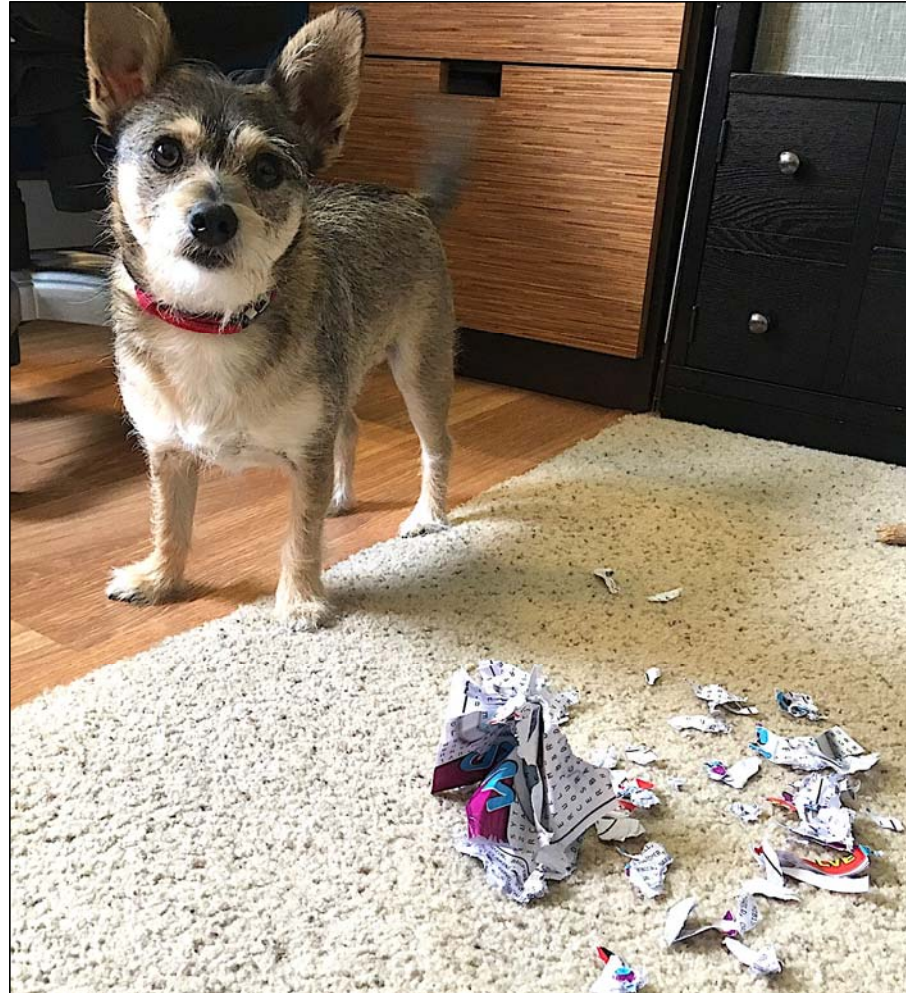


**EVOLVE OR DISSOLVE...**

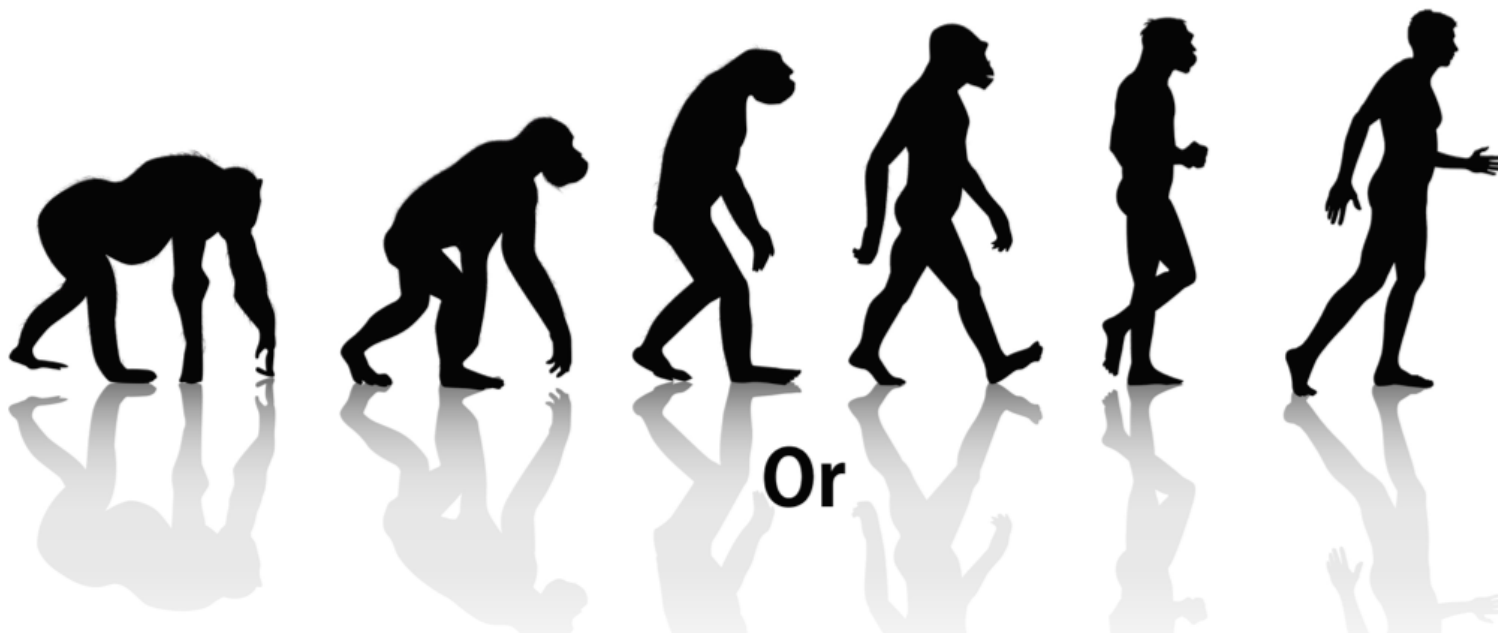
**EFFECTIVE MBD/MBE STRATEGY  
AND BENEFITS**

**NO PAIN**  
**NO CHANGE**



# Evolve or Dissolve

Created by Ross Halliday @FizzicalEd



Or

**DISSOLVED**

## Model-Based Consulting and Training



## TAKE ACTION TO BUILD YOUR DIGITAL ENTERPRISE™

### Training

<b>MBD/MBE EDUCATION – CAD Agnostic</b>
Model Based Enterprise (MBE) Overview – What, Benefits, How
Introduction to MBD – What, GD&T, How
<b>PLANNING</b>
MBE Implementation
MBE Planning and Roadmap Building
<b>IMPLEMENTING</b>
Model Schema and Organization – CAD Agnostic
How to Write a Modeling Guide – CAD Agnostic
Reading, Commenting and Publishing 3D PDFs
<b>CAD &amp; PDM IMPLEMENTATION: SOLIDWORKS</b>
Using SOLIDWORKS MBD
Administration, Set-up, and Best Practices for SOLIDWORKS and Enterprise PDM for MBD
Model Checking Automation for MBD
Reading, Viewing, and Reviewing MBD in SOLIDWORKS and eDrawings
<b>CAD IMPLEMENTATION: Creo</b>
Using Creo MBD
Model Checking Automation for MBD – ModelCHECK Administration and Best Practice
Reading, Viewing, and Reviewing MBD in Creo and CreoView
<b>CAD IMPLEMENTATION: NX</b>
Using NX MBD

## Industry Organization Memberships



# Topics

What does a fully integrated digital enterprise look like?

Why would I bother with MBD?

How can MBD enable smart manufacturing systems?

What about Suppliers and Manufacturing/Quality?

# Topics

What does a fully integrated digital enterprise look like?

Why would I bother with MBD?

How can MBD enable smart manufacturing systems?

What about Suppliers and Manufacturing/Quality?



Smart manufacturing requires a **digital enterprise**.

A **digital enterprise** requires **digital data**.



**Digital data** for product definition is called **Model-Based Definition (MBD)**.



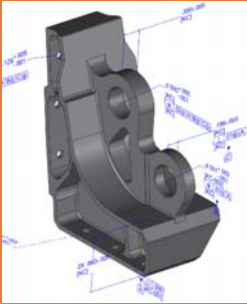
# Use MBD to Automate Inspection

Desired Functionality  
In Creo Native:  
Compare **Actual** to **Source**

CAPVIDIA SOFTWARE

ORIGIN SOFTWARE

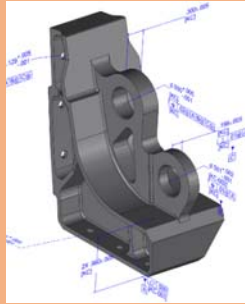
## Creo with MBD



### MBD defined as:

- Geometry
- Annotations
- Metadata
- Presentation
- Product Characteristics (PC)

## QIF MBD



### QIF MBD defined as:

- Geometry
- Annotations
- Metadata
- Presentation
- Bill of Characteristics (BoC)

## QIF PLAN

```

PRDMP1.PPG - Notepad
File Edit Format Help
$$$$----- CONSTRUCT POINT ----- CP006 -----
P(CP006)=FEAT/POINT.CART,00,951000,90,667000,
CALL/M(MINMAXPT),'CP006','SP004',1,1,2,'MAXZ'
$$$$
DECL/CHAR,BO,ORGSTR
DECL/CHAR,BO,ORGSTR1
ORGSTR1=PROMPT/'PART#'
DECL/CHAR,BO,ORGSTR2
ORGSTR2=PROMPT/'SERIAL#'
ORGSTR=ASSIGN/CONCAT(ORGSTR1,'_',ORGSTR2,'_OU
OPEN/DID(SYS_TERM),DIRECT,OUTFIT,OVERSR
DID(SYS_TERM)=DEVICE/STOR,ORGSTR,MODEL
CLOSE/DID(SYS_TERM)
(ENDPROC)
$$$$
$$$ The following DMIS Sensor definitions were
$$$ the corresponding styl1 (label, orientatio
  
