply but should also correspond with the choices made ins sections 1 and 2
- If a choice is made that would conflict with sections 1 or 2 explain in section 9

Section 5 Continued

The selections for this section are:

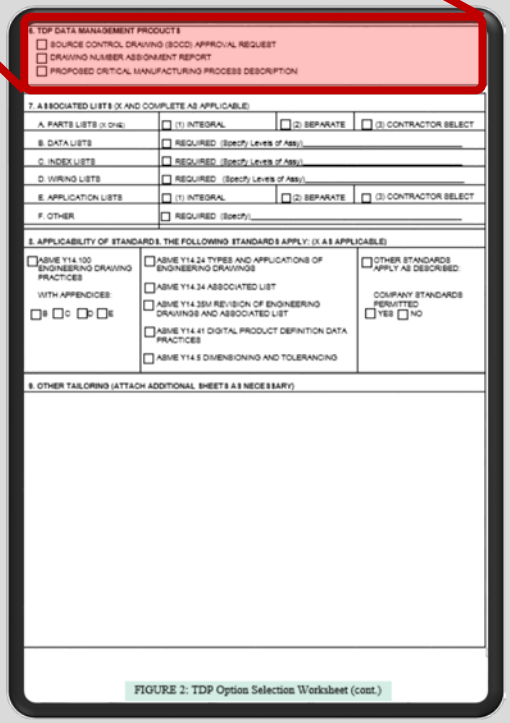
- Conceptual Design Drawings / Models
- Developmental Design Drawings / Models And Associated Lists
- Product Drawings / Models And Associated Lists
- Special Inspection Equipment (SIE) Drawings, Models And Associated Lists
- Special Tooling (ST) Drawings, Models And Associated Lists
- Special Packaging Instructions (SPI) Drawings, Models And Associated Lists
- Specifications And/Or Standards
- Software Documentation
- Quality Assurance Provisions (QAP)
- Metadata
- Supplementary Technical Data

Section 6

6. TDP DATA MANAGEMENT PRODUCTS

- ☐ SOURCE CONTROL DRAWING (SOCD) APPROVAL REQUEST
- ☐ DRAWING NUMBER ASSIGNMENT REPORT
- ☐ PROPOSED CRITICAL MANUFACTURING PROCESS DESCRIPTION

- This section defines elements that are used to manage other aspects of the TDP
- These are:
  - Source Control Drawing Approval
    - Deciding what is sources to use
  - Drawing Number Assignment Report
    - Only used when government CAGE code is used
  - Proposed Critical Manufacturing Process Description
    - Be very cautious, this can lead to sole source and or a very expensive TDP


6. TDP DATA MANAGEMENT PRODUCTS
☐ SOURCE CONTROL DRAWING (SOCD) APPROVAL REQUEST
☐ DRAWING NUMBER ASSIGNMENT REPORT
☐ PROPOSED CRITICAL MANUFACTURING PROCESS DESCRIPTION

7. ASSOCIATED LISTS (X AND COMPLETE AS APPLICABLE)

A. PARTS LISTS (X ONE)	☐ (1) INTEGRAL	☐ (2) SEPARATE	☐ (3) CONTRACTOR SELECT
B. DATA LISTS	☐ REQUIRED (Specify Levels of Assy):		
C. INDEX LISTS	☐ REQUIRED (Specify Levels of Assy):		
D. WIRING LISTS	☐ REQUIRED (Specify Levels of Assy):		
E. APPLICATION LISTS	☐ (1) INTEGRAL	☐ (2) SEPARATE	☐ (3) CONTRACTOR SELECT
F. OTHER	☐ REQUIRED (Specify):		

8. APPLICABILITY OF STANDARD. THE FOLLOWING STANDARDS APPLY: (X AS APPLICABLE)

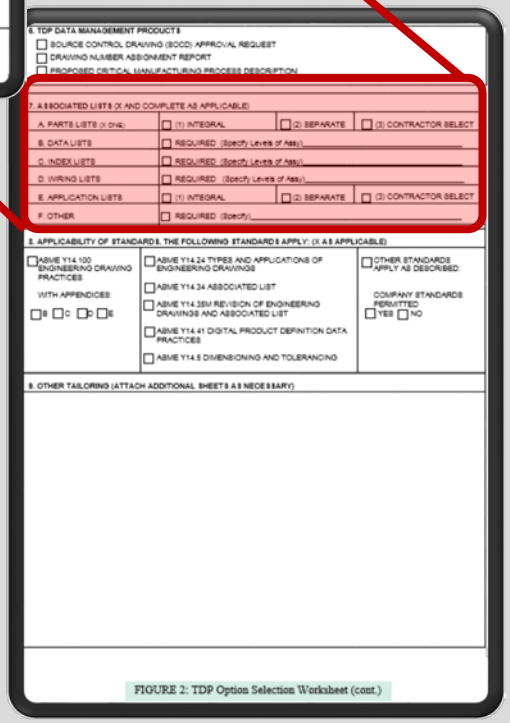
☐ ASME Y14.100 ENGINEERING DRAWING PRACTICES WITH APPENDICES: ☐ B ☐ C ☐ D ☐ E	☐ ASME Y14.24 TYPES AND APPLICATIONS OF ENGINEERING DRAWINGS ☐ ASME Y14.34 ASSOCIATED LIST ☐ ASME Y14.35M REVISION OF ENGINEERING DRAWINGS AND ASSOCIATED LIST ☐ ASME Y14.41 DIGITAL PRODUCT DEFINITION DATA PRACTICES ☐ ASME Y14.5 DIMENSIONING AND TOLERANCING	☐ OTHER STANDARDS APPLY AS DESCRIBED: COMPANY STANDARDS PERMITTED ☐ YES ☐ NO

9. OTHER TAILORING (ATTACH ADDITIONAL SHEETS AS NECESSARY)

FIGURE 2: TDP Option Selection Worksheet (cont.)

