



Malcolm Baldrige
National
Quality
Award
2007 Award
Recipient



Network Centric Manufacturing (NCM)

Sanjay Parimi

ARDEC Project Officer (APO)

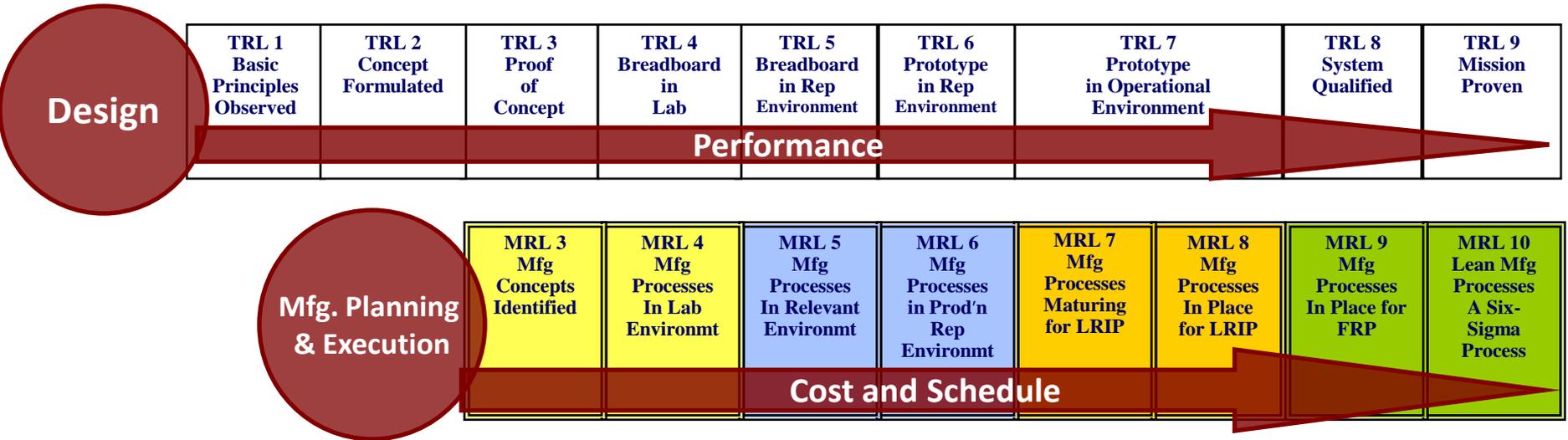
U.S Army's Armament Research, Development & Engineering Center (ARDEC)

December 2010

Issue: DoD system acquisition programs are not fully capitalizing on a knowledge-based acquisition approach and are likely to experience a cascade of negative effects on cost and schedule

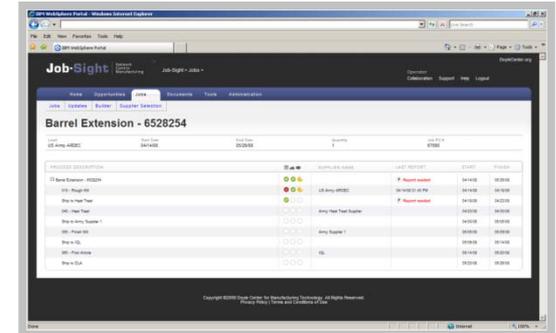
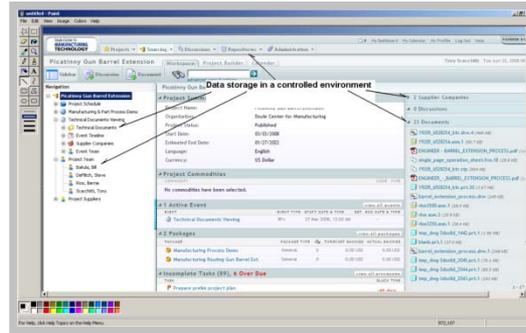
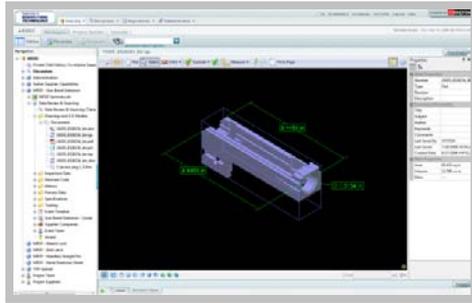
Solution: OSD Global Vision addresses the results of GAO report and ensures a “single digital thread”:

- Knowledge-based acquisition approach that is universally accessible, scalable, transferrable & sustainable
- Knowledge that is connected, captured and available in each lifecycle phase – design, manufacturing planning & execution – including end of life



Re-Define Product Data to include more than just design data:

- Design Data
- + Manufacturing Data (components & assemblies)
- + Sustainment Data (Digital TMs & TBs)



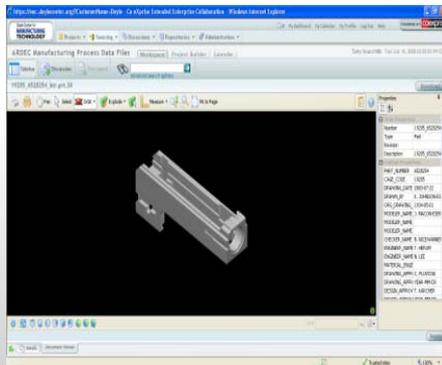
Develop "Modern"
Product Definition



Create Qualified
Supply Chain



Deploy product definitions
to qualified vendors



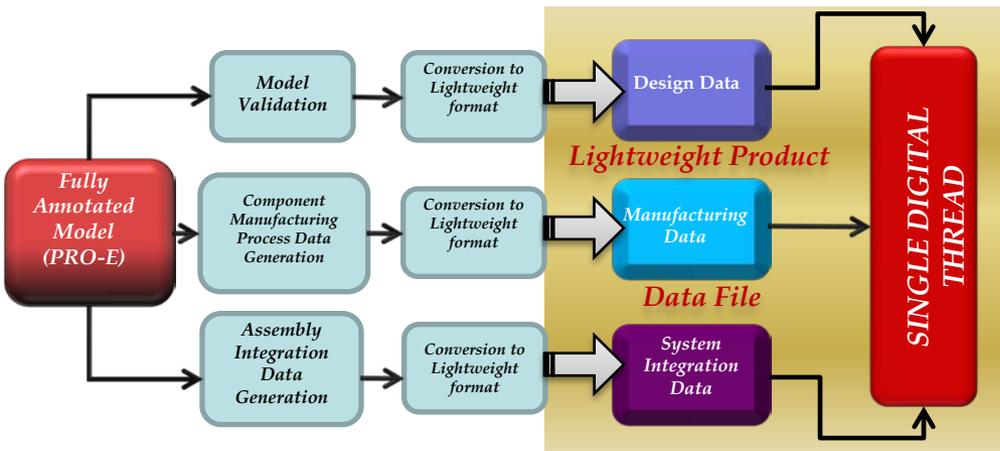
Time-to-field



reduced by 59%



\$1.2M production cost savings (3600 parts)



“Product Data is more than just 2D prints”

Purpose: To increase the speed to market of mission critical military systems by more effectively capturing, validating, storing, and transitioning product data to the industrial base.

Results/Products:

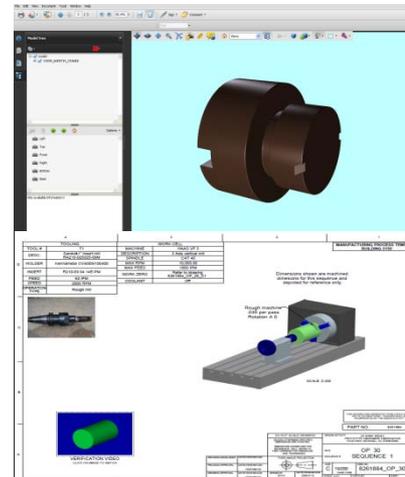
- Robust, well integrated business process.
- Knowledge management system capable of storing all the elements of product data.
- Updated & validated Product Data Files (PDF) for mission critical armament systems.

(Warfighter) Payoff:

- Upgraded & more responsive supply chains.
- Improved ability for DLA to stand up supply chains for “hard to manufacture” military components.
- Push button spare parts supply system for ASV- CAS and CROWS products.