```

### QIF PLAN defined as:

- How to perform measurements
- BoC turned into measurement items
- QPIDS created

DMIS Execution File

## Measurement Execution



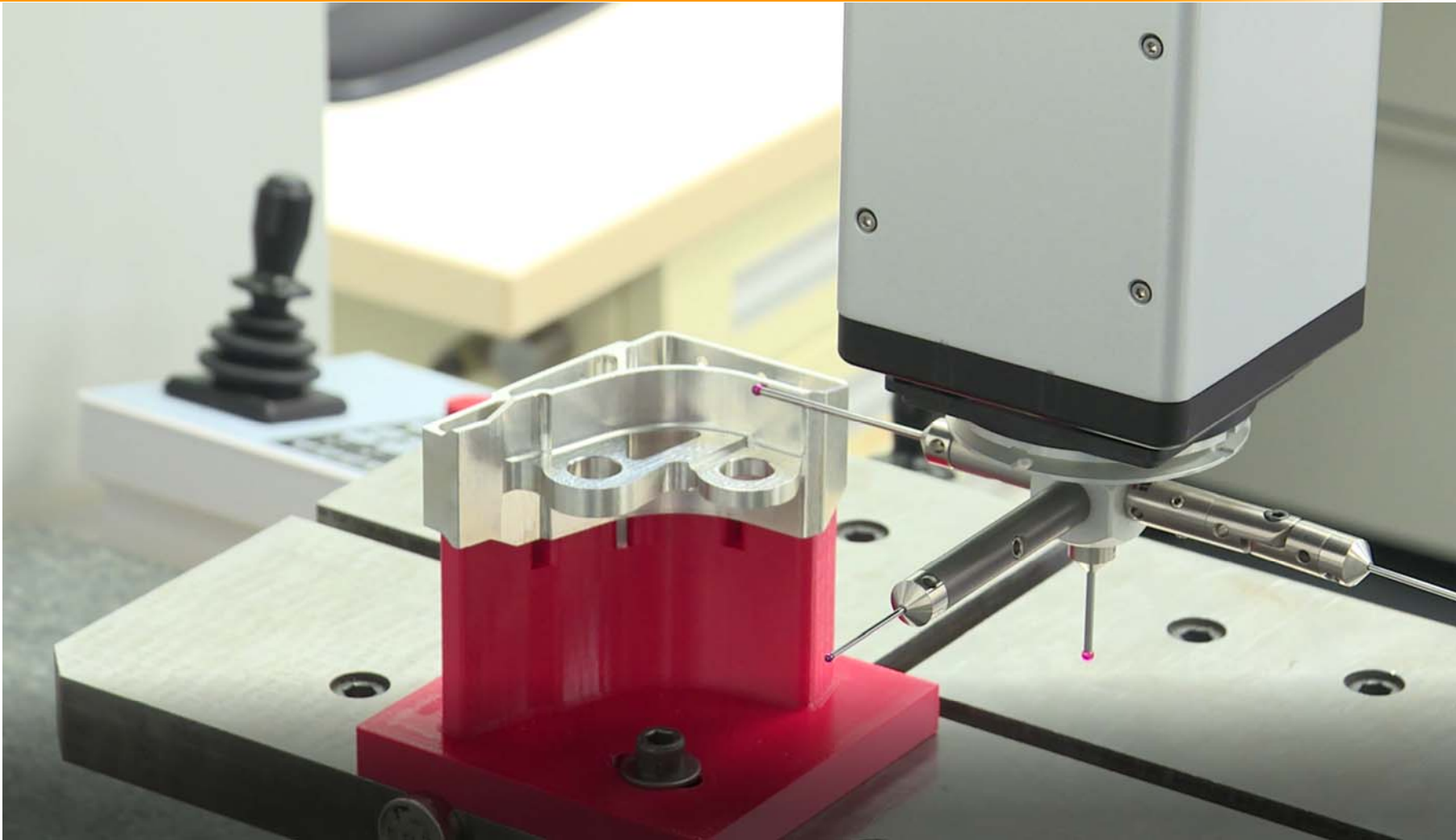
### CMM:

- Part Program
- Measurement Instructions
- Inspection Results

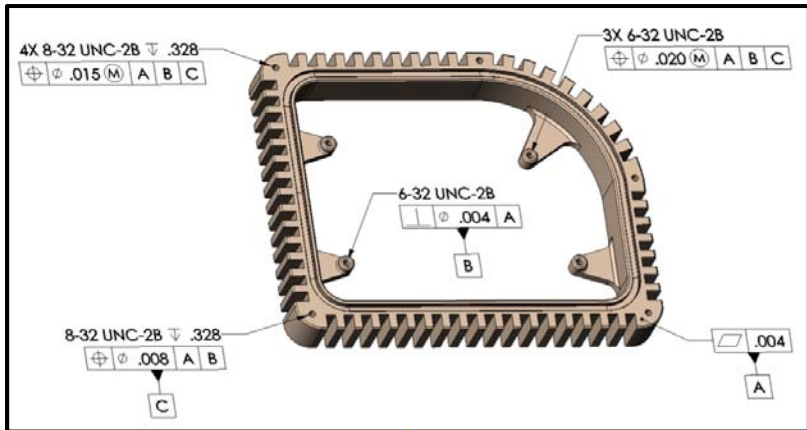
QIF Results

DMIS Output File

# Model-Based Inspection Process – Using QIF

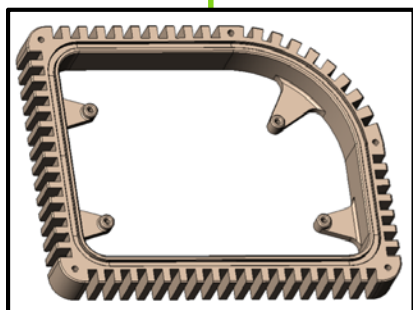


# What is MBD?

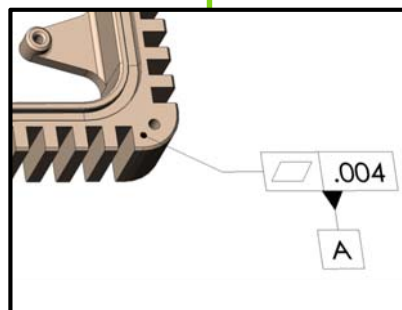


Model-Based Definition (MBD) is a model with Product Manufacturing Information (PMI) and consisting of:

- 1) **3D geometry** (serves as the basic dimensions)
- 2) **annotations\*** (displayed notes, dimensions and tolerances or GD&T)
- 3) **attributes\*** (metadata and queried data)
- 4) **presentation\*** (saved views, presentation organization)



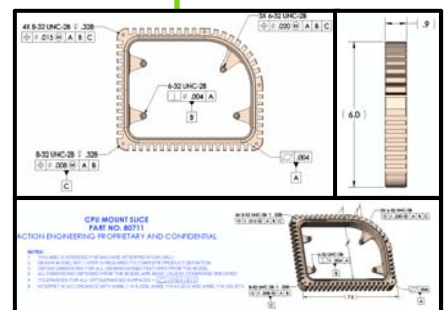
**3D GEOMETRY**



**ANNOTATIONS\***

<b>PART NUMBER</b>	8742659
<b>DESCRIPTION</b>	CPU MOUNT SLICE
<b>MATERIAL</b>	AL 6061-T651
<b>COMPANY</b>	Action Engineering
<b>DATA RIGHTS</b>	PROPRIETARY & CONFIDENTIAL
<b>SUPPLIER</b>	ACME MACHINING

