EXTEND YOUR REACH.
KAMAN
AEROSPACE

3D-MBD/DPD/MBD Process audit

(Three-dimensional model-based definition)

Supplier Name:			**Supplier Code #:**	
Address:			**Phone:**	
City:	**State:**	**Zip:**	**Fax:**	
Contact:		**Contact Email:**		
Survey Performed By:		**Date:**	**Note #:**	
Recommend Approval:	☐ **Yes**	☐ **No**	☐ **Conditional**	
Corrective Action Required?	☐ **Yes**	☐ **No**		

CAD/Catia/Unigraphics/etc. Software Operating System / Revision: /
Media file format:
☐ **CMM Computerized Measuring Machines (List)**
☐ **Portable Coordinate Measurement System (List)**
☐ **Optical Projection Ply Locating Machines (List)**
☐ **Plotters (List)**

A. General Capability	**Yes**	**No**	**N/A**	**Comments**
1. List Prime Customer that has completed a capability assessment and approval of your 3D-MBD process?	☐	☐	☐	
2. Is Supplier quality system certified?	☐	☐	☐	
3. Does the supplier have computer systems, software, and CMM or PCMS measurement equipment capable of utilizing 3D-MBD models and datasets?	☐	☐	☐	
4. Is the supplier familiar with the Supplier Quality Requirements Manual, available at: https://www.kaman.com/aerosystems/solutions/integrated-structures-metallics/suppliers	☐	☐	☐	
5. Is the Supplier familiar with Kaman PO and Vendor Instruction requirements?	☐	☐	☐	
6. Does the Supplier perform contract review?	☐	☐	☐	

B. Procedures	Yes	No	N/A	Comments
7. Does the supplier have a documented procedure that describes the complete process of utilizing 3D-MBD?	☐	☐	☐	
8. Is there a flow diagram of the complete documented 3D-MBD processes?	☐	☐	☐	
9. Do the 3D-MBD procedures include customer notification of changes to the process?	☐	☐	☐	
10. Are documented procedures implemented with defined authority for change control and periodic review?	☐	☐	☐	
11. Do the procedures require that all planning and derivatives created (NC & CMM programs, prints, etc.) are traceable to the authority dataset?	☐	☐	☐	
12. Does the supplier perform audits of their 3D-MBD system and procedures including data security, created derivatives, and sub-tier operations?	☐	☐	☐	
C. 3DMBD Engineering Data & Derivatives	**Yes**	**No**	**N/A**	**Comments**
13. Does the 3D-MBD procedure address receipt, storage, and security (with access control and archiving) of Customer supplied 3D-MBD data and supplier created derivative data?	☐	☐	☐	
14. Does the supplier have a process to ensure verification of all design requirements of the authority dataset when converted into their format? (e.g., all defined features, control frames, annotation, specifications, notes, parts list, dimensional and other properties)?	☐	☐	☐	
15. Are nonconforming datasets received from Customer identified in the supplier's nonconforming material system?	☐	☐	☐	
16. Does the supplier have a procedure to control obsolete datasets and dataset derivatives?	☐	☐	☐	
17. Does the process include formal release of datasets to manufacturing, inspection, and sub-tier suppliers?	☐	☐	☐	
18. Does the supplier have a procedure for change control and configuration management of authority datasets, derivative media, and tooling throughout the manufacturing and acceptance processes?	☐	☐	☐	
19. Can the supplier produce tooling, drawings, mylars, etc, used to manufacture and inspect to the model data?	☐	☐	☐	

20. Is a traceability record maintained showing relationships between authority datasets and created derivatives?	☐	☐	☐	
D. Personnel / Training	**Yes**	**No**	**N/A**	**Comments**
21. Do procedures define responsibilities and training of 3D-MBD users?	☐	☐	☐	
22. Do the procedures define training requirements for all 3D-MBD system users that assure competence and maintain employee training records?	☐	☐	☐	
23. Are all 3D-MBD system users trained as a result of changes to the 3D-MBD process, equipment, or software?	☐	☐	☐	
24. Are training records available and current?	☐	☐	☐	
E. FAI and Product Inspection	**Yes**	**No**	**N/A**	**Comments**
25. Does the supplier have a procedure to provide inspection planning from the authority dataset?	☐	☐	☐	
26. Is the supplier's planning package approved by Quality?	☐	☐	☐	
27. Are FAIR in compliance with AS9102 for product produced from datasets?	☐	☐	☐	
28. Do the supplier's inspection media contain graphics and text sufficient to illustrate inspection operation and result for each product characteristic?	☐	☐	☐	
29. Can the supplier produce a FAIR which includes derivatives such as CMM program, point cloud array, bubbled drawings that capture 100% of the characteristics?	☐	☐	☐	
30. Does the supplier have a process to verify dimensional accuracy of derivative data outputs, including verification of plotted media, as compared to the authority dataset?	☐	☐	☐	
31. Are all derivatives used for the inspection of product approved by Quality?	☐	☐	☐	
F. Sub-tier Operations				
32. Does the supplier have a procedure to assess, monitor, and control sub-tier compliance with 3D-MBD requirements?	☐	☐	☐	
33. Does the supplier have a procedure to flow down customer contract requirements to sub-tier suppliers	☐	☐	☐	

