

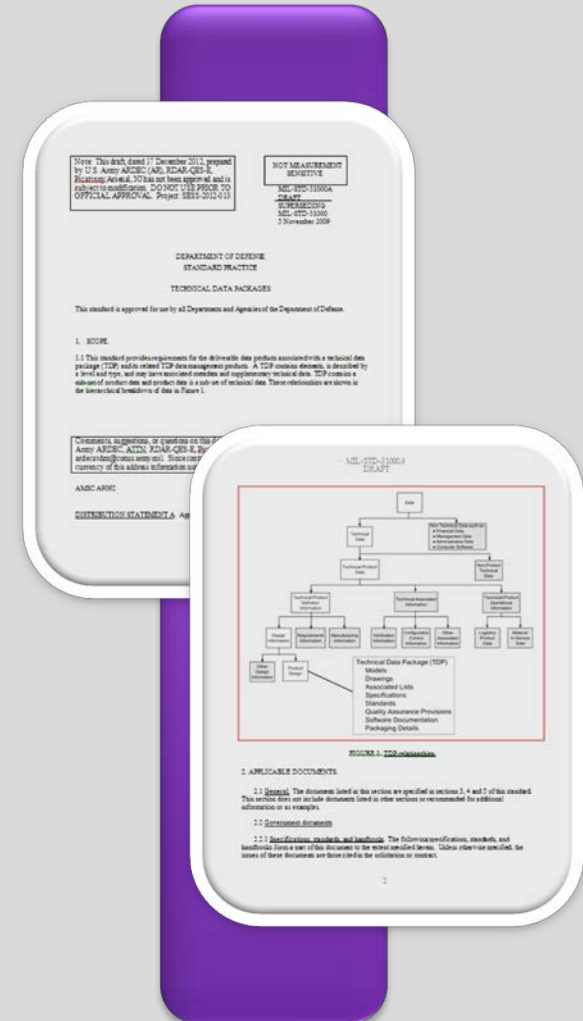
MIL-STD-31000A

Putting The Pieces Together

Prepared By:
Roy Whittenburg

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



Transforming the DoD



From This



To This

TDP – The Heart Of The Standard

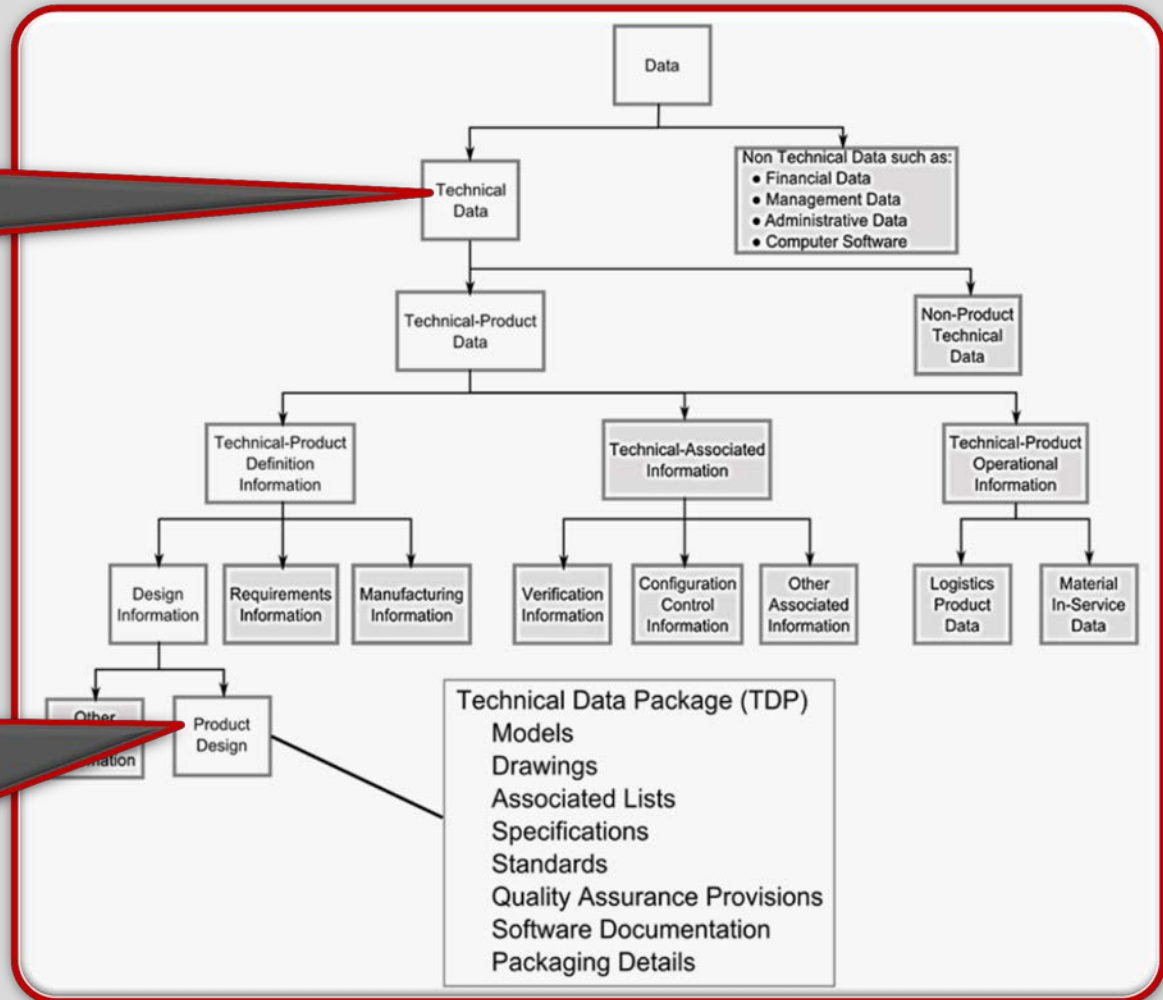
MIL-STD-31000A defines a TDP as:

“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

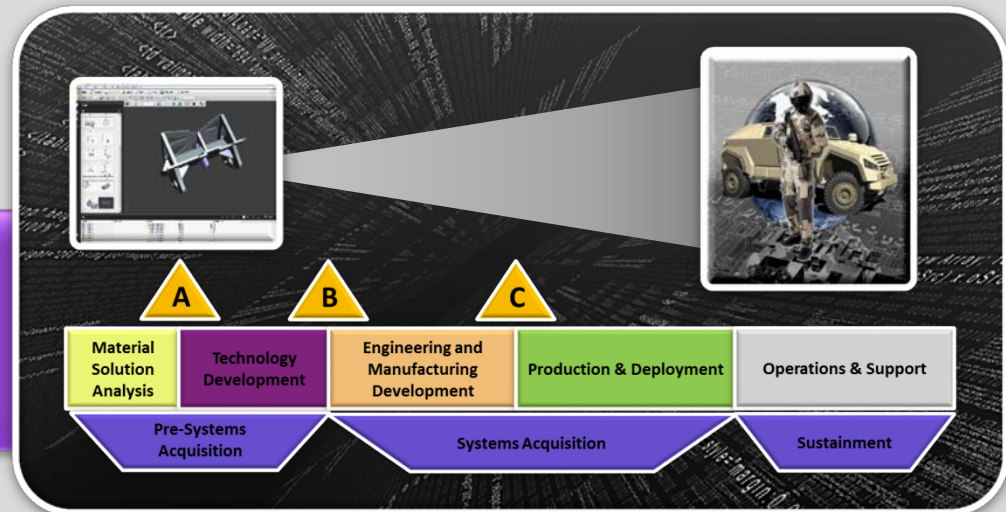
Technical Data Includes Many Types of Data

