MBE AND U.S. MANUFACTURERS: IMPLEMENTATION THROUGHOUT THE SUPPLY BASE FOR NASA AND THE DOD

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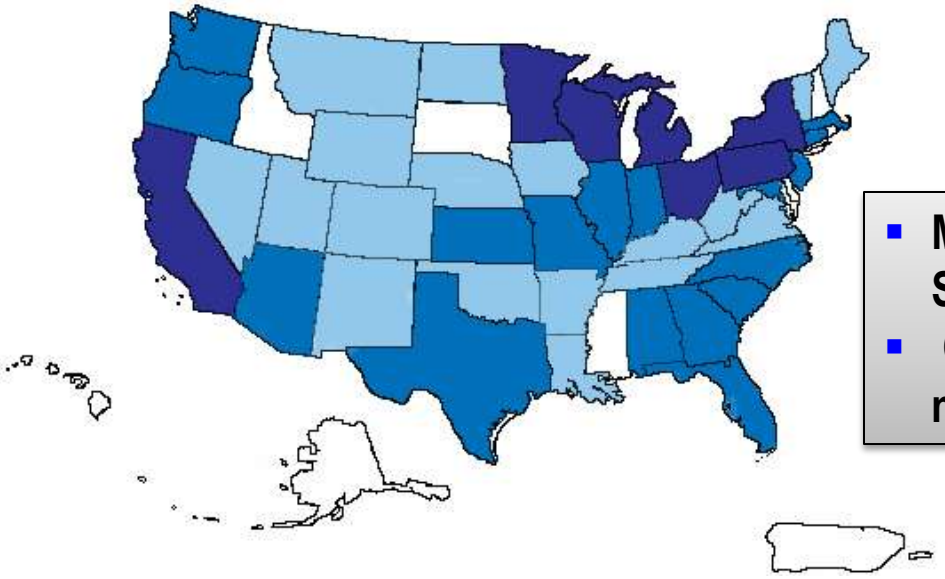
Manufacturing Extension Partnership (MEP)
National Institute of Standards and Technology (NIST)
U.S. Department of Commerce

BRIEFING OUTLINE

- 2009 MBE Supplier Capabilities Assessment
  - Results and Conclusions
- Suppliers: Understanding Capabilities and Raising MBE Literacy
  - Connect to Local MEPs
- Summary and Next Steps

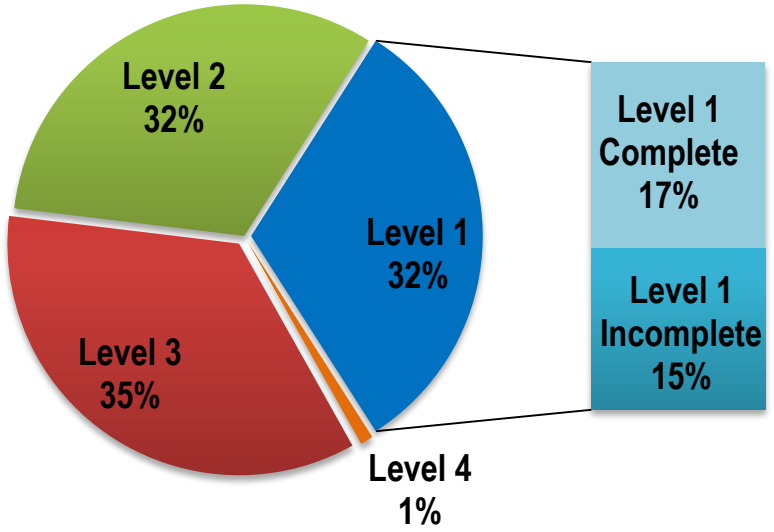
2009 MBE Supplier Capabilities Assessment



White: 0 Suppliers
Lt. Blue: < 5 Suppliers
Med. Blue: 5-10 Suppliers
Dk. Blue: >10 Suppliers

- MBE Assessment Team: ARL, NIST MEP, BAE Systems, MEP Centers
- Capabilities assessment performed for 445 military ground vehicle suppliers

- MBE Analysis Metric
- Analysis & Results: 2/3 of participating suppliers are ready to operate in an MBE environment



More information on this assessment can be found in its report, located at www.model-based-enterprise.com

MBE CAPABILITIES METRIC

- The MBE capability levels below on the left are for interpretation of the MEP 2009 Summer Assessment data only.
- The **ManTech MTO MBE Capability Levels** below on the right are the metrics that will be used for assessing MBE capabilities.