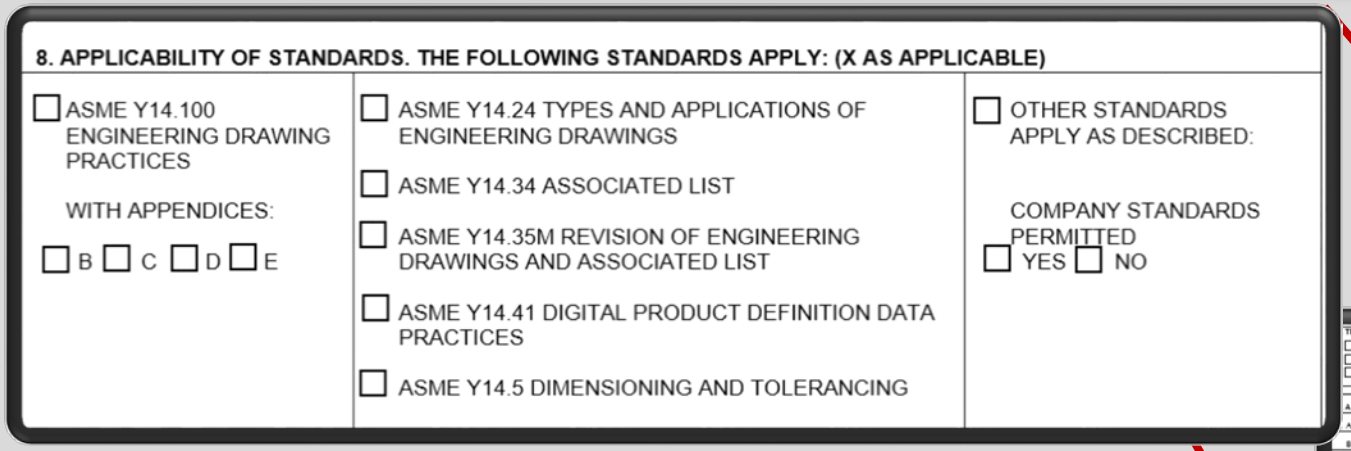
Section 7

7. ASSOCIATED LISTS (X AND COMPLETE AS APPLICABLE)			
A. PARTS LISTS (X ONE)	☐ (1) INTEGRAL	☐ (2) SEPARATE	☐ (3) CONTRACTOR SELECT
B. DATA LISTS	☐ REQUIRED (Specify Levels of Assy)_____		
C. INDEX LISTS	☐ REQUIRED (Specify Levels of Assy)_____		
D. WIRING LISTS	☐ REQUIRED (Specify Levels of Assy)_____		
E. APPLICATION LISTS	☐ (1) INTEGRAL	☐ (2) SEPARATE	☐ (3) CONTRACTOR SELECT
F. OTHER	☐ REQUIRED (Specify)_____		



- If Associated Lists are called out in section 2, use this section to further define what lists are needed
- The terms integral or separate refer to where the list is located (either in the drawing/model) or as a separate document
- Required level refers to what level in the product structure the list is required

Section 8



8. APPLICABILITY OF STANDARDS. THE FOLLOWING STANDARDS APPLY: (X AS APPLICABLE)

☐ ASME Y14.100 ENGINEERING DRAWING PRACTICES WITH APPENDICES: ☐ B ☐ C ☐ D ☐ E	☐ ASME Y14.24 TYPES AND APPLICATIONS OF ENGINEERING DRAWINGS ☐ ASME Y14.34 ASSOCIATED LIST ☐ ASME Y14.35M REVISION OF ENGINEERING DRAWINGS AND ASSOCIATED LIST ☐ ASME Y14.41 DIGITAL PRODUCT DEFINITION DATA PRACTICES ☐ ASME Y14.5 DIMENSIONING AND TOLERANCING	☐ OTHER STANDARDS APPLY AS DESCRIBED: COMPANY STANDARDS PERMITTED ☐ YES ☐ NO

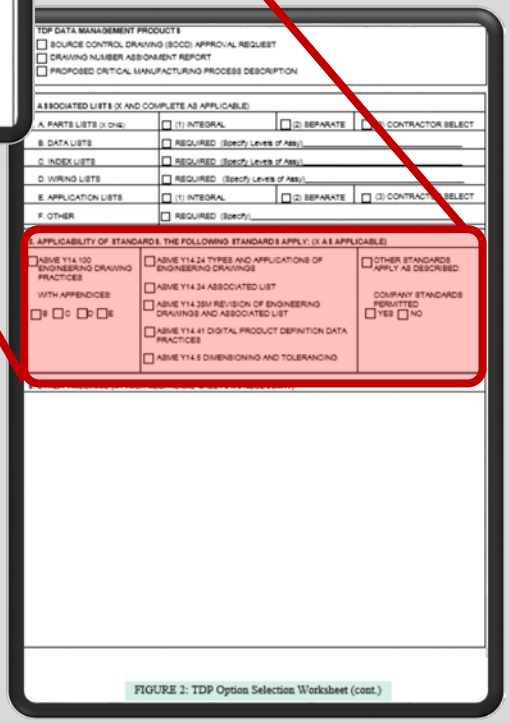


FIGURE 2: TDP Option Selection Worksheet (cont.)

- This step is critical because not all of the element selections have a standard associated with them
- This section allows the user to select what standards should apply to the TDP as a whole
- It also decides if the contractor can use their company standards or not when preparing the TDP

Section 9

9. OTHER TAILORING (ATTACH ADDITIONAL SHEETS AS NECESSARY)

- This section is a freeform area that allows the user to add any additional tailoring information
- Additional documents and/or sheets can be called out to further tailor the TDP
- It is also used to clarify some selections made earlier in the worksheet