**ATTRIBUTES\***

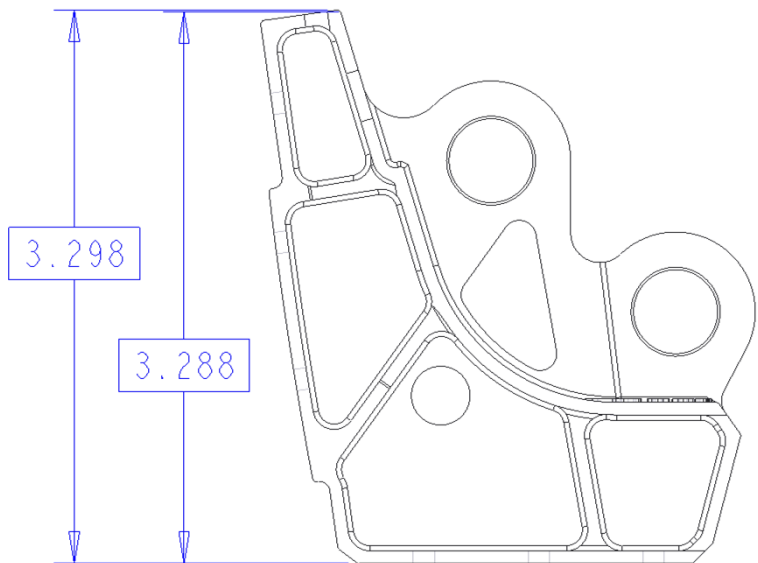


**PRESENTATION\***



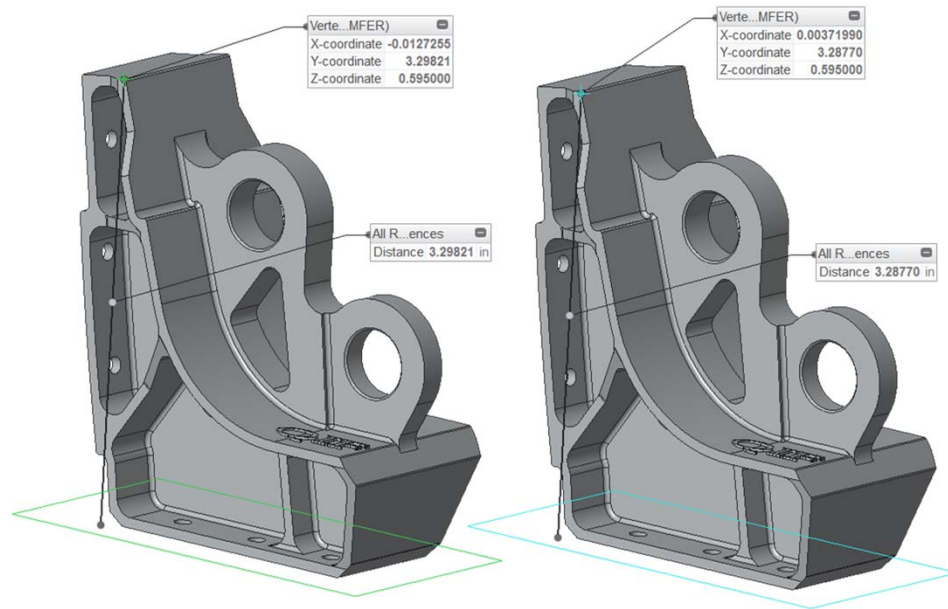


# How is MBD different from drawings?



Drawings are **AMBIGUOUS**

The 3D model is **ABSOLUTE**





# Anatomy of a Data Package (DD)



The screenshot displays a CAD environment with a 3D model of a housing part. On the right, a revision table is visible:

REV	REV DESCRIPTION	DATE
NEW	INITIAL RELEASE	02/09/2010
A	ADD 3D CSAT AND UPDATED CUSTOM PROPS	02/09/2010

Below the revision table is a 'GENERAL' section with text: 'DESIGN MODEL: REV=XXXXX\*STEP IS REQUIRED TO COMPLETE PRODUCT DEFINITION. OBTAIN DIMENSIONS FOR ALL UNDIMENSIONED SURFACES FROM THE MODEL. ALL DIMENSIONS OBTAINED FROM THE MODEL BASIC UNLESS OTHERWISE SPECIFIED. TOLERANCE FOR ALL UNTOLERANCED SURFACES: ±0.025. INTERPRET DRAWING IN ACCORDANCE WITH ASME Y14.5-2009, ASME Y14.41-2012, AND ASME Y14.100-2015.' A 'PART NOTES' section contains a note: 'This part will be manufactured using an additive (3D printing) process. Accessing to achieve hole tolerance requirements may be required.' At the bottom, a parts list table is shown:

P-I	QTY	DESCRIPTION
P-1	1	BE2400000 TOP ASSEMBLY
USED IN:	N/A	NEXT HIGHER ASSEMBLY DESCRIPTION
EN:		NUMBER
PROJECT NUMBER: TY9000X		
ACTION ENGINEERING, LLC		

At the bottom of the interface, a metadata table is visible:

APPROVER NAME	APPROVER FUNCTION	DATE	APPROVER SIGNATURE
THEROSS	RESPONSIBLE ENGINEER	02/09/2010	[Signature]
L. TOBERIGHT	CHECKER	02/01/2010	[Signature]
M. ZONE	DESIGNER	01/29/2010	[Signature]
J.B. HERRON	ORIGINATOR		

Below the metadata table, a table shows design maturity and material information:

DESIGN MATURITY	Development	LAKEWOOD, CO 80228
TOP TYPE	CLASS CODE 9: MODEL-ONLY	INT. USE: 87002
MATERIAL	Ureem 1000	HOUSING
MASS (LBS-Mass)	0.1615	PART NUMBER: BE24009024

## Data Package Elements

**3D Geometry** that is mathematically accurate provides graphical visual representation and dimensional representation

**Related Files** (3D and 2D) in a variety of formats (STEP, Parasolid, STL, Native CAD, more...)

### Annotations:

- Datums
- Tolerances
- Notes
- Product Characteristics

### Metadata

- Part Number, Description, Revision, Tolerance Block, Material, Finish, Organization Information
- Bill of Materials (BOM) or Parts List (PL)
- Option for encoded data (e.g. Color, IP Rights, Model Precision, CAD Format Compatibility)



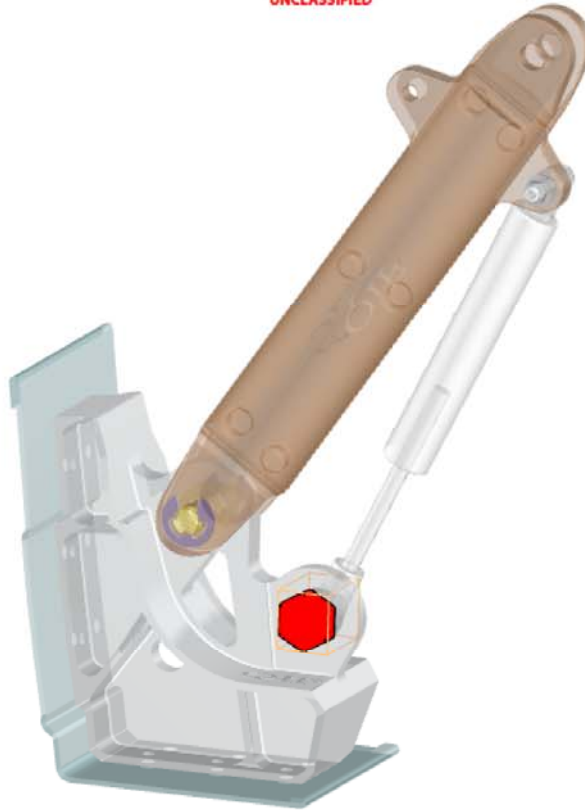
# Assembly Layout Example



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UNCLASSIFIED

PARTS LIST		
PART NUMBER	PART DESCRIPTION	PART QUANTITY
122333	BULKHEAD MOUNT	1
332211	QIF BRACKET	1
444555	QIF SHAFT	1
667788	QIF STRUT	2
60355K861	BALL BEARING	1
4170T211	CORROSION RESISTANT	1
97431A300	SIDE MOUNT_EXTERNAL	2
NAS620-8	WASHER	2
91259A163	ALLOY STEEL SHOULDER	1
MS21043 06	HEXAGON NUT	1
456987	BEARING SHAFT	1
97431A270	SIDE-MOUNT_EXTERNAL	1



REV	REV DESCRIPTION	DATE
A	INITIAL RELEASE	2016-09-05

NOTES AND/OR WORK INSTRUCTIONS

Project Number: QIF101

Company: ACTION ENGINEERING, LLC  
2269 S ELLIS CT  
LAKEWOOD, CO 80228

Case Code: 3TKH2

Assembly Name: QIF ASSEMBLY

Isolate Zoom Fit Show All

456987

BEARING\_SHAFT

QUANTITY 1 REVISION 1 MAKE

SUPPLIER Action Engineering, LLC

SUPPLIER CAGE CODE 3TKH2

MATERIAL AL 6061-T6

MASS (LBS-FORCE) 0.221307

0-OVERALL	1-MODELONLY	2-MANAGEMENTDATA	3-PROPERTIES

APPROVER NAME	APPROVER FUNCTION	DATE
G.BROWN	MANUFACTURING	2016-09-03
J.HORST	RESPONSIBLE ENGINEER	2016-08-29
R.RASTHEIMER	CHECKER	2016-08-28
D.RAMSEY	DESIGN	2016-08-28
J.HERRON	ORIGINATOR	2016-06-26

RELEASE APPROVAL	MATURITY CODE
555444-ASM 2016-09-05	M2-DEVELOPMEN
B.SQUIER	A1-NONE
	G3-FULL

DESCRIPTION	NUMBER	REVISION
QIF ASSEMBLY	555444	A

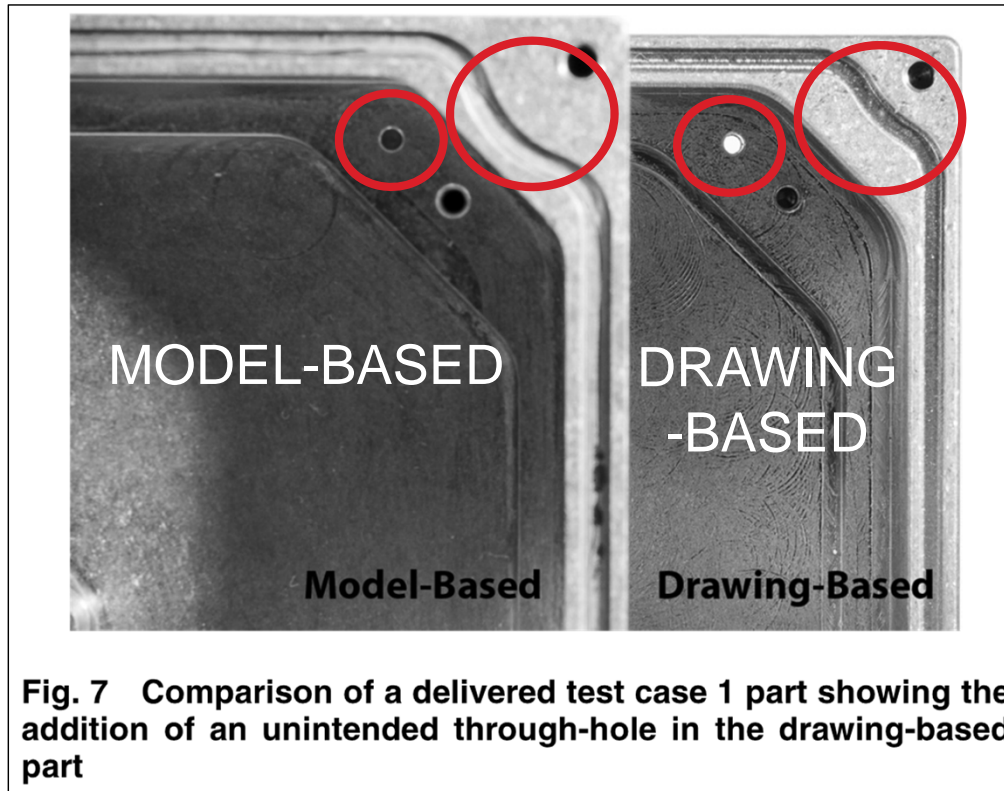
# Topics

What does a fully integrated digital enterprise look like?

