Reuse of Model Based Definition Data to Increase Army Efficiency and Reduce Lifecycle Costs

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• Define Model Based Enterprise (MBE)
• Obtain High Level Management Understanding and Support for implementing MBE activities in DoD.
• Explain how MBE contributes value throughout the weapon system life cycle
  – Design and production
  – Field operations (Training, Tech Pubs and manuals)
  – Depot Operations
  – Supply Chain Activities
• Discussion – Questions and Answers
Today Drawings come from models
What is MBE?

The Model Based Definition (MBD) is created at the beginning of the lifecycle then reused throughout the enterprise, thus creating the Model Based Enterprise (MBE).

MBE is an integrated and collaborative environment, founded on 3D product definition (MBD) shared across the enterprise, enabling rapid, seamless, and affordable deployment of products from concept to disposal.
MBE will help DoD to field, maintain, and upgrade weapons system more rapidly and economically over the lifecycle.
MBD/MBE Team Members & Collaborators

OSD

Air Force

Army

Navy/Marine Corps

NIST

DLA/DLIS

Industry-Prime Ctrs

Industry-Standard Organizations

Industry-Technology Developers

Other Govt. Agencies
Where is MBE Needed?

MBE is needed across all of the Acquisition, Technology, and Logistics Lifecycle areas:

1. **Model-Based Design & Reuse** – Design optimization through integrated applications and CAD interoperability
2. **Intelligent Mfg** – Reduce manufacturing risk and cost through modeling and simulation methodologies
3. **Innovative Mfg Execution** – Network Centric mfg and single digital master files
4. **Enterprise Collaboration** – Seamless collaboration across design and production networks
Objectives:
• Highly integrated design for mfg capability
• Increased fidelity cost modeling
• Pre-production test and validation
• First Article Quality

Major Elements:
• 3-dimensional modeling
• Manufacturing process simulation
• Verified component and process cost models
• Visualization of end-to-end production and test processes
**State of the Industry**

- 3D Models drive all CAD. 2D data is a derivative of the models
- PLM database associates Models with Metadata in a logical structure
- Models becoming the Master

**Future State of Practice in Industry and Army - DOD**

- Fully Annotated 3D Model are the Master
- Reuse models for production activities such as machining, line layout, work instructions
- Fully defined 3D TDP
- Certification of MBD data and the Product Master

**Increasing capability rapidly being introduced by major CAD Vendors**
MRAP Egress Trainer

- MRAP’s may roll over when hit with blast from mines or IEDs
- Trainers used to drill soldiers how to rapidly escape a roll over

MRAP Plus Egress Trainer
Design Start to Release 19 Days
No Drawings/only Models which are all fully annotated.

- Design hours bid: without MBE 26,000 hrs: with MBE by MBE Team 1,500 hrs Actual: 968 hrs
  - Saving-25,000 hrs Enabled by reuse of MBE data.
- Design Start: 9/18 Finish/Model Release: 10/1/09 9 Working Days
- Manufacturing Bill of Materials (MBOM) Start: 10/2 Finish/Release: 10/7/09
- Production Support for Design: Budgeted 720 hrs Act 0 hrs
- Required Wt Structure: 9,500 lbs Actual 9,440 lbs
State of the Industry

Illustrations are Recreated Based on Old Design Data or line drawings

• Tech Manuals are 2D Based With Limited 3D Content
• Tech Manuals are a Serial Process Started Late in the Project Lifecycle often later than the vehicle is fielded

Future State of Practice in Army

• Reuse MBE data for audio visual instructions (AVIs) in technical pubs and manuals
  – Operator manuals
  – Level 1 Maintenance Manuals
  – Depot Maintenance Work Req
• Today Soldiers learn quicker using visual instructions instead of text
• Configuration Management of data to insure correct version is available
• 3D Interactive manuals (respond to queries)

Opportunity to dramatically improve effectiveness of Pubs
Stryker Maintenance Training System (MTS) Device

- 3D data used to create immersive training environment
- The MTS is a family of computer-based training devices that interactively simulate and demonstrate performance of scheduled and unscheduled maintenance and repair actions in a virtual-reality environment. MTS classroom training is presented in 3D interactive format identical to that obtainable from net-centric MBE data.
- Stryker Maintenance Trainers estimate a savings of 25% in maintenance and repair time in the field.
- ROI - Estimate yearly maintenance and repair time for a single vehicle approximately 1,000 hours. Applying an average labor cost of $100 / hr to an estimated number of vehicles in service of 1000, yields an estimated yearly ROI for reuse of Net-Centric MBE Data as interactive 3D models imbedded within animated instruction files is $25M.
Current State of Depot Practice

- Typically the Depots receive only limited 2D TDPs at best. Many times nothing.
- Work instructions are paper based with pictures of disassembled hardware
- There is typically no PLM and limited ERP
- No manufacturing simulations

Future State of Depot Practice

- Digital Depot activities are currently being piloted at:
  - RRAD, LEAD
- Working with technology providers to perfect Ltwt PDF work Instructions
- Depots will receive 3D data
- Visual based work instructions on the shop floor
- Simulation based shop floor planning for streamlining new mission requirements
- Integration of data from PLM, ERP, and MES

Depots Are One Of The Largest Potential Users Of MBE Data

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.
• Prior to initial production start
  – Process plans without first article
  – Optimize layout
  – Optimize factory flow
  – Create work instructions
• Simulate in pixels rather than in brick and mortar
• Complete multiple simulation scenarios in order to determine best possible processes
AT RRAD

- Two teams trained and functioning
  - Methods and Standards
    - BFV Transmission Flow
    - Caterpillar engine rebuild
  - Production Documentation
    - BFV Transmission Work Instructions
      - On shop floor now
      - L3 Com wants the work instructions
    - BFV 25mm Gun rebuild
    - BFV Turret Servo Drives rebuild
This program will prove the value of interactive visual based documents and provide an affordable solution that is ready for adoption by the Army resulting in:

- 30% Reduction in time to layout or rebuild line, work stations, and assignment of tasks and tools
- 25% Increase in more rebuilt vehicles in the first 3 months of operation
- 30% Reduction in operator training time
- 50% Improvement in clarity of Work Instructions
- 20% Reduction in rebuild costs for vehicles during first 3 months of operation
Questions?