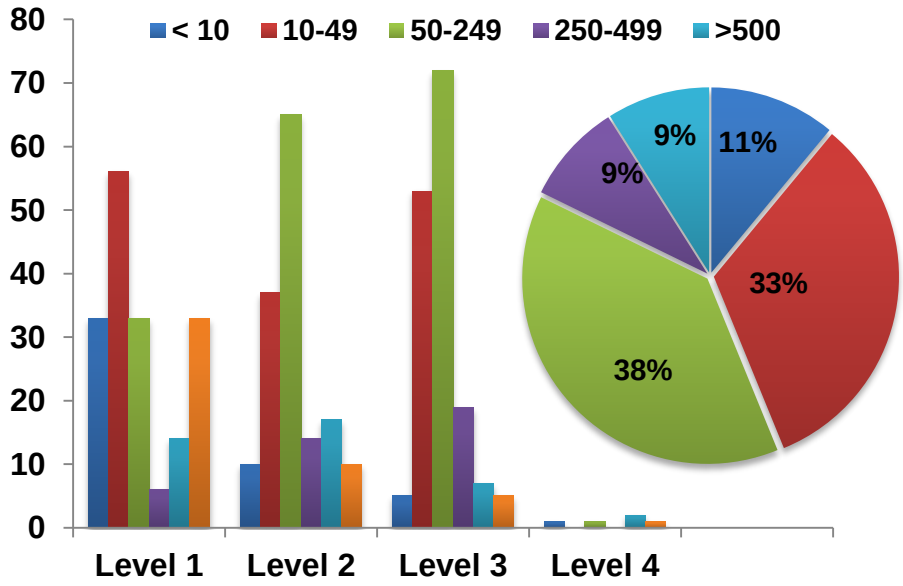
MBE Capability Level 1	MBE Capability Level 2	MBE Capability Level 3	MBE Capability Level 4	MBE Capability Level 5
Very little computer-driven/automated/CNC ops Most or all ops based upon 2D drawings Receive, send electronic manufacturing files in .pdf or other 2D format Use s/w to assist business/management functions, but little or no electronic cross-dept integration/re-use of data	Both CNC, manual ops Can accept 3D models from customers, but convert to 2D drawings to drive manufacturing processes Small amounts of electronic cross-dept integration / re-use of info exists	Majority of mfg processes are computer-driven / automated / CNC operations Planning, programming for manufacturing processes is performed using combination of 3D models, 2D models, 2D drawings Cross-dept integration exists via use of MRP system (or "MRP-like" software)	All manufacturing processes are planned / programmed based upon 3D model info Significant cross-dept integration, re-use of info exists via extensive use of MRP, ERP systems Some use of PDM / PLM systems occurs	All manufacturing processes are planned / programmed based upon 3D model info All company ops are integrated, driven by the same 3D model info - PDM / PLM systems serve as the data integration hub for company ops

ManTech MTO MBE Capability Level	Notes
Level 0: Model-centric drawings for design and manufacture, 2D drawing	Correlates to Capability Level 1 on the 2009 scale Operational basis is 2D drawings
Level 1: Model-based manufacturing, 2D drawing and neutral CAD model	Correlates to Capability Level 2 on the 2009 scale Operational basis is 2D drawings, but have CAD capabilities, which implies 3D capabilities at some level
Level 2: Native CAD based manufacturing, 2D drawing and native CAD model	
Level 3: Model-based definition, 3D annotated model and light weight viewable	Correlates to Capability Level 3 on the 2009 scale Operational basis is 3D models Still likely to see use of 2D data in operations Software systems assist in management and re-use of 3D model data across company operations
Level 4: Model-based definition with data management, 3D annotated model and light weight viewable via PLM	
Level 5: Model-based definition with automated technical data package, digital product definition package and TDP	Correlates to a Capability Level 4 Operational basis is 3D models No 2D conversions Extensive electronic integration of data across company operations, most of which are automated
Level 6: MBD with automated TDP and on-demand enterprise access, digital product definition package and TDP via the web	Correlates to a Capability Level 5 Operational basis is 3D models Fully integrated company operations for asset visibility up and down the supply chain