**Why would I bother with MBD?**

How can MBD enable smart manufacturing systems?

What about Suppliers and Manufacturing/Quality?



- ♻️ Drawing-based method
  - ★ Rework required due to human mis-interpretation
- ♻️ Model-based method
  - ★ Built as modeled

**CITATION:** Testing the Digital Thread in Support of Model-Based Manufacturing and Inspection, Journal of Computing and Information Science in Engineering, June 2016, Vol.16

# MBD Benefits at a Large Scale

## LIFECYCLE INSIGHTS

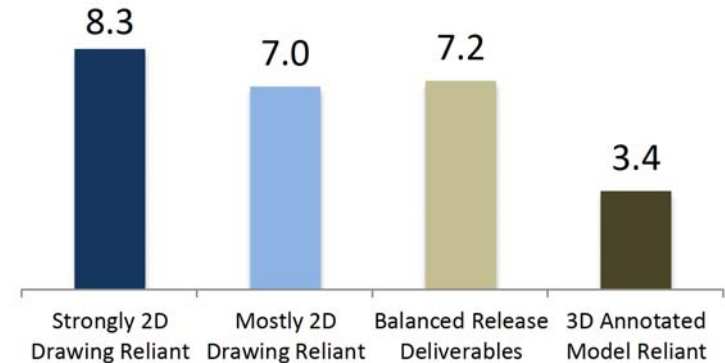
- Migrating to MBD provides quantifiable benefits
- MBD can reduce scrap rate and reduce engineering changes
- Using a minimally annotated model reduces product definition authoring time

REFERENCE:

<http://www.lifecycleinsights.com/study/the-design-and-documentation-study/>

## 2014 DATA

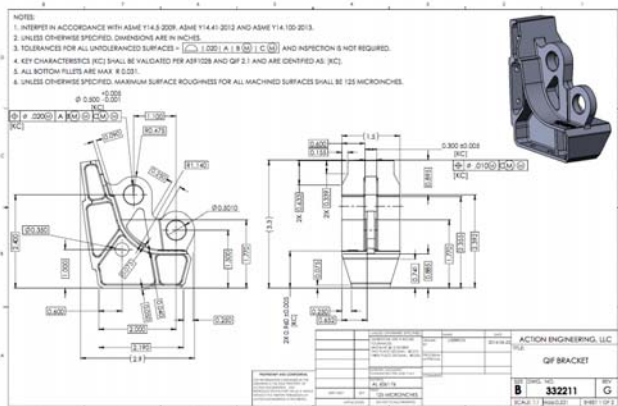
Assessing why parts don't fit together  
**4.9 fewer times per month**



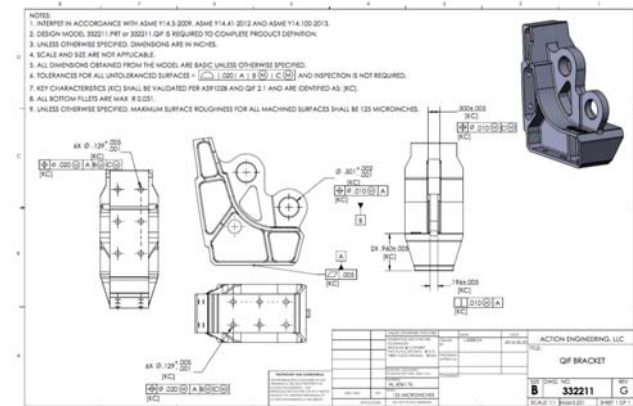
*Figure 3: Average times per month the organization assesses why parts don't fit as a result of engineering documentation*

REFERENCE: QUANTIFYING THE VALUE OF MODEL BASED DEFINITIONS – Lifecycle Insights - <http://www.lifecycleinsights.com>

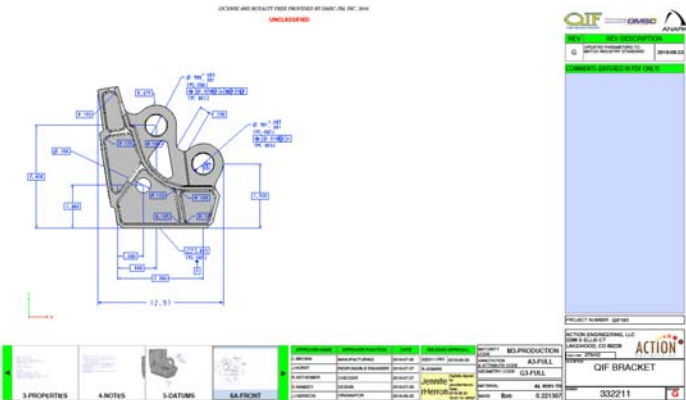
© Lifecycle Insights, do not distribute or repurpose



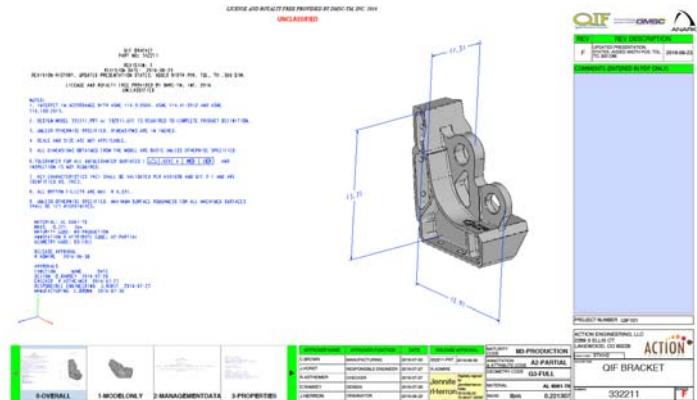
Fully Annotated Drawing



Minimally Annotated Drawing



Fully Annotated 3D Model



Minimally Annotated 3D Model

LIFECYCLE
INSIGHTS

## MBD ADOPTION

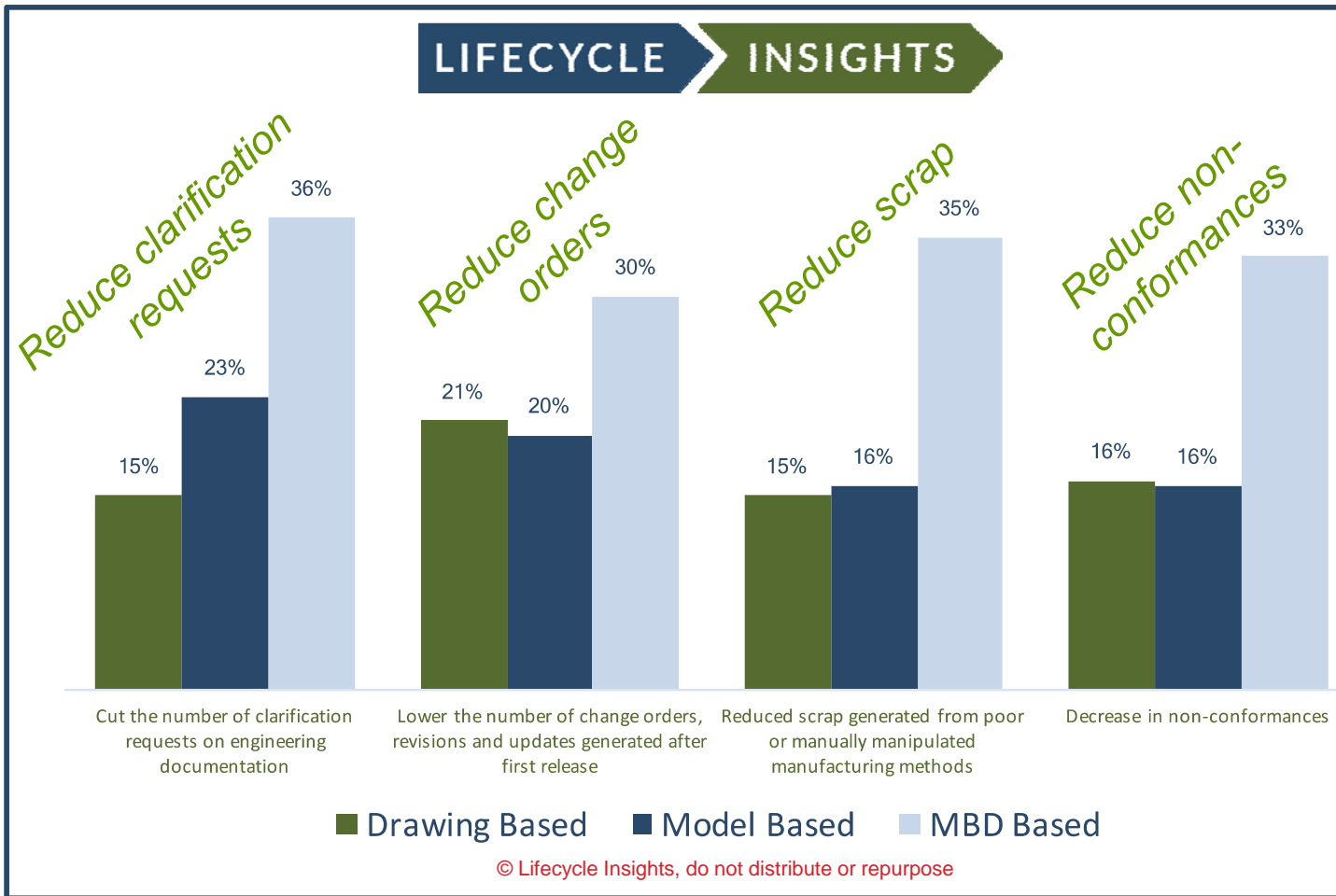
2016 DATA

- Drawing exclusive
- Drawing with model
- Drawing with MBD deliverable
- Drawingless