including digital data?				
G. Measurement Systems & Equipment				
34. Does the supplier document inventory of all specific components used for PCMS measurements that affect the integrity of data collection?	☐	☐	☐	
35. Are all CMM, PCMS, and plotters included in the calibration control, traceable to NIST?	☐	☐	☐	
36. Is there a procedure in place to validate Product Acceptance Software (PAS) independent of the software developer?	☐	☐	☐	
37. Does the Supplier have an artifact calibrated with test report to test and verify algorithm accuracy of the CMM or PCMS measuring equipment?	☐	☐	☐	
38. When CMS operations are performed in a non-controlled environment, does the process compensate for environmental variation?	☐	☐	☐	
39. Does the supplier have a documented procedure to control the following minimum required critical functions of the PCMS such as:	☐	☐	☐	
a) Create acceptance criteria used by operator and quality assurance?	☐	☐	☐	
b) Establish and manipulate coordinate systems?	☐	☐	☐	
c) Establish data collection parameters and requirements?	☐	☐	☐	
d) Equipment handling, equipment setup, multi-station set-up, field checks and calibrations?	☐	☐	☐	
e) Data analysis, format, storage, and reporting?	☐	☐	☐	
f) Develop and use of scale factors to compensate measurements for coefficient of thermal expansion and to verify accuracy	☐	☐	☐	
H. Tooling	**Yes**	**No**	**N/A**	**Comments**
40. Is there a process to periodically verify accuracy and repeatability of digitally defined tooling used as media of inspection?	☐	☐	☐	
41. Are all tools/gages traceable to the authority dataset?	☐	☐	☐	

Attach reference documents, systems & equipment list if available.
Summary / Comments

DEFINITIONS

AUTHORITY (as used in dataset)
Original owner source of approved design used for product manufacturing and quality assurance acceptance

ASME Y14.41 2003
American Society of Mechanical Engineers - Digital Product Definition Data Practices
This standard defines preparation, use, applied tolerance systems, symbols, and reference standards

BUBBLE DRAWING
A 2D reproduction, (derivative), showing all part dimensions, geometry, notes with applied unique identifiers for each feature, tolerance, notes, and special process requirements. Must include date generated, originator, part number, dataset revision, required as part of FAIR. Also known as balloon drawing

CAD
Computer Aided Design-any computer system or program used to support design, evaluating design

CAE
Computer Aided Engineering-use of computers to develop engineering data to supplement engineering design, product manufacturing and inspection, creating derivatives

CAM
Computer Aided Manufacturing- synonymous with numerical control (NC). Use of computer and computer data to develop, produce, fabricate, assembly, test, and installation

CATIA
Computer Aided Three-dimensional Interactive Application. CAD system with interactive graphics design software modules used to create 3D, 2D geometric product design

CMS
Coordinate Measurement System-synonymous with Computer Aided Inspection (CAI), Computer Aided Measurement Systems (CAMS),

CMM
Coordinate Measuring Machine-e.g. Brand names Cordax, M&M, Hoffler, L&K, Laser Track

DATASET
Information prepared and maintained by electronic means, and provided by electronic data access, transfer, or on electronic media

DERIVATIVE
Any reproduction derived from the authority dataset, including but not limited to; part definitions, notes, limited design, mylars, tool design, numerical control programs, check templates, inspection criteria, and any other extractions

DPD
Digital Product Definition-electronic data elements derived from the authority dataset for manufacturing and product inspection

FAIR
First Article Inspection Report-synonymous with AS9102

IEGS
Initial Graphics Exchange Specification-American National Standards Institute (ANSI) data standard for the exchange of computer graphics generated product definition, (no solids) between different manufacturers CAD/CAM systems

INSPECTION PLAN
A complete description of 2D-3D computer generated inspection media and methods derived from the authority dataset used to define inspection requirements to manufacturing and inspection functions.

MBD
Model Based Definition-dataset containing the exact part solid, and it associates geometry, annotations, dimensions, notes

MDD
Master Dimension Definition-a mathematically controlled surface definition which is computer generated

PAS
Product Acceptance Software-computer generated programs used to inspect and accept parts, assemblies, tooling, and systems, e.g. Programs used with CMM

PCMS
Portable Coordinate Measurement System-e.g. Faro Arm, Laser Track

REDUCED CONTENT DRAWING
A 2D reproduced drawing with limited part dimensioning, typically will reference 3D model for limited part geometry