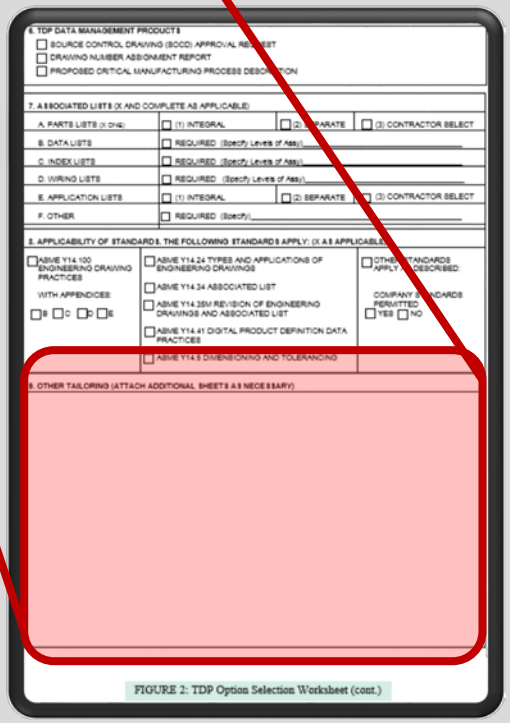
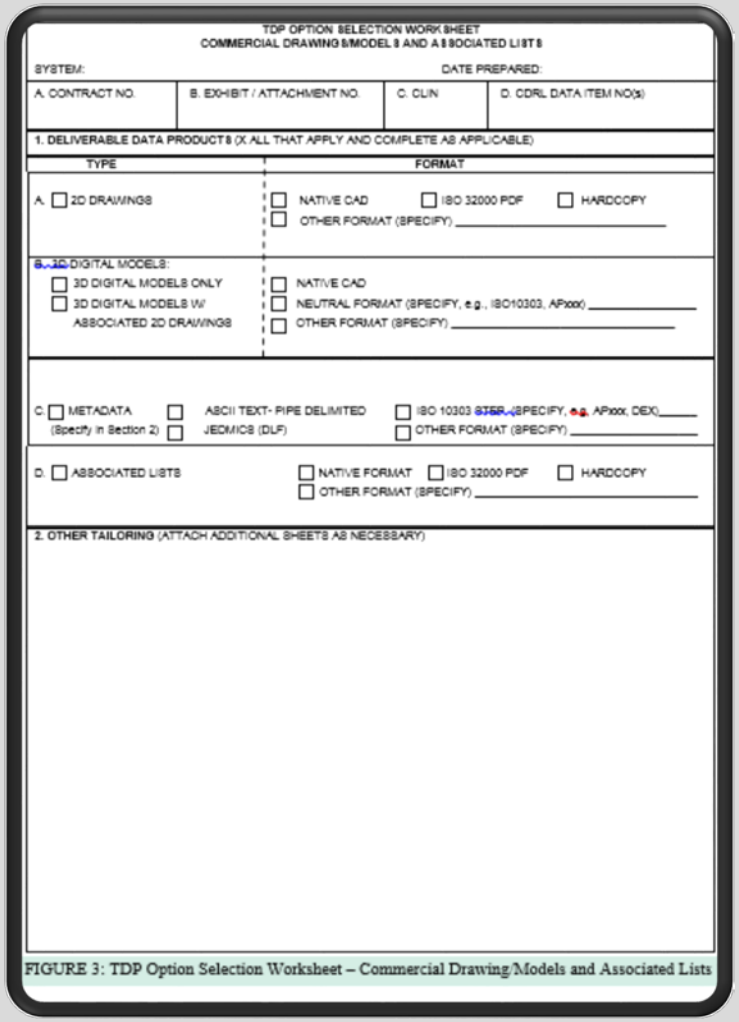


FIGURE 2: TDP Option Selection Worksheet (cont.)

Commercial Drawings/Models and Associated Lists Worksheet

- This worksheet is similar to the previous one but only applies to Commercial Drawings/Models that may be included in the TDP to support COTS (Commercial Off The Shelf) items
- The selections are the same as the previous worksheet except fewer in number because not as much information is available when buying a commercial item



TDP OPTION SELECTION WORK SHEET
COMMERCIAL DRAWINGS/MODELS AND ASSOCIATED LISTS

SYSTEM: DATE PREPARED:

A. CONTRACT NO.	B. EXHIBIT / ATTACHMENT NO.	C. CLIN	D. CDRL DATA ITEM NO(s)

1. DELIVERABLE DATA PRODUCTS (X ALL THAT APPLY AND COMPLETE AS APPLICABLE)

TYPE	FORMAT
A. ☐ 2D DRAWINGS	☐ NATIVE CAD ☐ ISO 32000 PDF ☐ HARDCOPY ☐ OTHER FORMAT (SPECIFY) _____
B. 3D DIGITAL MODELS: ☐ 3D DIGITAL MODELS ONLY ☐ 3D DIGITAL MODELS W/ ASSOCIATED 2D DRAWINGS	☐ NATIVE CAD ☐ NEUTRAL FORMAT (SPECIFY, e.g., ISO10303, APxxx) _____ ☐ OTHER FORMAT (SPECIFY) _____
C. ☐ METADATA (Specify in Section 2) ☐ ☐ ASCII TEXT- PIPE DELIMITED ☐ JEDMICS (DLF)	☐ ISO 10303 STEP (SPECIFY, e.g. APxxx, DEX) _____ ☐ OTHER FORMAT (SPECIFY) _____
D. ☐ ASSOCIATED LISTS	☐ NATIVE FORMAT ☐ ISO 32000 PDF ☐ HARDCOPY ☐ OTHER FORMAT (SPECIFY) _____

2. OTHER TAILORING (ATTACH ADDITIONAL SHEETS AS NECESSARY)

FIGURE 3: TDP Option Selection Worksheet – Commercial Drawing/Models and Associated Lists