Schedule & Cost

	FY 09	FY 10	FY 11
Assess Existing MBE Technology			
Develop NCPM process			
Validate NCPM process		Milestone B diamond	
Transition NCPM process to stakeholders			Milestone C diamond



Utilizing 3D Product data in a generic, free to access format is a game changer...

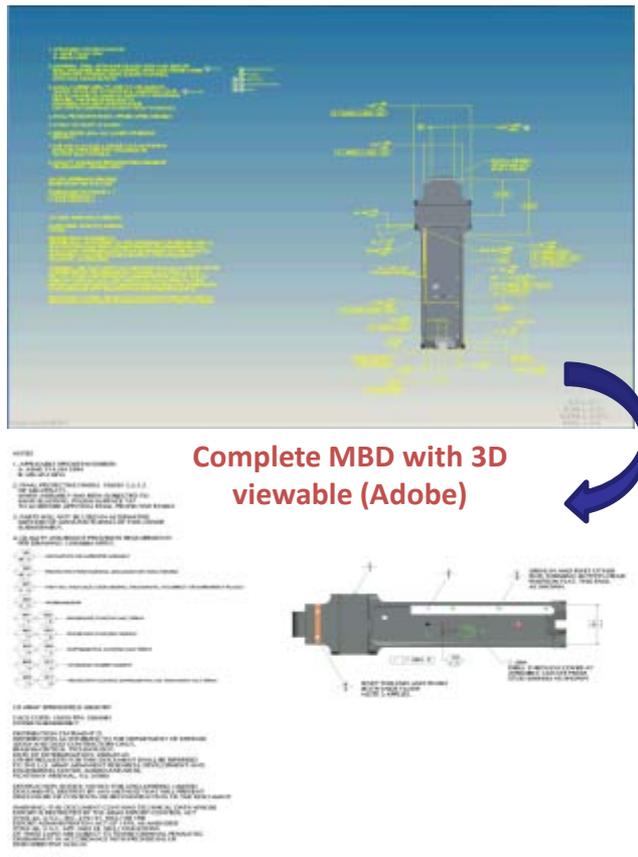
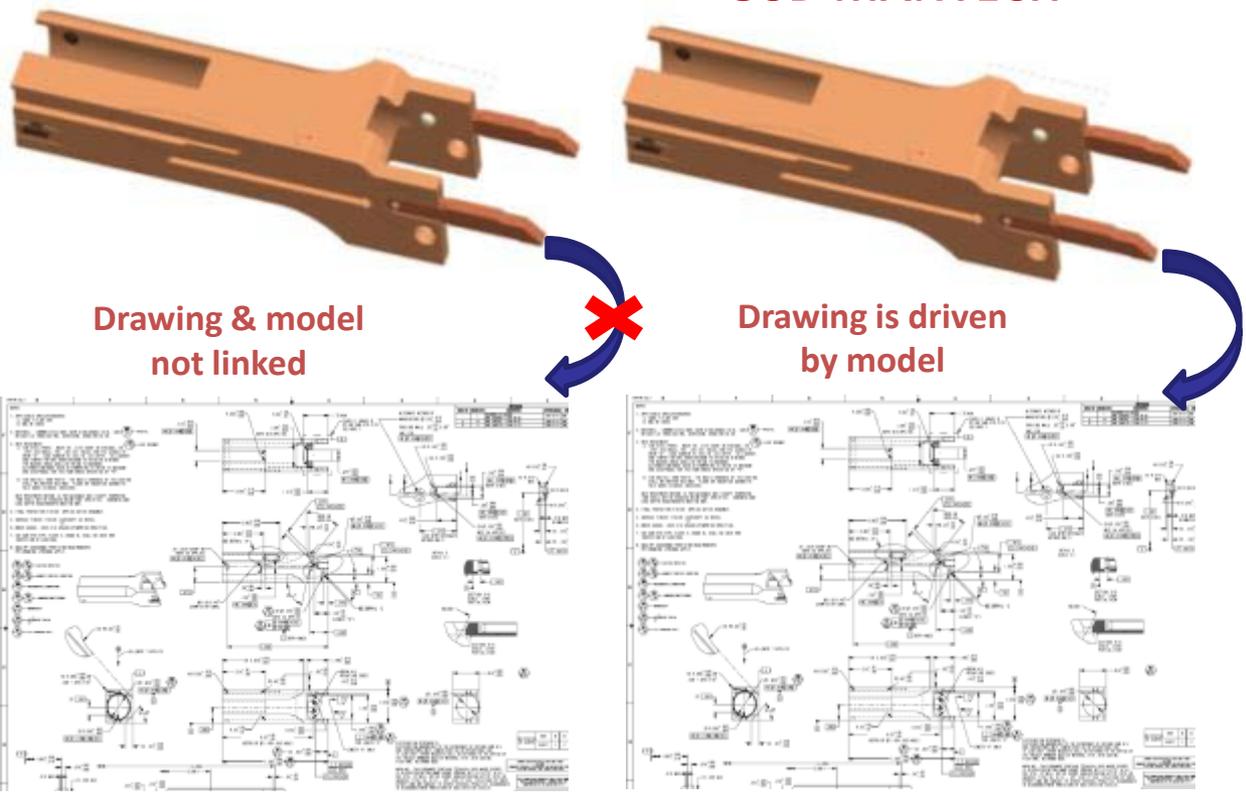
2D PDF and C4: Current Army Document of Record