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



The New Levels

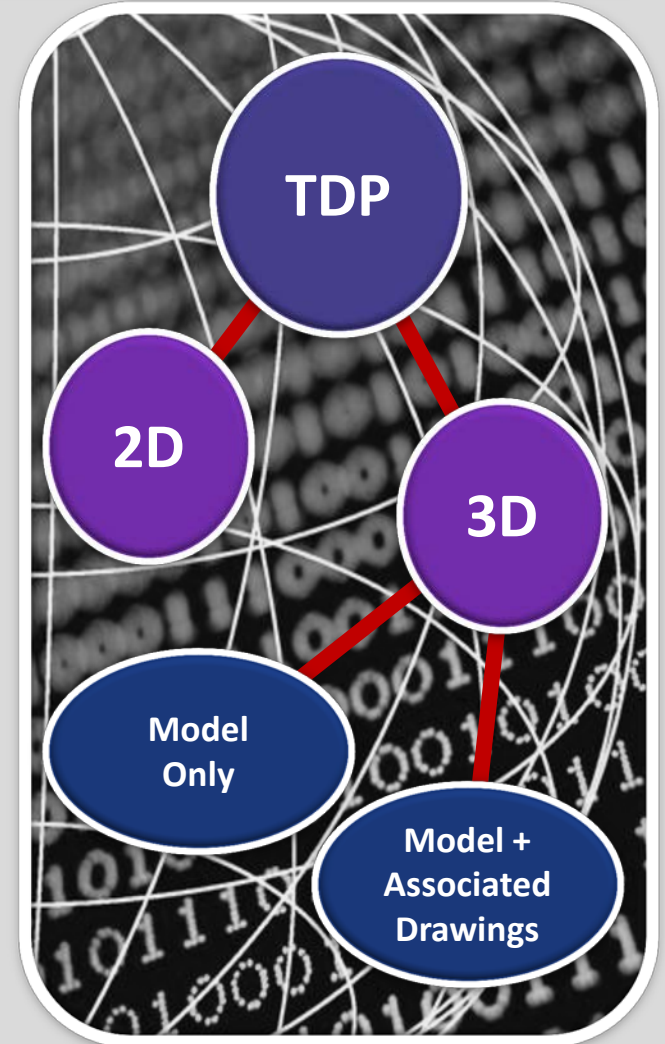
- The old MIL-DTL-31000 used numeric levels (1, 2, and 3) to describe ascending levels of detail, where a level 3 would fully define a product
- MIL-STD-31000 ties this concept to the lifecycle
 - Conceptual Level
 - Developmental Level
 - Production Level



Types Of A TDP

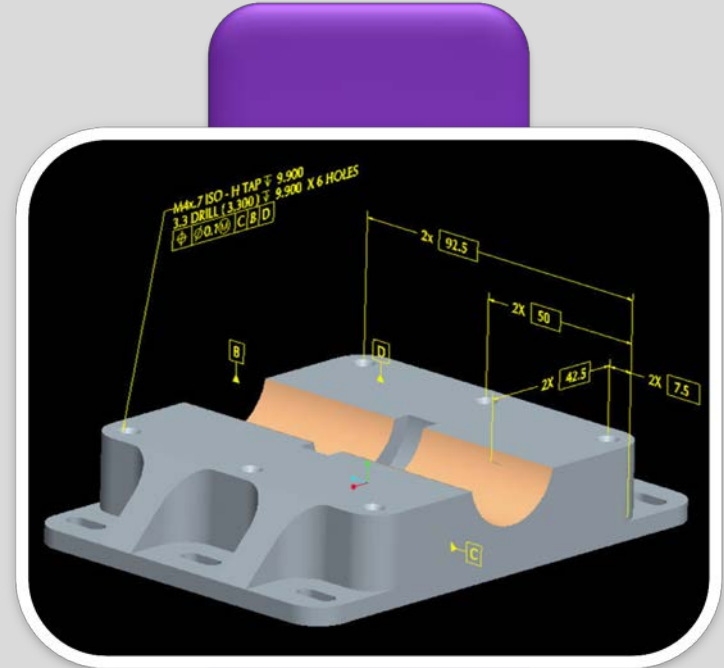
MIL-STD-31000A supports two basic types of TDPs:

- 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



MASS PROPERTIES & CENTER OF GRAVITY

Mass: 223.047
Mass Unit: &PRO_MP_MASS_UNIT
Source: GEOMETRY

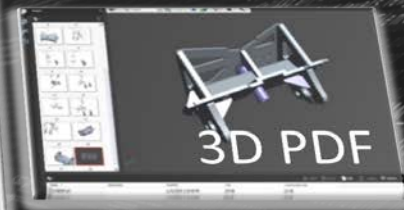
Inertia Tensor about the CG

IXX	=	3.37284460
IYY	=	1.5672999400
IZZ	=	1.5269991731
IXZ	=	-2200447.850
IYZ	=	-531.000
IXY	=	-3895.076

MATERIAL INFORMATION:

Material: &PTC_MATERIAL_NAME
Finish: &FINISH
Material Engineer: &MATL_ENG_NAME

Annotated Model



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 image displays three overlapping screenshots of the Option Selection Worksheet forms. The top screenshot is labeled 'FIGURE 1: TDP Option Selection Worksheet' and shows a form with sections for 'GENERAL INFORMATION', 'TDP ELEMENTS', 'TDP ELEMENTS AND ASSOCIATED DATA', and 'TDP ELEMENTS AND ASSOCIATED DATA'. The middle screenshot is labeled 'FIGURE 2: TDP Option Selection Worksheet (cont.)' and shows sections for 'TDP ELEMENTS AND ASSOCIATED DATA' and 'TDP ELEMENTS AND ASSOCIATED DATA'. The bottom screenshot is labeled 'FIGURE 3: TDP Option Selection Worksheet - Commercial Drawing Models and Associated Lists' and shows sections for 'GENERAL INFORMATION', 'TDP ELEMENTS', 'TDP ELEMENTS AND ASSOCIATED DATA', and 'TDP ELEMENTS AND ASSOCIATED DATA'. Each form contains various checkboxes and fields for selecting and configuring TDP elements.

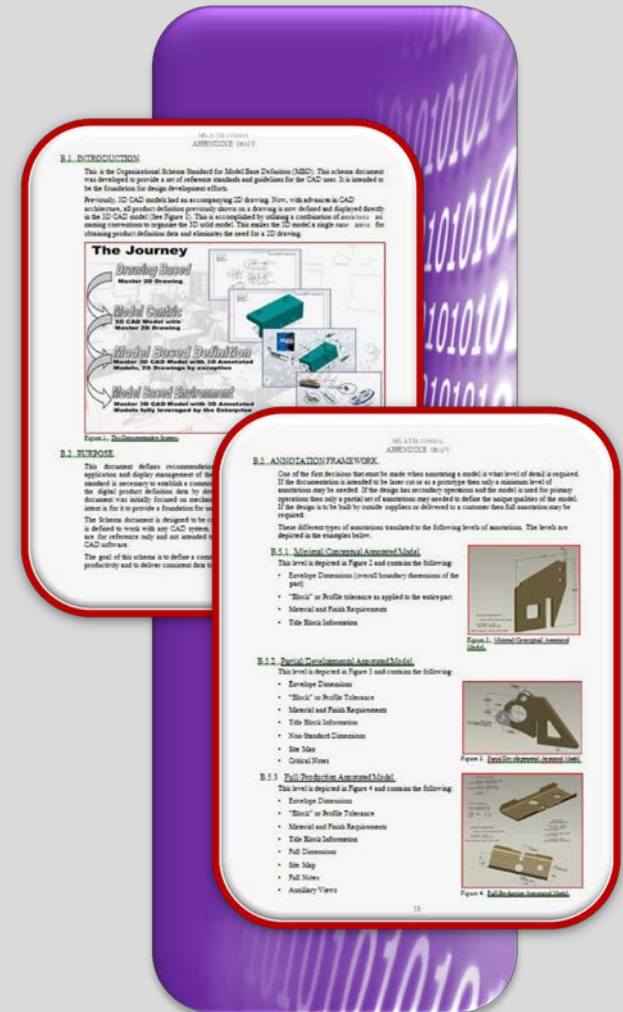
DIDs and MIL-STD-31000

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

Appendix B – Model Schema

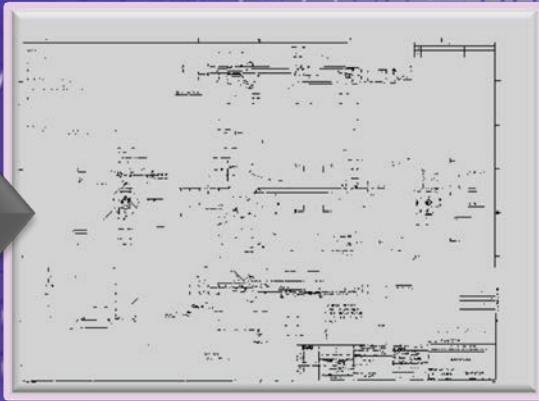
- This appendix provides a baseline modeling organization schema to insure the model can be easily understood and reused
- If a contractor desires to use their own schema, they simply provide a document mapping it to this appendix
- Remember, like all appendices in MIL Standards it is reference only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



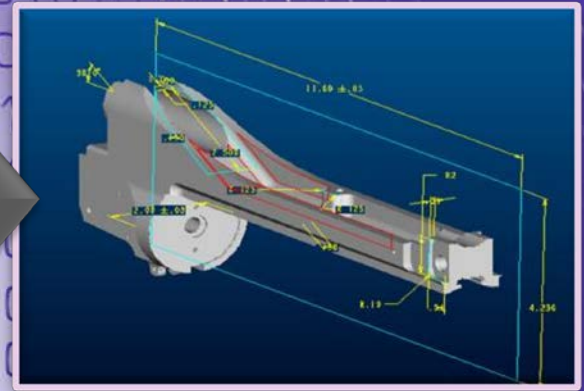
Why a Schema?