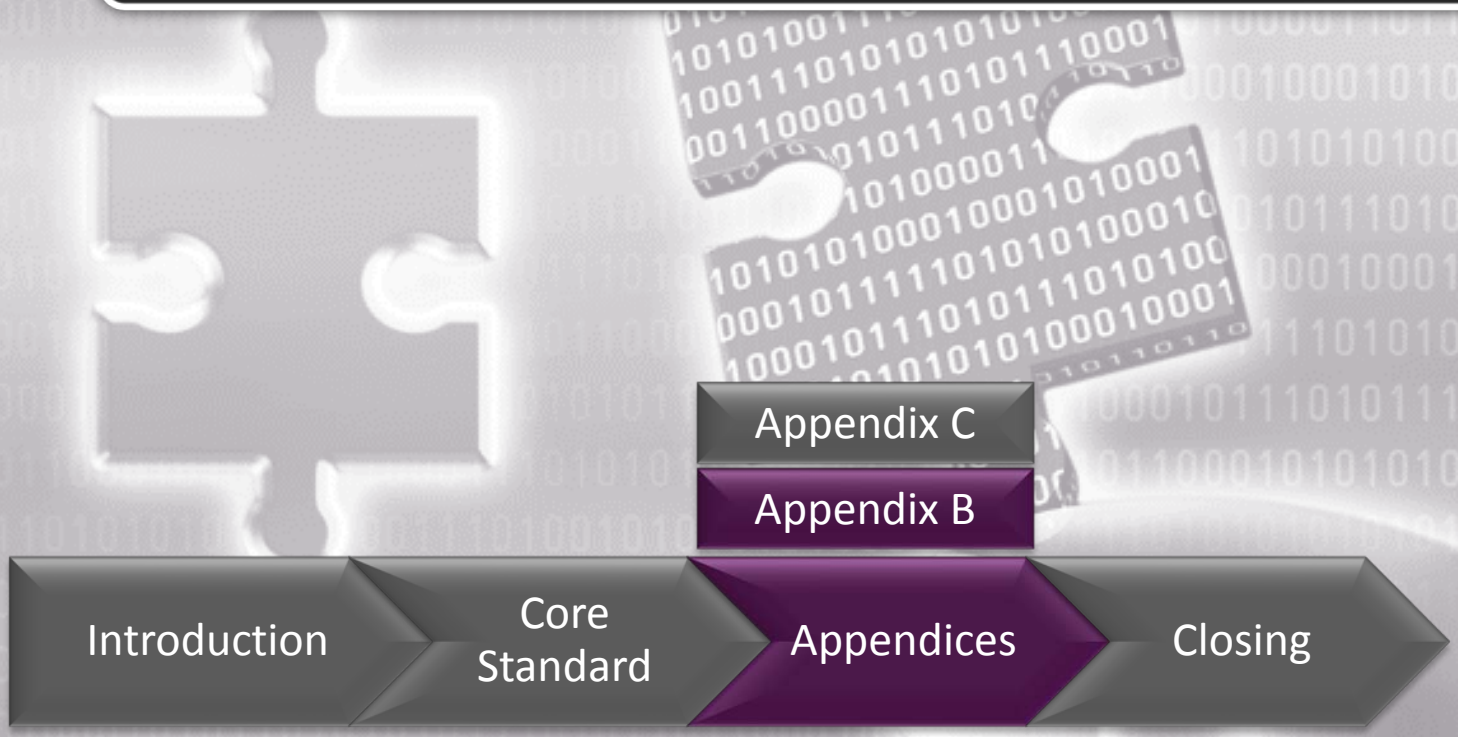
DIDs and MIL-STD-31000

The following Data Item Descriptions are used in conjunction with 31000A

DID Number	DID Title	Suggested Tailoring	Reference Paragraph
DI-SESS-81001E	Conceptual Design Drawings/Models	Appendix A	A.2.4.1
DI-SESS-81002F	Developmental Design Drawings/Models and Associated Lists	Appendix A	A.2.4.2
DI-SESS-81000E	Product Drawings/Models and Associated Lists	Appendix A	A.2.4.3
DI-SESS-81003E	Commercial Drawings/Models and Associated Lists	Appendix A	A.2.4.4
DI-SESS-81004E	Special Inspection Equipment Drawings/Models and Associated Lists	Appendix A	A.2.4.5
DI-SESS-81008E	Special Tooling Drawings/Models and Associated Lists	Appendix A	A.2.4.6
DI-SESS-81010E	Source Control Drawing Approval Request	Appendix A	A.2.5.1.b
DI-SESS-81011E	Drawing/Model Number Assignment Report	Appendix A	A.2.5.2.b
DI-SESS-81012E	Proposed Critical Manufacturing Process Description	Appendix A	A.2.5.3.b
DI-CMAN 80776A	Technical Data Package	Appendix A	A.2.4.3

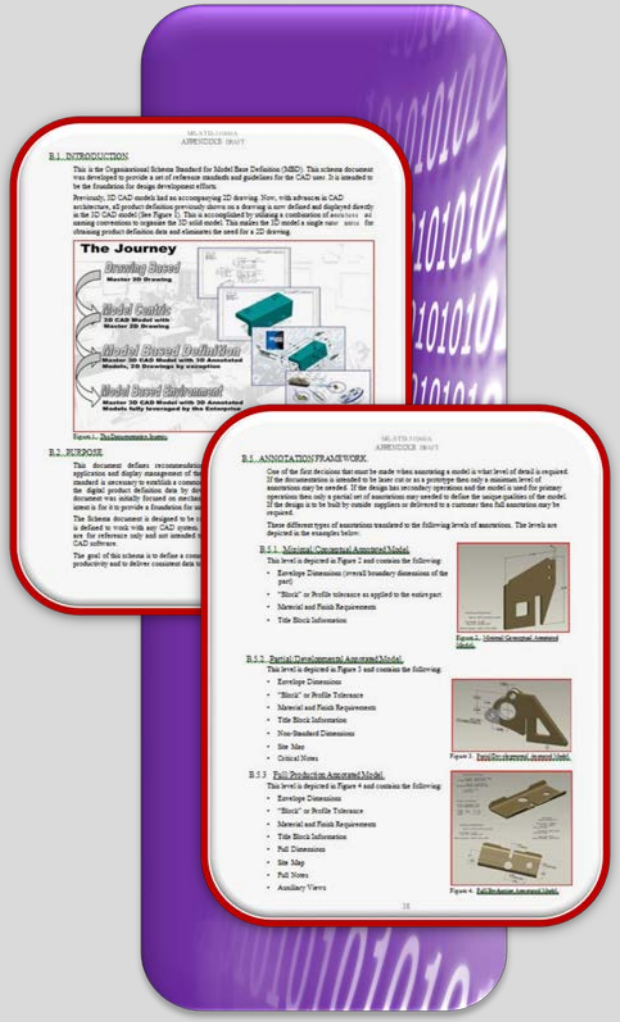
Appendices B and C

Appendix B: How to organize a model



Appendix B – Model Schema

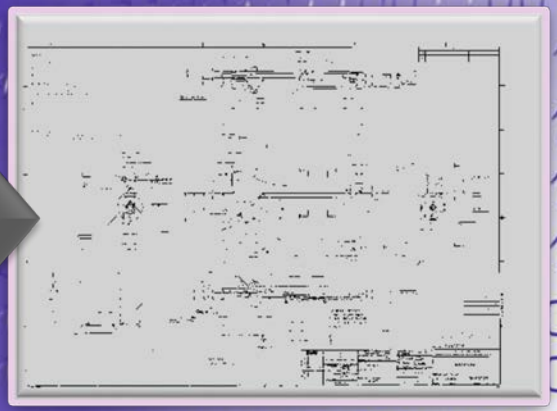
- This appendix provides a baseline modeling organization schema to insure the model can be easily understood and reused
- If a contractor desires to use their own schema, they simply provide a document mapping it to this appendix
- Remember, like all appendices in MIL Standards it is reference only unless called out by the contract



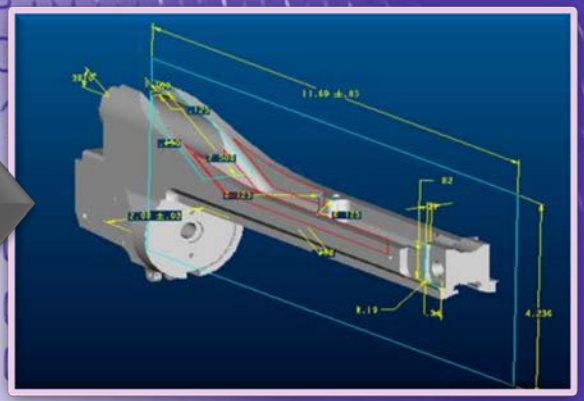
Why a Schema?