3D Official: 3D model is official. 2D drawing driven by model

3D Fully Annotated: Complete Model Based Definition with supporting Lightweight viewable (i.e. Adobe 9.0 file)

Congressional NCPM

OSD MANTECH



19205_5009395-second.pdf - Adobe Reader

File Edit View Window Help

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Tools Comment Share

CURRENT DESIGN ACTIVITY CAGE CODE: 192 00
U.S. ARMY
ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER
PICATINNY ARSENAL, NEW JERSEY 07806-5000
COMBINED STATE: MBD1_SITE_MAP

MBD5A_FRONT

MBD5B_LEFT

- MBD0_NONE
- MBD1_SITE_MAP
- MBD2_TITLE_BLOCK
- MBD4_SET_DATUMS
- MBD5A_FRONT
- MBD5B_LEFT

Clipping State:SECTION_RIGHT_MIMV_DRAWING

Instance:GENERIC



Anark First Article Inspection doc.pdf - Adobe Reader

File Edit View Window Help

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Tools Comment Share

Please fill out the following form. You can save data typed into this form. Highlight Existing Fields

PART SUBMISSION WARRANT



PART MANUFACTURING INFORMATION

Part Name: Differential casting

Part Number: 00256982

Safety and/or Government Regulation: YES NO

Drawing Change Level: -

Additional Changes: Changed draft

Drawing Number: 0058 Engineering Change#: 000

SUPPLIER MANUFACTURING INFORMATION

Supplier Name: Chris Garcia Casting Supplier Code: 36589

Address: 1434 Spruce Street

City: Boulder State: CO Zip Code: 80302

SUBMISSION INFORMATION

Dimensional Material/Functional Appearance

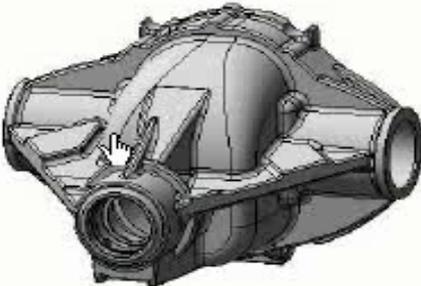
Customer: General Motors Buyer: Pam Smith

REASON FOR SUBMISSION

Please Select Reason: Change in Part Description

Delivered Part

Click to activate...



Part Specifications

Specified	Measured
A: Width = 15.83 +/- 0.03 in	15.84
B: Axle Bore Dia = 3.94 +/- 0.01 in	3.94
C: Driveshaft Bore Dia = 3.93 +/- 0.01 in	3.93
D:	

Anark generated Bradley Transmission 3DPDF W1.pdf - Adobe Reader

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Comment Share

Assy Number	Model Number	Revision	Date
MT022222	12446500	2.3	4/9/2010

Bradley Transmission: MT022222 Assembly Digital Work Instructions

Work Steps

- Place gasket 11629476_H
- Align MTO22222 to MT077777
- Attach MTO22222 to MTO77777
- Tighten MTO22222 primary bolts
- Bolt MTO22222 to MTO77777
- Tighten MTO22222 secondary bolts
- Attach MTO22222 tertiary bolt
- Attach 11629365
- Attach 12389424

Step #

< Prev Next > Play Animation Sequence

Selected Part Name

Work Instructions

Fetch 11629476_H from Bin #6655, QTY 1.