Enabling Reuse Through Organization

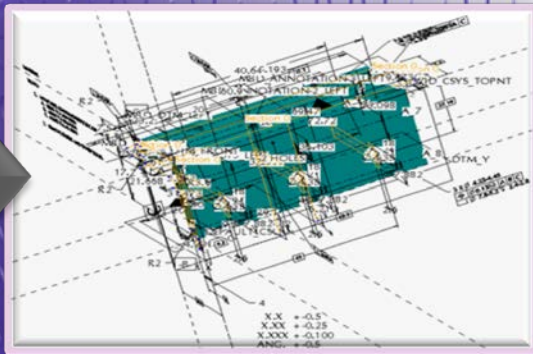
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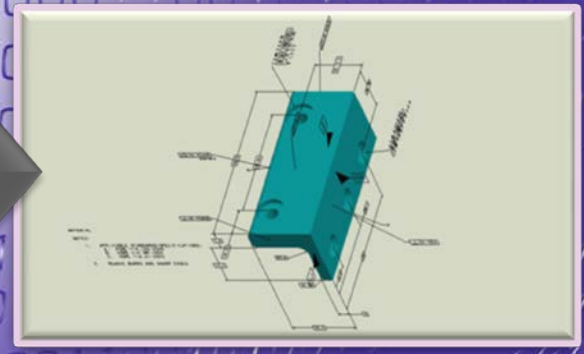
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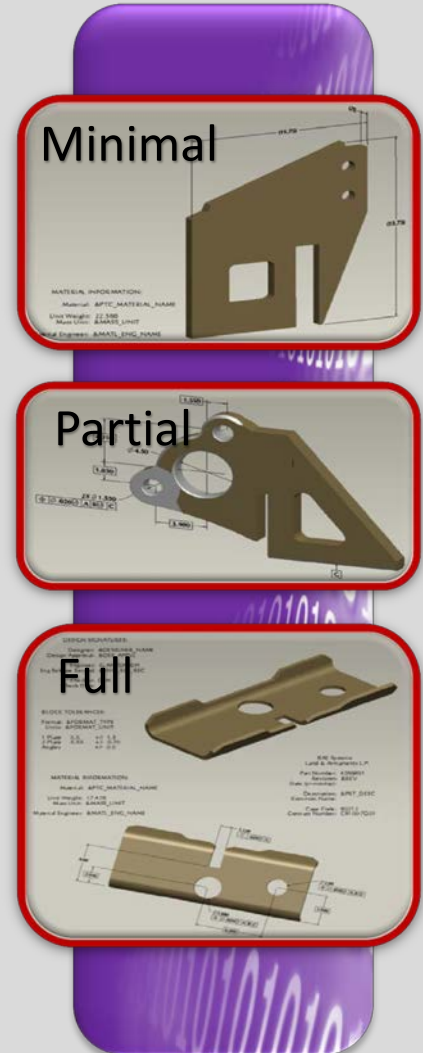
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Levels Of Annotated Models