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# Reduce Changes, Scrap, and Non-Conformances

2016 DATA



# Search-ability

 **CHALLENGE:** Engineers spend too much time searching for data

 **SOLUTION:** Consistently applied MBD can increase the “google-ability” of 3D data



Name	Kind	Date Last Opened
2017 MBE Summit-Evolve or Dissolve-Herron.pptx	Office...ntation	Today, 12:44 PM
2017 MBE Summit-MBD Supplier Readiness-Herron.pptx	Office...ntation	Today, 12:44 PM
~\$2017 MBE Summit-MBD Supplier Readiness-Herron.pptx	Office...ntation	Today, 12:44 PM
101 Transcript - WIP.docx	Word 2...ument	Today, 11:58 AM
2017 Jennifer Herron...	PDF Document	Today, 11:44 AM
### Catalog...	Word 2...ument	Today, 11:42 AM
NTS Unit...	PDF Document	Today, 11:19 AM
Purd...	Word 2...ument	Today, 11:12 AM
MB...	Word 2...ument	Today, 10:50 AM
2...	PDF Document	Today, 10:39 AM
...	PDF Document	Today, 10:34 AM
...ering10.6.17 Af ...	Word 2...ument	Today, 10:06 AM
...ngineering10.6.17 AE-signed-u...	PDF Document	Today, 10:06 AM
Course Outlines.docx	Word 2...ument	Today, 10:04 AM
W Course Outlines.docx	Word 2...ument	Today, 10:04 AM
Unitek Cover Letter.docx	Word 2...ument	Today, 9:44 AM
oToWebinar - The Open-Source Moodle...ution in C...	ICS file	Today, 9:16 AM
ME Y14.37-2012.pdf	PDF Document	Today, 9:08 AM
3-10-12_ASME Y14.37_201x-Draft_r2.docx	Word 2...ument	Today, 9:06 AM
Jennifer Herron Resume.pdf	PDF Document	Today, 9:02 AM
4.46 Acceptance Letter.pdf	PDF Document	Today, 8:53 AM
...ache.png	Image	Today, 8:07 AM
02_..._2.pptx	Office...ntation	Today, 8:07 AM
2017-0...	Office...ntation	Today, 7:19 AM
03-02-17 Usa...	Office...ntation	Today, 7:19 AM
Retractable Banner.ppt...	Office...ntation	Today, 7:19 AM
4PNr1NFoDQL.stl	Standa...	Today, 7:19 AM
2rJ1tGhB17q.stl	Standa...Format	Today, 7:19 AM
fGJqluCCqyS.stl	Standa...Format	Today, 7:19 AM
fGJqluCCqyS.zip	ZIP archive	Today, 7:19 AM



# What is your pain?

- ♻️ High cost & schedule engineering changes
- ♻️ High scrap rate
- ♻️ Poor product quality
- ♻️ High tribal knowledge
- ♻️ Chaotic Design
  - ♻️ Engineer To Order (ETO)
  - ♻️ Configure To Order (CTO)



# Topics

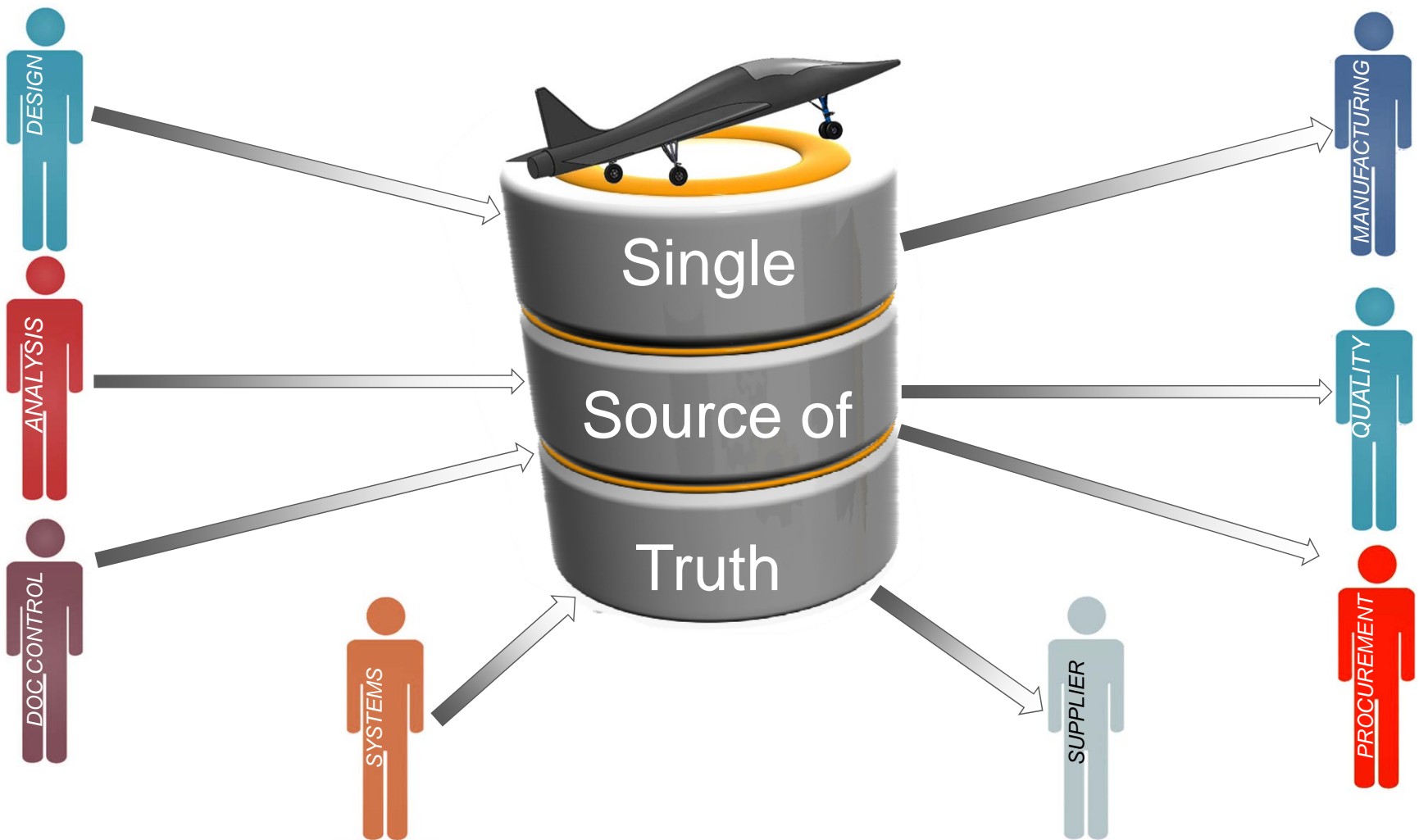
What does a fully integrated digital enterprise look like?

Why would I bother with MBD?

**How can MBD enable smart manufacturing systems?**

What about Suppliers and Manufacturing/Quality?