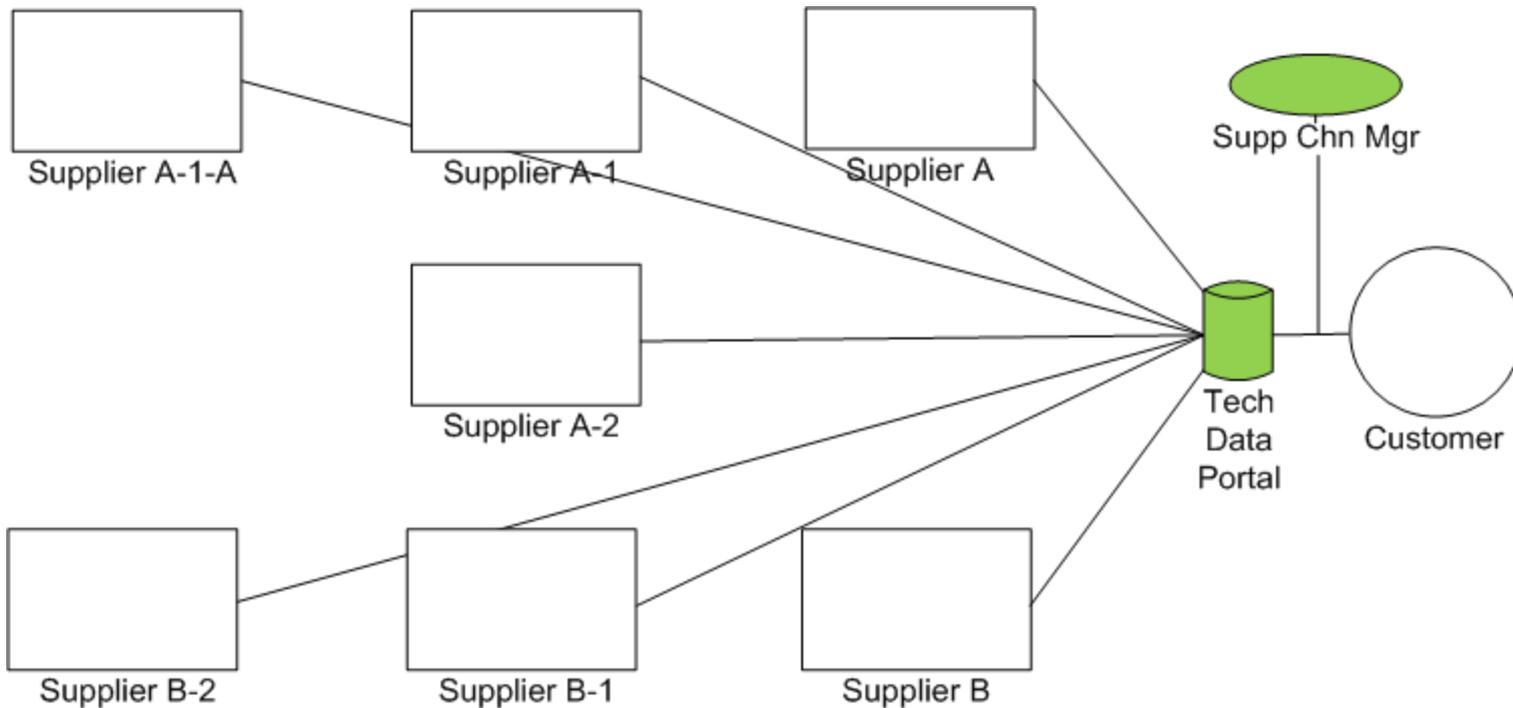
Place gasket 11629480 and align to proper location.

Apply gasket seal.

Apply liberal amount.

Use brush to even out material over gasket face.

- Improvements through new centralized tools and processes



Linking NCM to Manufacturing Readiness Levels



- Manage & Reuse Product Definition

- Adjust supply chain based on shifts in demand.