Enabling Reuse Through Organization

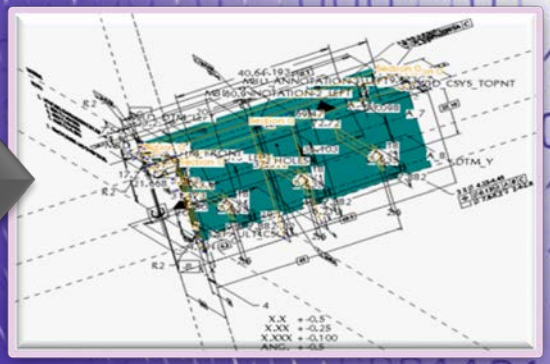
From This



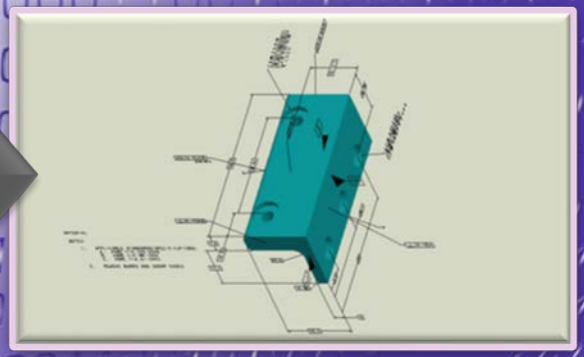
To This



From This



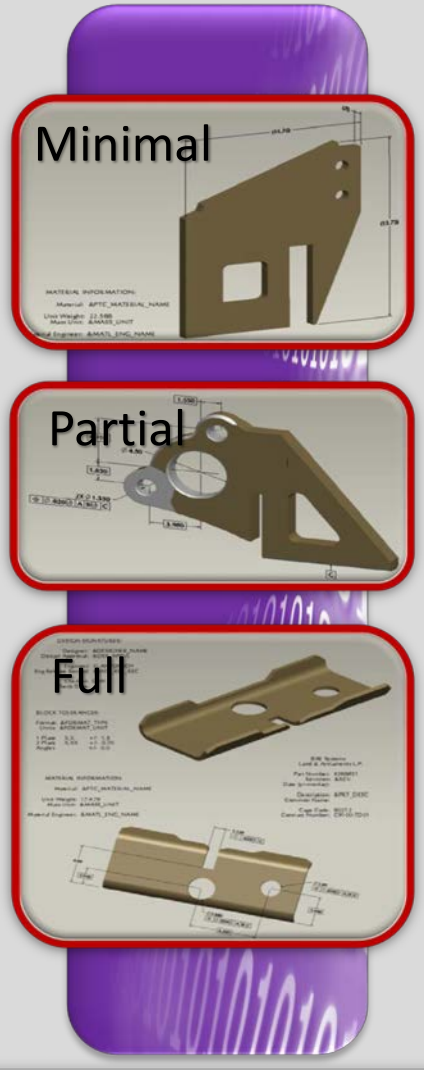
To This



Levels Of Annotated Models

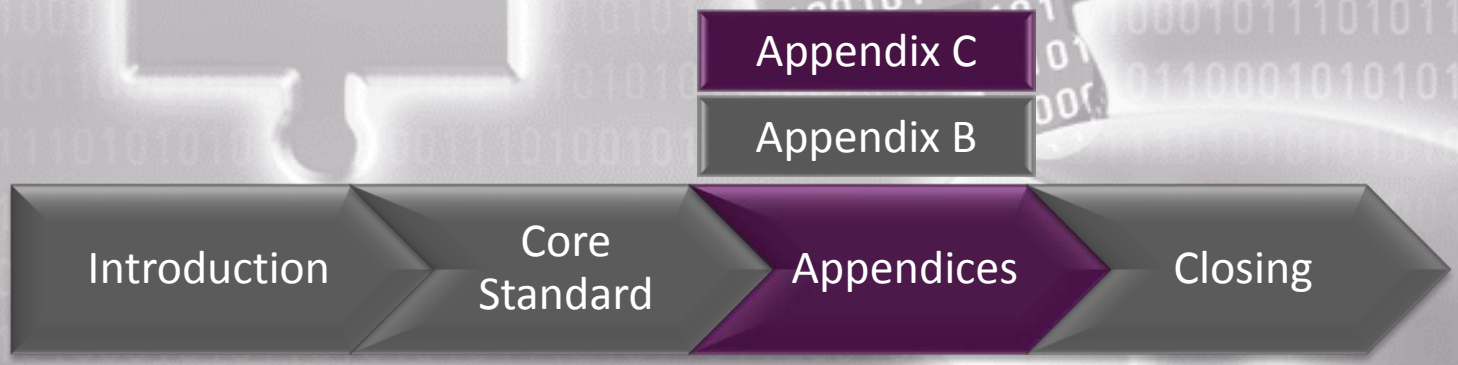
The Model Organization Schema also defines three basic levels of annotated models

- Conceptual/Minimal Annotation
  - Only contains general information
  - Examples are: Material, Finish, Envelope Dims
- Developmental/Partial Annotation
  - Only contains non standard or critical information
  - Adds to minimal definition
  - Examples are key and critical dimensions, interface notes
- Production/Full Annotation
  - Contains all information needed to clearly define a product
  - Adds to Partial
  - Examples are complete dimensions and notes