# What does a fully integrated digital enterprise look like?



# Success with Digital Data Requires the Entire Enterprise

	Design	Manufacturing	Quality	Procurement	Data Management
Standards	ASME Y14 Series	<ul style="list-style-type: none"> <li>• STEP</li> <li>• ASME Y14</li> </ul>	<ul style="list-style-type: none"> <li>• QIF</li> <li>• ASME Y14</li> </ul>	<ul style="list-style-type: none"> <li>• QIF</li> <li>• ASME Y14</li> <li>• STEP</li> </ul>	Defined Method to Manage Information Throughout Enterprise
Processes	CAD Agnostic Modeling Processes	Part-Specific Process Specifications & Derivative Models	Part-Specific Process & Derivative Models	Defined Methods to Acquire MBD Parts	ASME Y14 Series
Tools	CAD Software	CAM Software	Metrology Software	Viewer Software	PDM and PLM
People & Culture		Defined, Commonly Understood & Executed Culture Fosters Adherence to New Rules and Methods			

# Organizational Readiness: Evaluate Current & Target States

		Digital Design Model		
		Level 1 - Low Capability	Level 2 - Medium Capability	Level 3 - Best in Class Capability
Documentation	Master Data Set	2D Drawing is Master, Modeling is sparsely used or not used at all, no digital association between Drawing & Model - Y14.100 - Classification Code 1 or 2	3D Model is Master for Geometry, PMI is still in Drawing, Digital associativity is enabled between Model & Drawing, Drawing is derivative of Model - Y14.100 - Classification Code 3	3D Model is Master, is mathematically accurate, includes complete digital definition to support a wide range of domains - Y14.100 - Classification Code 5
	Data Authoring & Review	No or inconsistently applied methods for producing consistent documentation	Some and inconsistently applied methods for producing consistent documentation	Defined, repeatable and consistently applied methods for producing consistent documentation
	Data Consumption	No or inconsistently applied software consumable downstream re-use of design documentation	Some and inconsistently applied software consumable downstream re-use of design documentation	Defined, repeatable and consistently applied software consumable downstream re-use of design documentation
Analysis	Calculation Sophistication	Calculations based on manual methods/spreadsheets	Native CAD Model is reused as analytic model,	Automatic analysis as design progresses

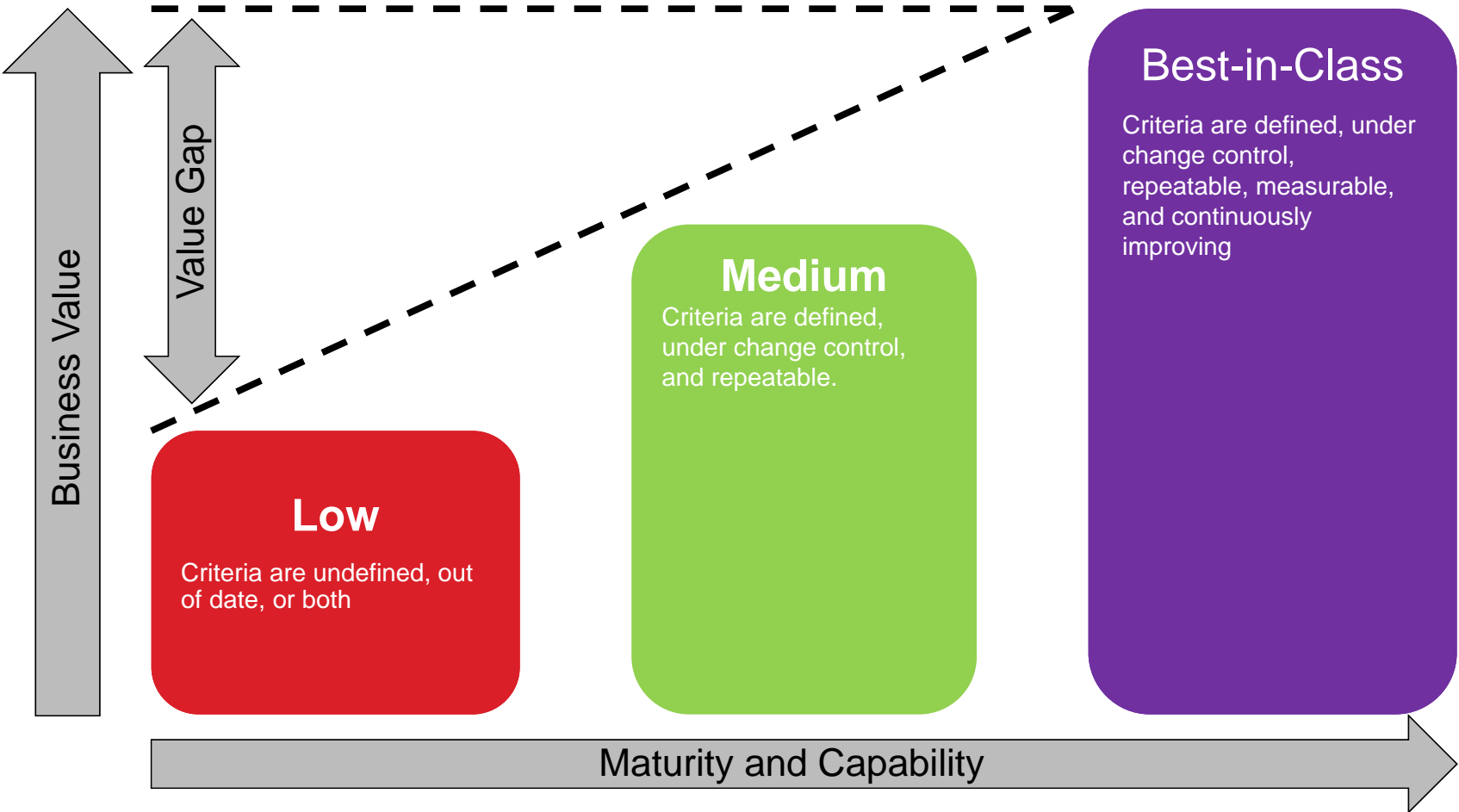


		Digital Design Model				SCORE	SCORE
		Relative Business Case	Level 1 - Low Capability	Level 2 - Medium Capability	Level 3 - Best in Class Capability	Current State	Target State
Requirements Traceability	Requirements Sophistication	Master Data Set	Single point of entry for all data: - Enables data flow accuracy - Enables downstream efficiency & accuracy - Allows for automation	2D Drawing is Master, Modeling is sparsely used or not used at all, no digital association between Drawing & Model - Y14.100 - Classification Code 1 or 2	3D Model is Master for Geometry, PMI is still in Drawing. Digital associativity is enabled between Model & Drawing. Drawing is derivative of Model - Y14.100 - Classification Code 3	Level 2-MEDIUM	Level 3-BEST IN CLASS
	Requirements Decomposition						
	Requirement & Design Associativity						
Product Data Release & Change Management	Requirement Validation	Documentation	Everyone creates and understands the data in the same way	No or inconsistently applied methods for producing consistent documentation	Some and inconsistently applied methods for producing consistent documentation	Level 1-LOW	Level 3-BEST IN CLASS
	Schema						
	Release Process						
Resource Management	Change Capture	Data Authoring & Review	Everyone receives and uses the data in a control and con	No or inconsistently applied software	Some and inconsistently applied	Level 3-BEST IN CLASS	Level 3-BEST IN CLASS
	Error Tracking						
	Data Collaboration & Interoperability						
Requirements Management	Data Access	Data Consumption	No or limited access to the data by all stakeholders	Limited access to the data by all stakeholders	Full	Level 3-BEST IN CLASS	Level 3-BEST IN CLASS
	Infrastructure						
	People Resources						
Requirements Management	Skills	Data Consumption	Everyone is personally responsible for developing and maintaining his/her own skills	Company provides training on the job	The firm	Level 3-BEST IN CLASS	Level 3-BEST IN CLASS
	Roles & Responsibilities						
	Requirements Management						
Requirements Management	Requirements Management	Data Consumption	No particular focus on the first planning & requirements stages of NPD	Level of focus on planning & requirements stages is arbitrary and driven Team by Team	Considerable efforts are made at the early planning & requirements stages of NPD	Level 3-BEST IN CLASS	Level 3-BEST IN CLASS
	Requirements Management						
	Requirements Management						

**[Low]** *Undefined & Out-of-date*  
**[Basic]** *Defined & Repeatable*  
**[Best-in-Class]** *Measured & Continuously Improving*

REFERENCE: Digital Thread Capability & Maturity Model, Action Engineering, LLC & DSA

# The Value Add of MBE Maturity



# Top 3 Focus Areas... and Why

Software Tools and Maintenance

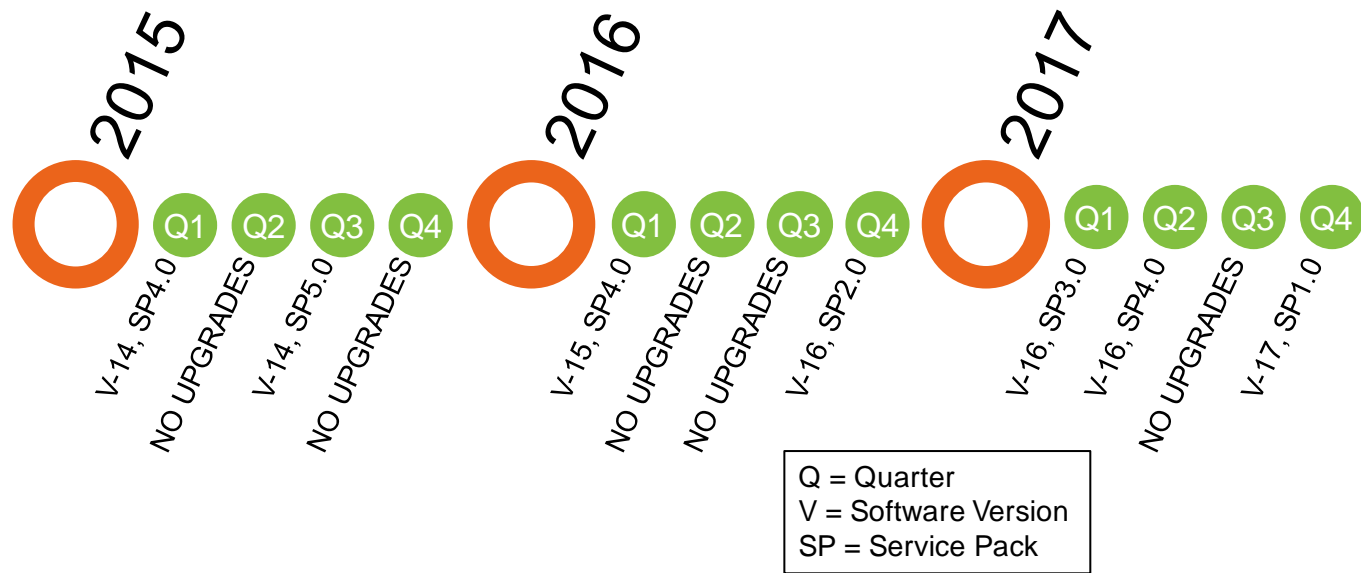
Define and Execute Consistently

Robust CAD Source, Derivative and  
Interoperability Strategy



- 🔄 Research
- 🔄 Select
- 🔄 Test
- 🔄 Deploy
- 🔄 Maintain

★ It is critical to “KEEP UP”



REFERENCE: <http://www.action-engineering.com/blog/2015/12/cad-maintenance-flavors>

# Define and Execute Consistently

## 🔄 Road Map for Implementation

- 🔄 Include all stakeholders: Design, Manufacturing, Quality, Data & Change Management, Procurement, Product Lifecycle Management, People & Culture

## 🔄 3D Product Definition

- 🔄 3D modeling standard
- 🔄 Sophisticated understanding of GD&T
- 🔄 Sophisticated approach to inspection criteria
- 🔄 CAD agnostic processes for MBD

## 🔄 Stakeholder Engagement

- 🔄 It's all about the people!
  - ★ Make jobs less frustrating
  - ★ Improving the quality of the end product
  - ★ Build loyalty



# Robust CAD Source, Derivative and Interoperability Strategy





# Topics

What does a fully integrated digital enterprise look like?