Sustainment
RESET,
Refurbish,
Repair



MRL 3
Mfg
Concepts
Developed

- Conceptual Product Models
- Identification of prototyping process

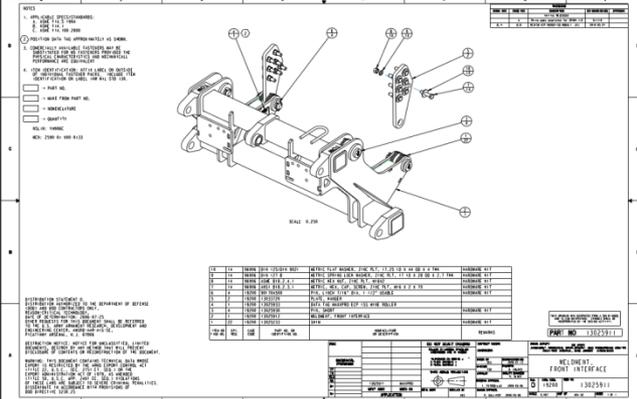
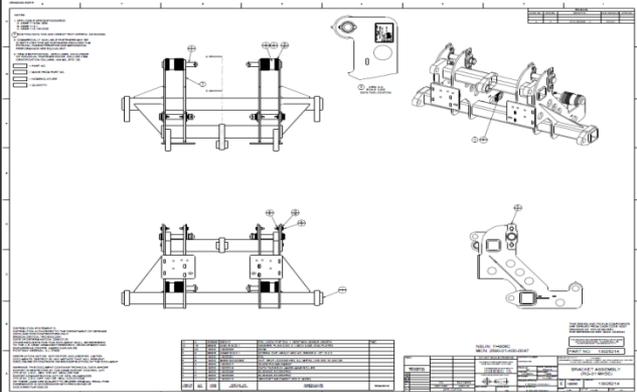
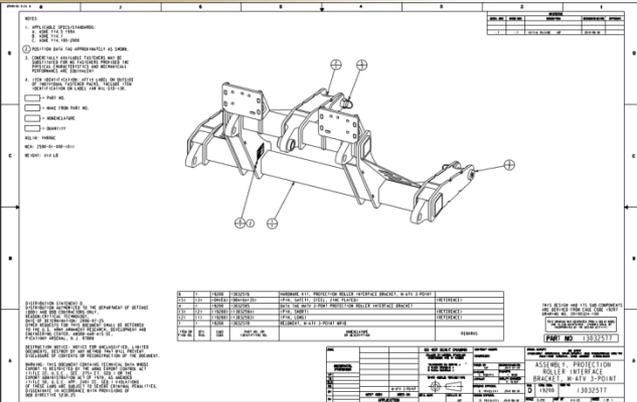
- Model Based Definition
- Mature MPDF
- System integration data
- Configured, agile supply chain

MRL 9
Mfg
Processes
In Place
for LRIP

MRL 5
Mfg
Processes
Maturing
for LRIP

- Robust 3D design models
 - Initial Manufacturing Process Data File (MPDF)
- Supply Chain model

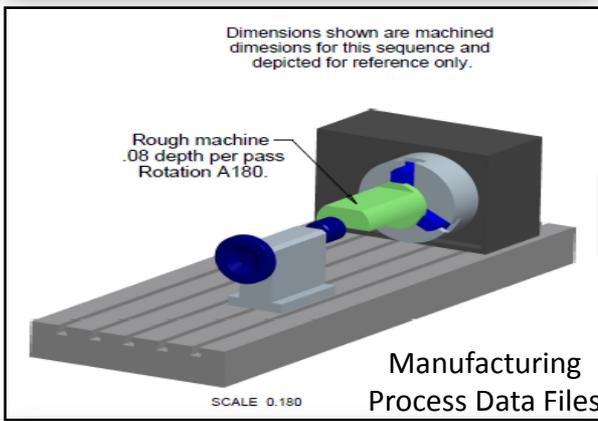
NCM ensures sufficient MRL to enable efficient delivery of critical parts to the field



Convert to modern product data package



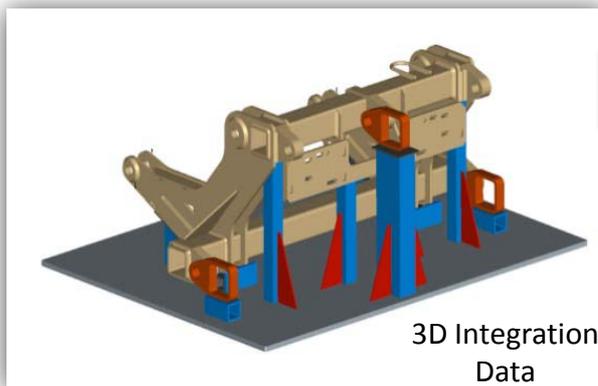
Lightweight 3D Design



Dimensions shown are machined dimensions for this sequence and depicted for reference only.