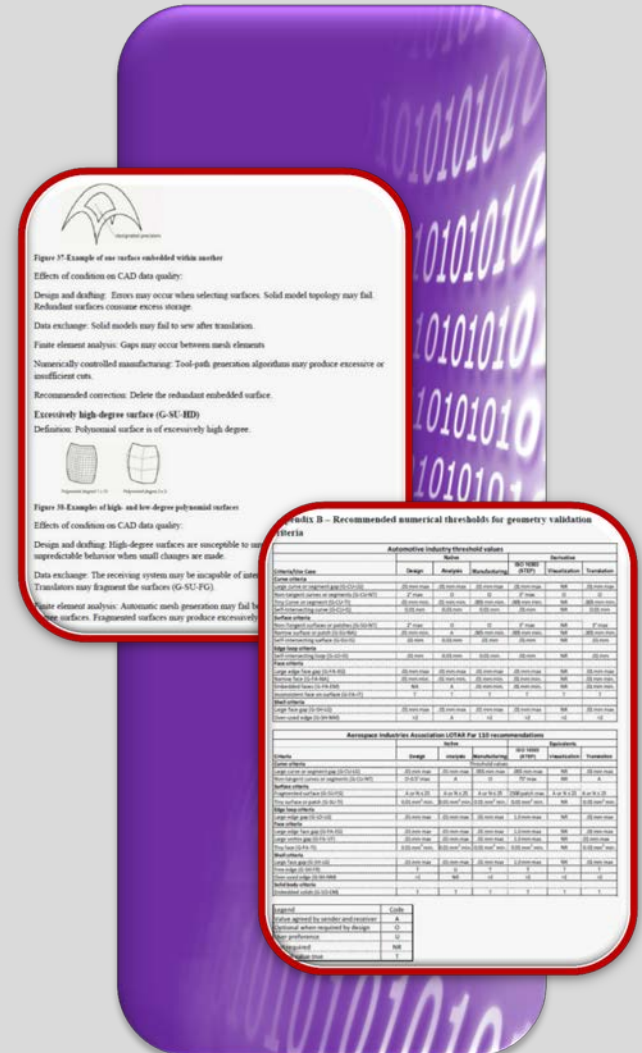
The Model Organization Schema also defines three basic levels of annotated models

- **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



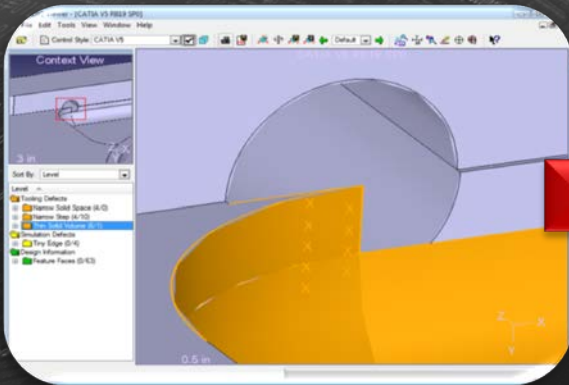
Appendix C – Model Validation

- 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

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.5.1. 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)
<u>Curve criteria</u>			
<input type="checkbox"/>	Large curve or segment gap	(G-C)	_____
<input type="checkbox"/>	Non-tangent curves or segments	(G-C)	_____
<input type="checkbox"/>	Non-smooth curves or segments	(G-C)	_____
<input type="checkbox"/>	Tiny Curve or segment	(G-C)	_____
<input type="checkbox"/>	Indistinct curve knots	(G-C)	_____
<input type="checkbox"/>	Self-intersecting curve	(G-C)	_____
<input type="checkbox"/>	Embedded curves	(G-C)	_____
<input type="checkbox"/>	Excessively high-degree Curve	(G-C)	_____
<input type="checkbox"/>	Fragmented curve	(G-C)	_____
<input type="checkbox"/>	Wavy planar curve	(G-C)	_____
<input type="checkbox"/>	Small radius of curvature	(G-C)	_____
<u>Surface criteria</u>			
<input type="checkbox"/>	Large gap between surfaces	(G-S)	_____
<input type="checkbox"/>	Non-Tangent surfaces or patches	(G-S)	_____
<input type="checkbox"/>	Non-smooth surfaces or patches	(G-S)	_____
<input type="checkbox"/>	Tiny surface or patch	(G-S)	_____
<input type="checkbox"/>	Narrow surface or patch	(G-S)	_____
<input type="checkbox"/>	Relatively narrow neighboring	(G-S)	_____
<input type="checkbox"/>	Degenerate surface boundary	(G-S)	_____
<input type="checkbox"/>	Degenerate surface corner	(G-S)	_____
<input type="checkbox"/>	Indistinct surface knots	(G-S)	_____
<input type="checkbox"/>	Self-intersecting surface	(G-S)	_____
<input type="checkbox"/>	Embedded surfaces	(G-S)	_____
<input type="checkbox"/>	Excessively high-degree surface	(G-S)	_____
<input type="checkbox"/>	Fragmented surface	(G-S)	_____
<input type="checkbox"/>	Unused patches	(G-S)	_____
<input type="checkbox"/>	Folded surface	(G-S)	_____

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

Signatures: _____

Contracting officer _____ Date _____ Supplier _____ Date _____

Questions?



Thank You



Image by DoD Live

Thank you
for your time and
consideration