Why would I bother with MBD?

How can MBD enable smart manufacturing systems?

What about Suppliers and Manufacturing/Quality?

-  Internal Suppliers
-  External Suppliers

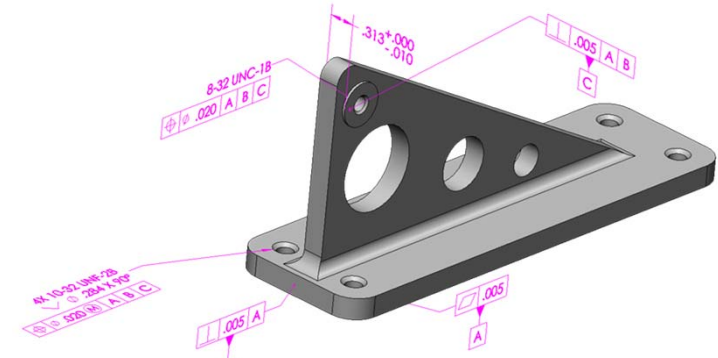
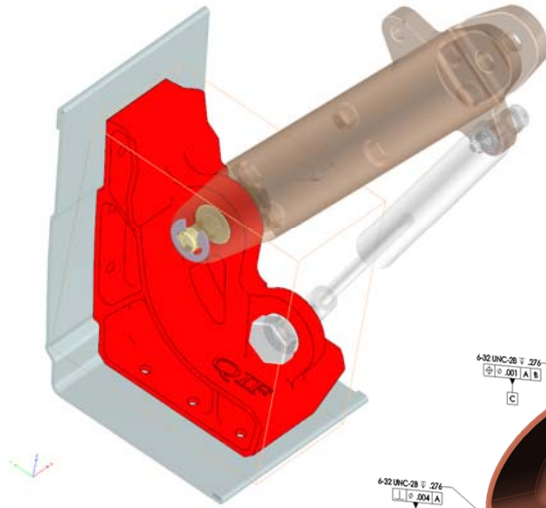
**MBE Summit Manufacturing & Quality Track**  
*MBD Supplier Readiness*  
*Tuesday, April 5, 2017 4:20-4:40 pm*

# What did you learn?

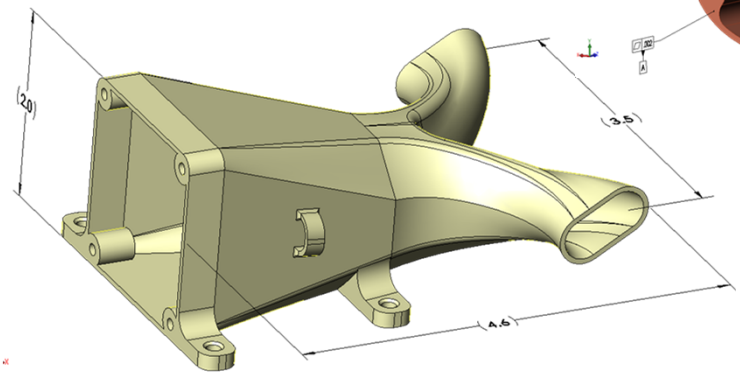
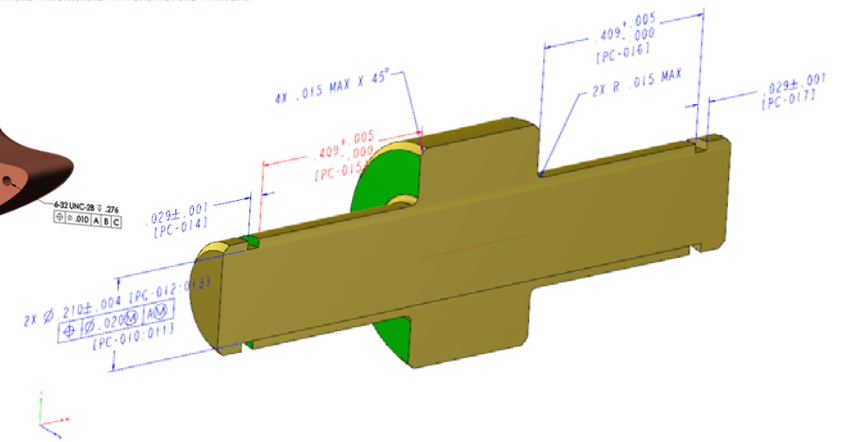
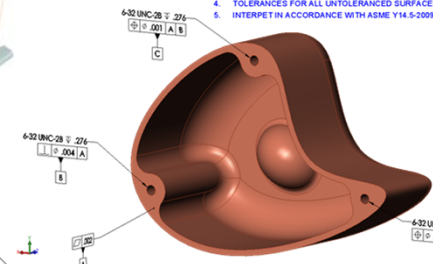
PARTS LIST		
PART NUMBER	PART DESCRIPTION	PART QUANTITY
122333	BULKHEAD MOUNT	1
332211	QIF BRACKET	1
444555	QIF SHAFT	1
667788	QIF STRUT	2
60355K861	BALL BEARING	1
4170T211	CORROSION RESISTANT	1
97431A300	SIDE_MOUNT_EXTERNAL	2
NAS620-8	WASHER	2
91259A163	ALLOY STEEL SHOULDER	1
MS21043_06	HEXAGON_NUT	1
456987	BEARING_SHAFT	1
97431A270	SIDE-MOUNT_EXTERNAL	1

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- NOTES:
- DESIGN MODEL #0313 STEP IS REQUIRED TO COMPLETE PRODUCT DEFINITION.
  - OBTAIN DIMENSIONS FOR ALL UNDIMENSIONED FEATURES FROM THE MODEL.
  - ALL DIMENSIONS OBTAINED FROM THE MODEL ARE BASIC UNLESS OTHERWISE SPECIFIED.
  - TOLERANCES FOR ALL UNTOLERANCED SURFACES =  $\pm .010(A,B,C)$
  - INTERPRET IN ACCORDANCE WITH ASME Y14.5-2009, ASME Y14.41-2012 AND ASME Y14.100-2013.



VIEW	PROPER NAME	APPROVED FUNCTION	DATE	RELEASE APPROVAL	MATURITY CODE
6A_FRONT	C.BROWN	MANUFACTURING	2016-09-05	ASSEMB-INT	M3-PRODUCTION
6B_RIGHT	J.HORST	RESPONSIBLE ENGINEER	2016-08-02	PLADMRP	A3-FULL
6C_SECTION_A	PLATHEIMER	CHECKER	2016-04-01		G3-FULL
KEY_CHARACTERISTI	S.WANDEY	DESIGN	2016-07-30		
	J.HERRON	ORIGINATOR	2016-07-12		

Find Out More...



## Model-Based Business Process Coaching & Planning

- Model-Based Engineering & Enterprise (MBE) Planning
- PDM & PLM Process Implementation
- Tailor Business Practices and PDM/PLM Workflows to include 3D CAD
- Apply Configuration Management Directly to 3D Model Data Sets
- Strategies to Create and Consume MBD Models

## Model-Based Training and Education

- Basic Training is CAD Agnostic and Focuses on MBE Philosophy
- Intermediate and Advanced Training is Software-Specific and Customized to Your Organization
- Understanding Model-Based Definition (MBD) and Technical Data Packages (TDP), per ASME Y14.41 and MIL-STD-31000A
- CAD Modeling Best Practice for MBE

## CAD, PDM, PLM Software Selection Consulting

- Software Beta Testing
- User-Based Feedback and Improvement for Software Tools
- Assess and Recommend Software Tools for Compatibility with 3D Model-Based Engineering (MBE)

# CAD Agnostic Course Listings

MBD/MBE EDUCATION	Course Number	Suggested Format
Model Based Enterprise (MBE) Overview – What, Benefits, How	101	Live or Online
Introduction to MBD – What, GD&T, How	102	Live or Online
<b>PLANNING</b>		
MBE Implementation	103	Live or Online
MBE Planning and Roadmap Building	104	Live
<b>IMPLEMENTING</b>		
Model Schema and Organization – CAD Agnostic	105	Live or Online
How to Write a Modeling Guide – CAD Agnostic	106	Live or Online
Reading, Commenting and Publishing 3D PDFs	107	Live or Online