Rough machine .08 depth per pass Rotation A180.

Manufacturing Process Data Files



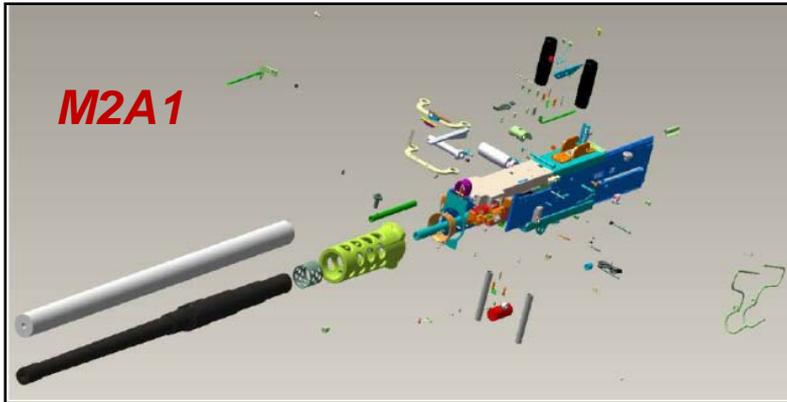
3D Integration Data

Qualified Supplier 1

Qualified Supplier 2

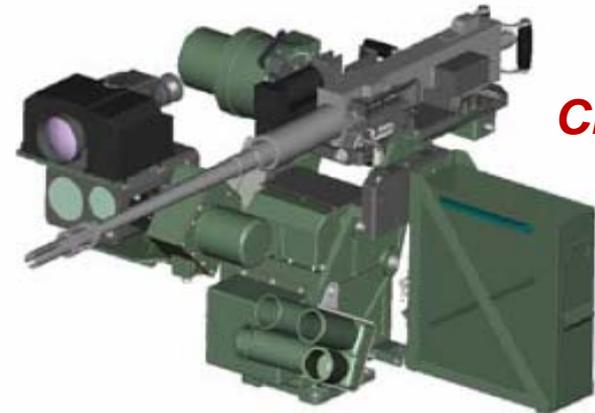
Qualified Supplier 3

Qualified Supplier 4



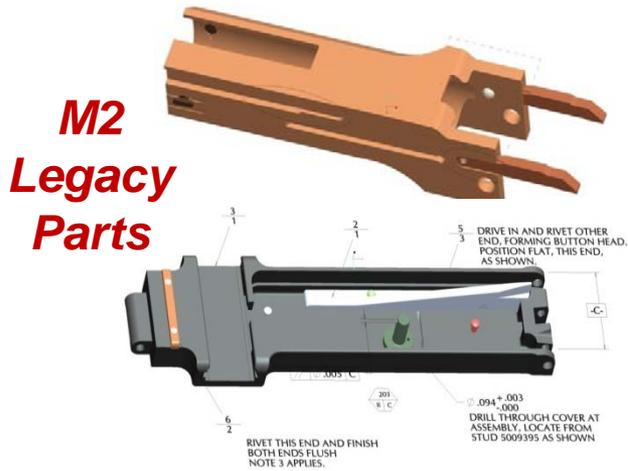
M2A1

- Fully-Annotated Model w/ Lightweight Design Data (3DPDFs)
- MPDFs for hard to source parts
- Digital Work Instructions for RESET operations.



CROWS

- Develop 3D representations of LRUs/SRUs
- Interactive Electronic Technical Manual (IETM)



**M2
Legacy
Parts**

- Create full product data package (PDF format)
- Establish qualified Manufacturing Network
- Deploy modern product data to source components



**M3P
&
Kiowa**