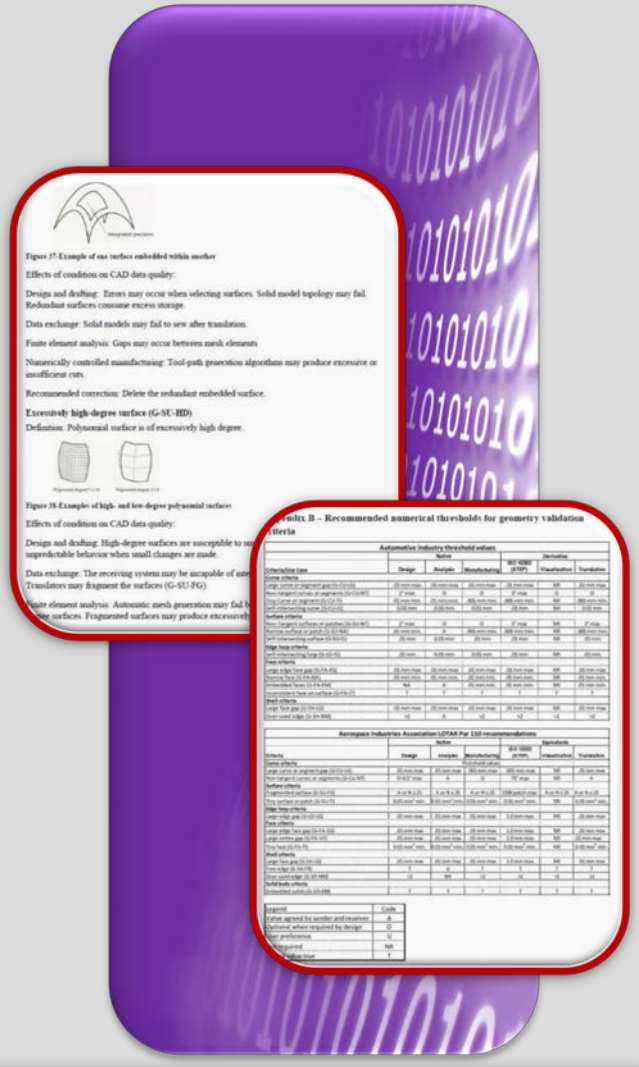
Appendices B and C

Appendix C: How to measure the quality of a model



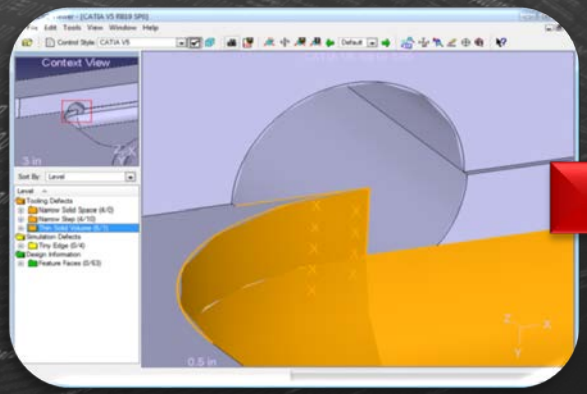
Appendix C – Model Validation

- The quality of a model determines how easily it can be reused
- This appendix gives guidelines for defining that quality
- Every program should have a model quality guideline
- Guidance is under development to validate the conversion of a Drawing to a 3D Annotated Model
- Again note that to be used this must be called out in the contract



Why Validate?

Because…

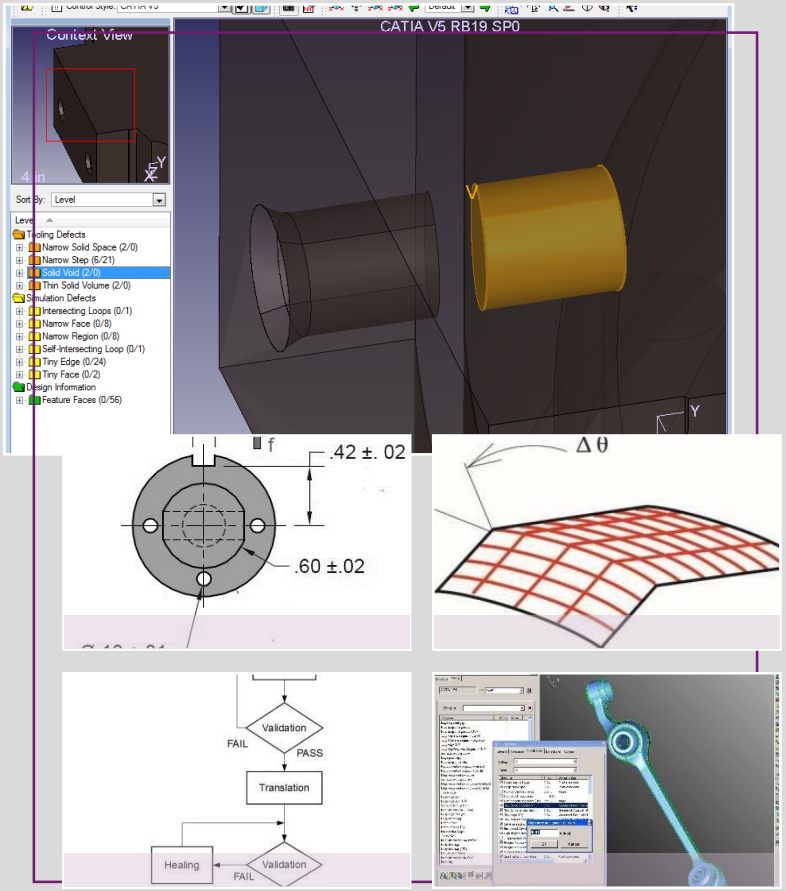


… If you don't

Contents

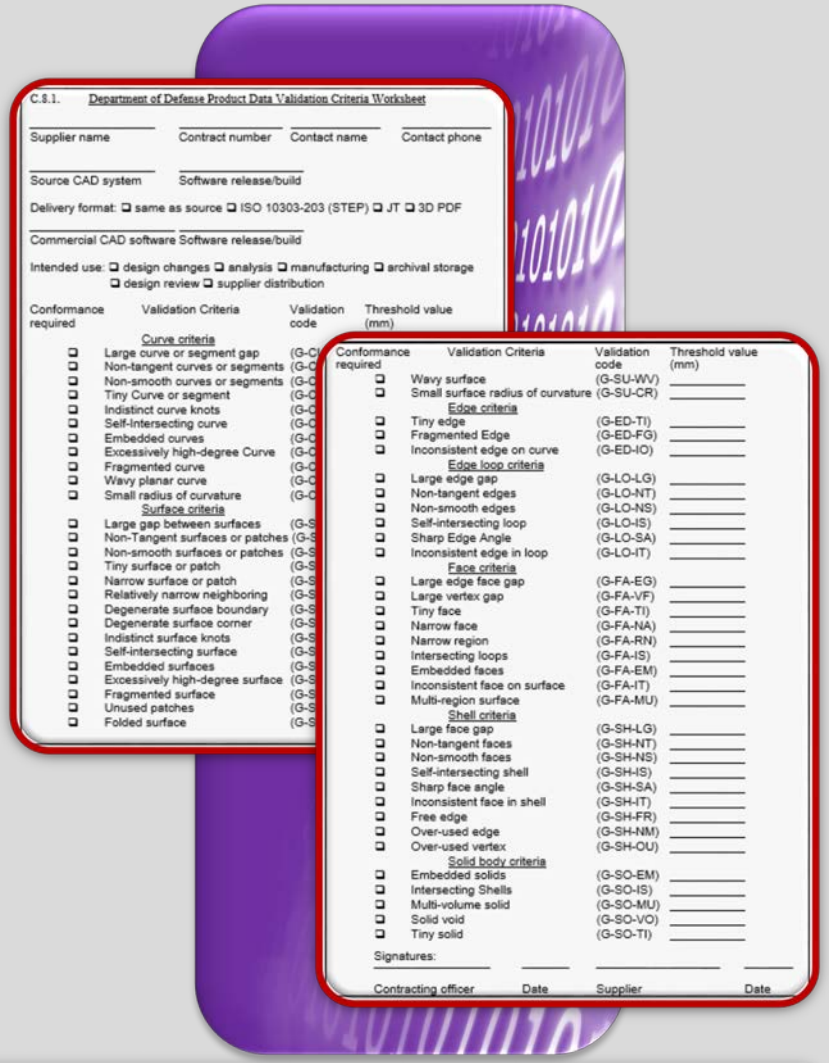
Appendix C contains the following:

- Technical Glossary
- Explanation of Checks
- High-Level Processes
- Examples
- Checks for Geometry, Visualization and PMI
- Checks for Derivative Models
- Tailoring Worksheet
- Recommended Values



Worksheet

- Similar to the main standard Appendix C has a worksheet to define what checks are needed
- Each program should review the checks and decide which are applicable (along with their associated tolerance)
- There are recommended values and checks if the program has no preference



C.8.1. Department of Defense Product Data Validation Criteria Worksheet

Supplier name | Contract number | Contact name | Contact phone

Source CAD system | Software release/build

Delivery format: ❑ same as source ❑ ISO 10303-203 (STEP) ❑ JT ❑ 3D PDF

Commercial CAD software | Software release/build

Intended use: ❑ design changes ❑ analysis ❑ manufacturing ❑ archival storage ❑ design review ❑ supplier distribution

Conformance required	Validation Criteria	Validation code	Threshold value (mm)
	Curve criteria		
❑	Large curve or segment gap	(G-C	
❑	Non-tangent curves or segments	(G-C	
❑	Non-smooth curves or segments	(G-C	
❑	Tiny Curve or segment	(G-C	
❑	Indistinct curve knots	(G-C	
❑	Self-Intersecting curve	(G-C	
❑	Embedded curves	(G-C	
❑	Excessively high-degree Curve	(G-C	
❑	Fragmented curve	(G-C	
❑	Wavy planar curve	(G-C	
❑	Small radius of curvature	(G-C	
	Surface criteria		
❑	Large gap between surfaces	(G-S	
❑	Non-Tangent surfaces or patches	(G-S	
❑	Non-smooth surfaces or patches	(G-S	
❑	Tiny surface or patch	(G-S	
❑	Narrow surface or patch	(G-S	
❑	Relatively narrow neighboring	(G-S	
❑	Degenerate surface boundary	(G-S	
❑	Degenerate surface corner	(G-S	
❑	Indistinct surface knots	(G-S	
❑	Self-intersecting surface	(G-S	
❑	Embedded surfaces	(G-S	
❑	Excessively high-degree surface	(G-S	
❑	Fragmented surface	(G-S	
❑	Unused patches	(G-S	
❑	Folded surface	(G-S	

Conformance required	Validation Criteria	Validation code	Threshold value (mm)
❑	Wavy surface	(G-SU-WV)	
❑	Small surface radius of curvature	(G-SU-CR)	
	Edge criteria		
❑	Tiny edge	(G-ED-TI)	
❑	Fragmented Edge	(G-ED-FG)	
❑	Inconsistent edge on curve	(G-ED-IO)	
	Edge loop criteria		
❑	Large edge gap	(G-LO-LG)	
❑	Non-tangent edges	(G-LO-NT)	
❑	Non-smooth edges	(G-LO-NS)	
❑	Self-intersecting loop	(G-LO-IS)	
❑	Sharp Edge Angle	(G-LO-SA)	
❑	Inconsistent edge in loop	(G-LO-IT)	
	Face criteria		
❑	Large edge face gap	(G-FA-EG)	
❑	Large vertex gap	(G-FA-VF)	
❑	Tiny face	(G-FA-TI)	
❑	Narrow face	(G-FA-NA)	
❑	Narrow region	(G-FA-RN)	
❑	Intersecting loops	(G-FA-IS)	
❑	Embedded faces	(G-FA-EM)	
❑	Inconsistent face on surface	(G-FA-IT)	
❑	Multi-region surface	(G-FA-MU)	
	Shell criteria		
❑	Large face gap	(G-SH-LG)	
❑	Non-tangent faces	(G-SH-NT)	
❑	Non-smooth faces	(G-SH-NS)	
❑	Self-intersecting shell	(G-SH-IS)	
❑	Sharp face angle	(G-SH-SA)	
❑	Inconsistent face in shell	(G-SH-IT)	
❑	Free edge	(G-SH-FR)	
❑	Over-used edge	(G-SH-NM)	
❑	Over-used vertex	(G-SH-OU)	
	Solid body criteria		
❑	Embedded solids	(G-SO-EM)	
❑	Intersecting Shells	(G-SO-IS)	
❑	Multi-volume solid	(G-SO-MU)	
❑	Solid void	(G-SO-VO)	
❑	Tiny solid	(G-SO-TI)	

Signatures:

Contracting officer | Date | Supplier | Date

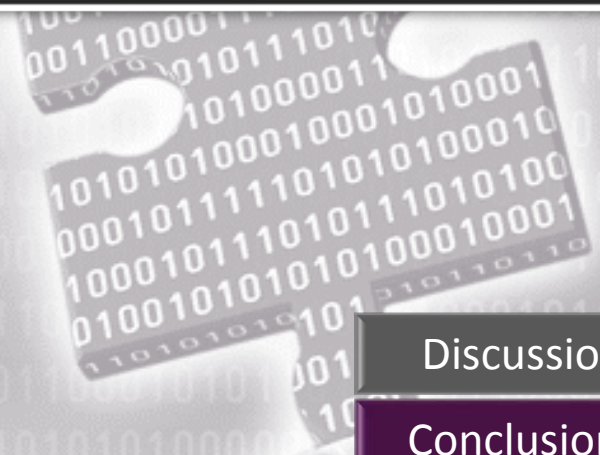
Recommended Tolerance Values

Automotive industry threshold values						
	Native			Derivative		
Criteria/Use Case	Design	Analysis	Manufacturing	ISO 10303 (STEP)	Visualization	Translation
Curve criteria						
Large curve or segment gap (G-CU-LG)	.01 mm max	.01 mm max	.01 mm max	.01 mm max	NR	.01 mm max
Non-tangent curves or segments (G-CU-NT)	2° max	O	O	3° max	O	O
Tiny Curve or segment (G-CU-TI)	.01 mm min.	.01 mm min.	.005 mm min.	.005 mm min.	NR	.005 mm min.
Self-Intersecting curve (G-CU-IS)	0.0					
Surface criteria						
Non-Tangent surfaces or patches (G-SU-NT)	2°					
Narrow surface or patch (G-SU-NA)	.01 m					
Self-intersecting surface (G-SU-IS)	.01					
Edge loop criteria						
Self-intersecting loop (G-LO-IS)	.01					
Face criteria						
Large edge face gap (G-FA-EG)	.01 m					
Narrow face (G-FA-NA)	.01 m					
Embedded faces (G-FA-EM)						
Inconsistent face on surface (G-FA-IT)						
Shell criteria						
Large face gap (G-SH-LG)	.01 m					
Over-used edge (G-SH-NM)						

Automotive industry threshold values						
	Native			Derivative		
Criteria/Use Case	Design	Analysis	Manufacturing	ISO 10303 (STEP)	Visualization	Translation
Curve criteria						
Large curve or segment gap (G-CU-LG)	.01 mm max	.01 mm max	.01 mm max	.01 mm max	NR	.01 mm max
Non-tangent curves or segments (G-CU-NT)	2° max	O	O	3° max	O	O
Tiny Curve or segment (G-CU-TI)	.01 mm min.	.01 mm min.	.005 mm min.	.005 mm min.	NR	.005 mm min.
Self-Intersecting curve (G-CU-IS)	0.01 mm	0.01 mm	0.01 mm	.01 mm	NR	0.01 mm
Surface criteria						
Non-Tangent surfaces or patches (G-SU-NT)	2° max	O	O	3° max	NR	3° max
Narrow surface or patch (G-SU-NA)	.01 mm min.	A	.005 mm min.	.005 mm min.	NR	.005 mm min.
Self-intersecting surface (G-SU-IS)	.01 mm	0.01 mm	.01 mm	.01 mm	NR	.01 mm
Edge loop criteria						
Self-intersecting loop (G-LO-IS)	.01 mm	0.01 mm	0.01 mm	.01 mm	NR	.01 mm
Face criteria						
Large edge face gap (G-FA-EG)	.01 mm max	.01 mm max	.01 mm max	.01 mm max	NR	.01 mm max
Narrow face (G-FA-NA)	.01 mm min.	.01 mm min.	.01 mm min.	.01 mm min.	NR	.01 mm min.
Embedded faces (G-FA-EM)	NA	A	.01 mm min.	.01 mm min.	NR	.01 mm min.
Inconsistent face on surface (G-FA-IT)	T	T	T	T	T	T
Shell criteria						
Large face gap (G-SH-LG)	.01 mm max	.01 mm max	.01 mm max	.01 mm max	NR	.01 mm max
Over-used edge (G-SH-NM)	>2	A	>2	>2	>2	>2

Closing

Conclusions: Review of what we have learned



Discussion

Conclusions

Introduction → Core Standard → Appendices → Closing

Summary – What It Provides

- Defines what makes up both 2D and 3D TDPs
- Better alignment between the TDP and the product lifecycle to ensure the right data is acquired at the right point in the lifecycle
- Defines a 3D TDP that uses modern data to provide a product definition foundation that can be reused throughout the lifecycle
- Defines a complete up to date TDP that can be used to competitively bid the product
- Provides a method for both structuring and verifying the quality of a 3D TDP

Summary - Benefits

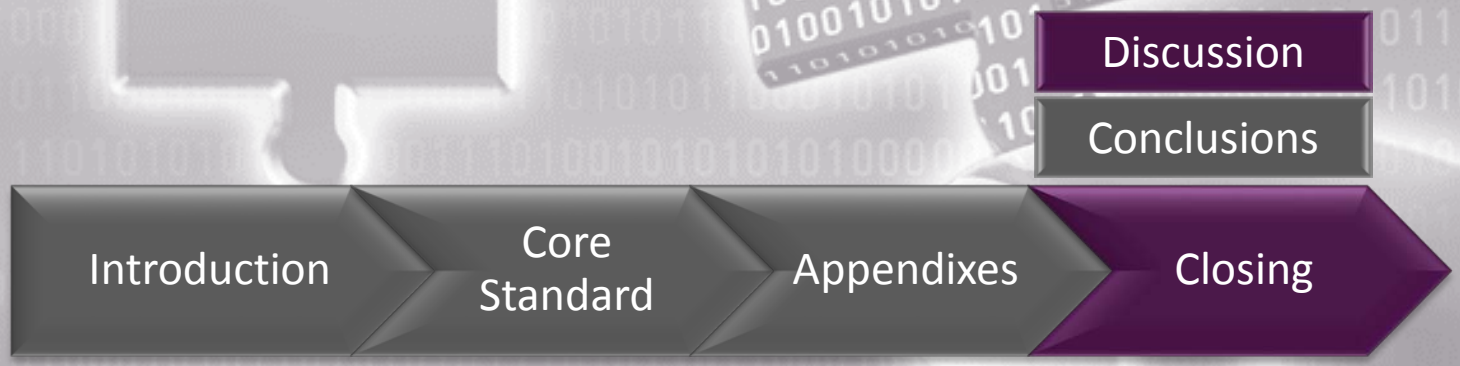
- Fewer sole source because of the ability to increase competition by acquiring the complete product definition
- Higher quality data thus reducing the risk of errors during production and sustainment
- Reduces the time to mission on critical programs by providing reusable, quality, modern data
- Potentially reduces cost by using the same modern data as the contractor and reducing labor through reuse vs. recreation
- By defining the right TDP early in the lifecycle it helps to avoid costly renegotiations for missing data during the later part of the lifecycle
- Fully supports and enables the tenants of Better Buying Power 2.0

Summary – Key Take A Ways

- Whenever possible obtain the 3D model data as part of the TDP
- Always obtain the TDP in both its Native and a Standard Based format
- Use the option selection worksheets to define what TDP elements are needed
- Specifically specify all appendices and standards in the contract that are needed to support the complete TDP
- While it may incur substantial cost to acquire a complete TDP in the initial stages of a program, it will cost dramatically more to acquire it once the product is made

Closing

Discussions: What have we missed?



Questions?

Thank You

Image by DoD Live

Thank you

for your time and consideration