# CAD Specific Course Listings

CAD & PDM IMPLEMENTATION: SOLIDWORKS	Course Number	Suggested Format
Using SOLIDWORKS MBD	201	Live or Online
Administration, Set-up, and Best Practices for SOLIDWORKS and Enterprise PDM for MBD	202	Live or Online
Model Checking Automation for MBD	203	Live or Online
Reading, Viewing, and Reviewing MBD in SOLIDWORKS and eDrawings	204	Live or Online
CAD IMPLEMENTATION: Creo	Course Number	Suggested Format
Using Creo MBD	301	Live or Online
Model Checking Automation for MBD – ModelCHECK Administration and Best Practice	303	Live or Online
Reading, Viewing, and Reviewing MBD in Creo and CreoView	304	Live or Online
CAD IMPLEMENTATION: NX	Course Number	Suggested Format
Using NX MBD	401	Live or Online

*Courses listed are not official SOLIDWORKS, DASSAULT, PTC, or SIEMENS sanctioned courses.*

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**[action-engineering.com](http://action-engineering.com)**






**@ReUseYourCAD**





**Re-Use Your CAD**

# Online Resources

## Blogs


-  [www.action-engineering.com/blog](http://www.action-engineering.com/blog)
-  [blog.grabcad.com](http://blog.grabcad.com)
-  [MCADCafe.com](http://MCADCafe.com)

## LinkedIn Groups

-  Model Based Enterprise
-  Model Based Definition



## Events

-  3D CIC + QIF Summit  
October 3-5, 2017, Golden, CO

# Part Layout Example

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UNCLASSIFIED

QIF BRACKET  
PART NO: 332211  
REVISION: G  
REVISION DATE: 2016-08-23  
REVISION HISTORY: UPDATED PARAMETERS TO MATCH INDUSTRY STANDARD  
LICENSE AND ROYALTY FREE PROVIDED BY DMSC-TM, INC. 2016  
UNCLASSIFIED

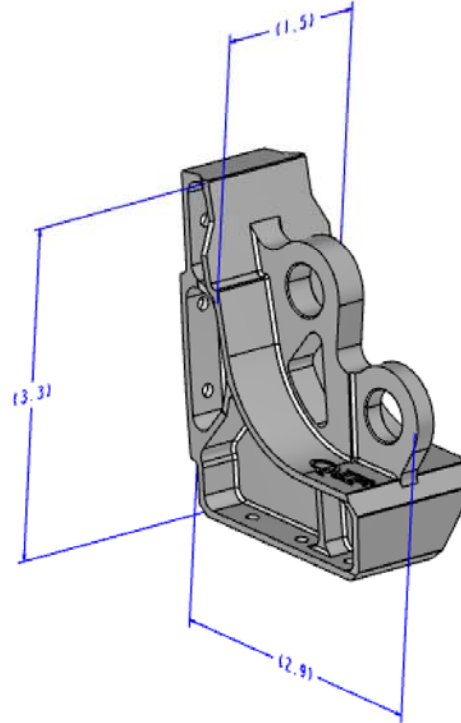
- NOTES:
- INTERPRET IN ACCORDANCE WITH ASME Y14.5-2009, ASME Y14.41-2012 AND ASME Y14.100-2013.
  - DESIGN MODEL 332211.PRT or 332211.QIF IS REQUIRED TO COMPLETE PRODUCT DEFINITION.
  - UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES.
  - SCALE AND SIZE ARE NOT APPLICABLE.
  - ALL DIMENSIONS OBTAINED FROM THE MODEL ARE BASIC UNLESS OTHERWISE SPECIFIED.
  - TOLERANCES FOR ALL UNTOLERANCED SURFACES =  $\pm .020$  A B C D AND INSPECTION IS NOT REQUIRED.
  - KEY CHARACTERISTICS (KC) SHALL BE VALIDATED PER AS9102B AND QIF 2.1 AND ARE IDENTIFIED AS: (PC-###).
  - ALL BOTTOM FILLETS ARE MAX R @ .031.
  - UNLESS OTHERWISE SPECIFIED, MAXIMUM SURFACE ROUGHNESS FOR ALL MACHINED SURFACES SHALL BE 125 MICROINCHES.

MATERIAL: AL 6061-T6  
MASS: 0.221 lbm  
MATURITY CODE: M3-PRODUCTION  
ANNOTATION & ATTRIBUTE CODE: A2-PARTIAL  
GEOMETRY CODE: G3-FULL

RELEASE APPROVAL  
R.ADMIRE 2016-06-30

APPROVALS

FUNCTION	NAME	DATE
DESIGN	D. RAMSEY	2016-07-26
CHECKER	R. ASTHEIMER	2016-07-27
RESPONSIBLE ENGINEERING	J. HORST	2016-07-27
MANUFACTURING	C. BROWN	2016-07-30



REV	REV DESCRIPTION	DATE
G	UPDATED PARAMETERS TO MATCH INDUSTRY STANDARD	2016-08-23

COMMENTS (ENTERED IN PDF ONLY)

PROJECT NUMBER QIF101

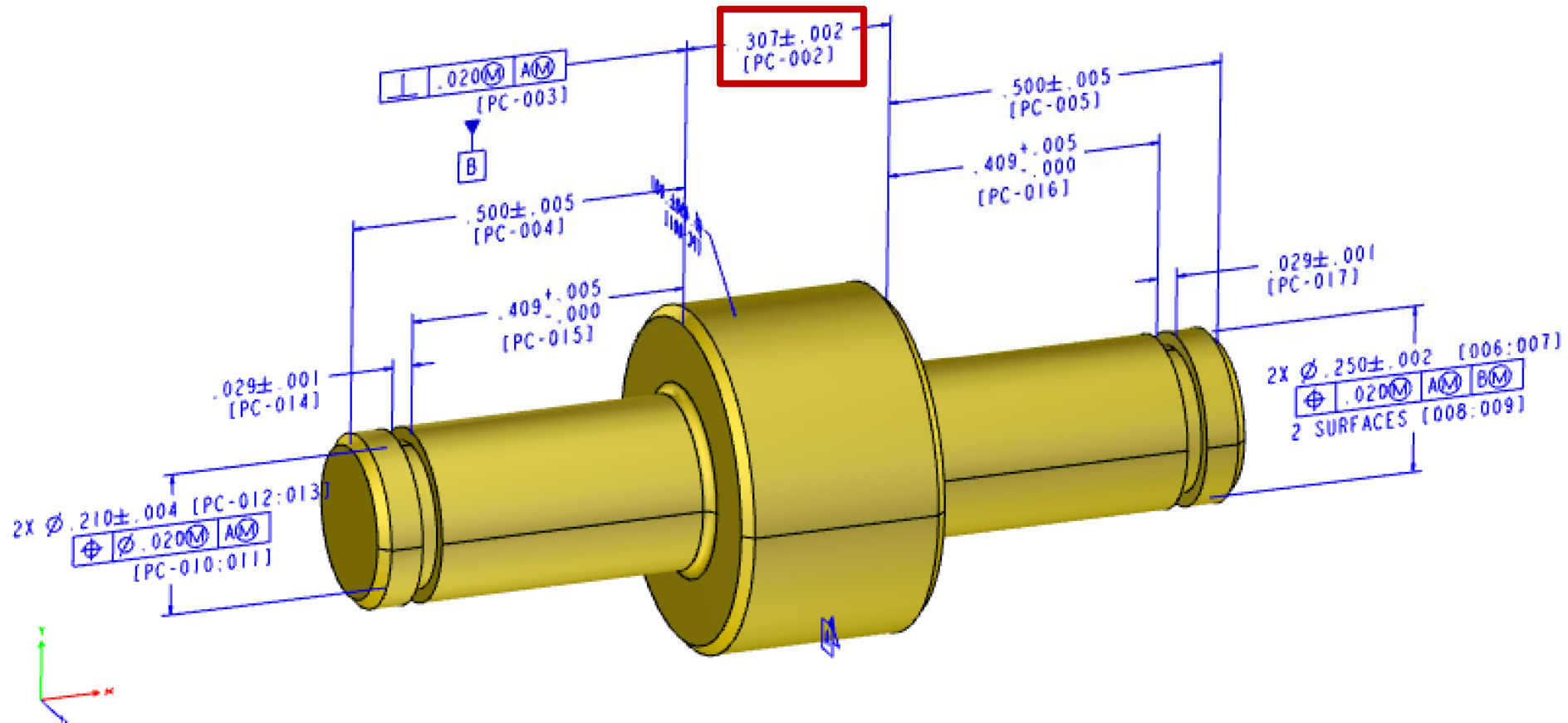
ACTION ENGINEERING, LLC 2269 S ELLIS CT LAKEWOOD, CO 80228		
CAGE CODE: 5TKH2	DESCRIPTION: QIF BRACKET	
NUMBER: 332211	REVISION: G	



APPROVER NAME	APPROVER FUNCTION	DATE	RELEASE APPROVAL	MATURITY CODE
C. BROWN	MANUFACTURING	2016-07-30	332211-PRT 2016-06-30	M3-PRODUCTION
J. HORST	RESPONSIBLE ENGINEER	2016-07-27	R.ADMIRE	A2-PARTIAL
R. ASTHEIMER	CHECKER	2016-07-27	Digitally signed by Jennifer Herron Date: 2016.08.23 18:47:42 -0800	GEOMETRY CODE
D. RAMSEY	DESIGN	2016-07-26		G3-FULL
J. HERRON	ORIGINATOR	2016-06-22	MATERIAL	AL 6061-T6
			MASS	lbm 0.221307

# Identifying Product Characteristics with MBD

7. PRODUCT CHARACTERISTICS (PC) SHALL BE VALIDATED PER AS9102B AND QIF 2.1 AND ARE IDENTIFIED AS: [PC-###].



# Creating a Data Package (DP)