2009 ASSESSMENT RESULTS

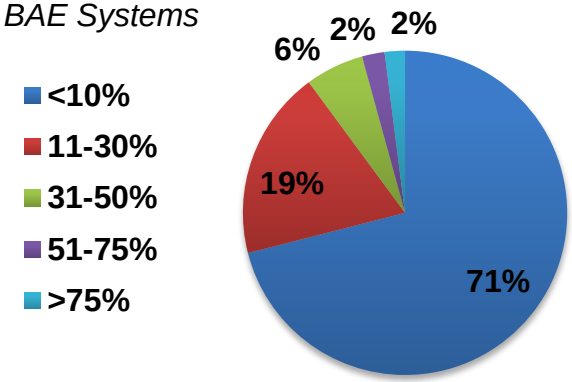
Supplier Demographics and Business Dynamics

Company Size



% of Business to a Single OEM

In this case BAE Systems



MBE Level	Contract Manufacture/ Build-to-Print	Design & Build	Design, Outsource, & Assemble
1	6	21	8
2	99	78	38
3	132	85	41
4	4	3	2

Information was also gathered on % of participating suppliers' business that goes to defense vs. commercial customers

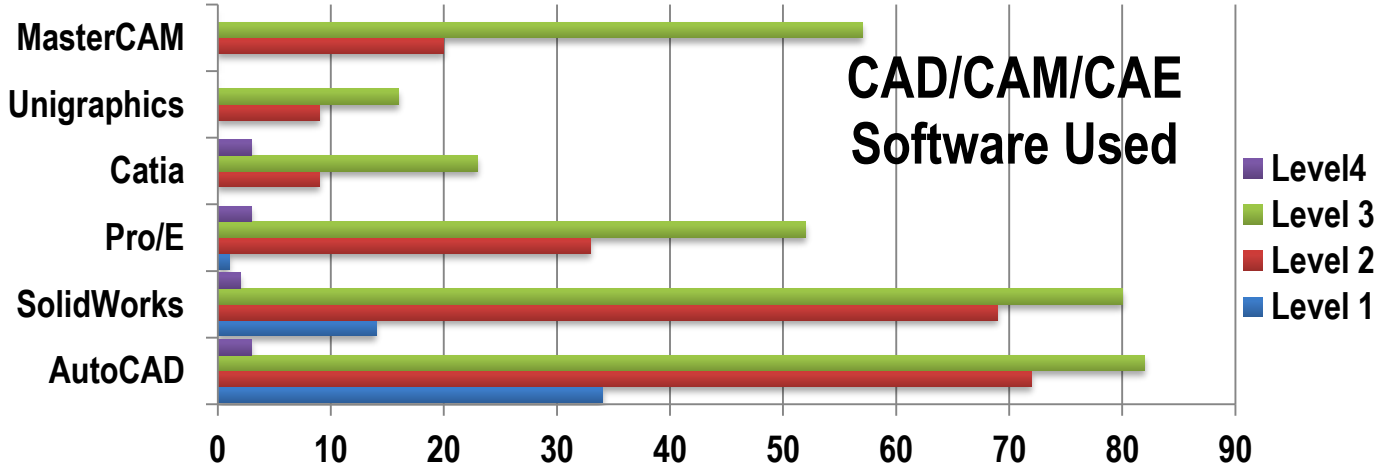
Participating Suppliers' Quality Certifications

ISO	258	TS	34
AS	75	QS	2
MIL	40	NADCAP	9

Information was also gathered on the participating suppliers' set-aside categories and product lines

2009 ASSESSMENT RESULTS

Use of 3D Software & Models

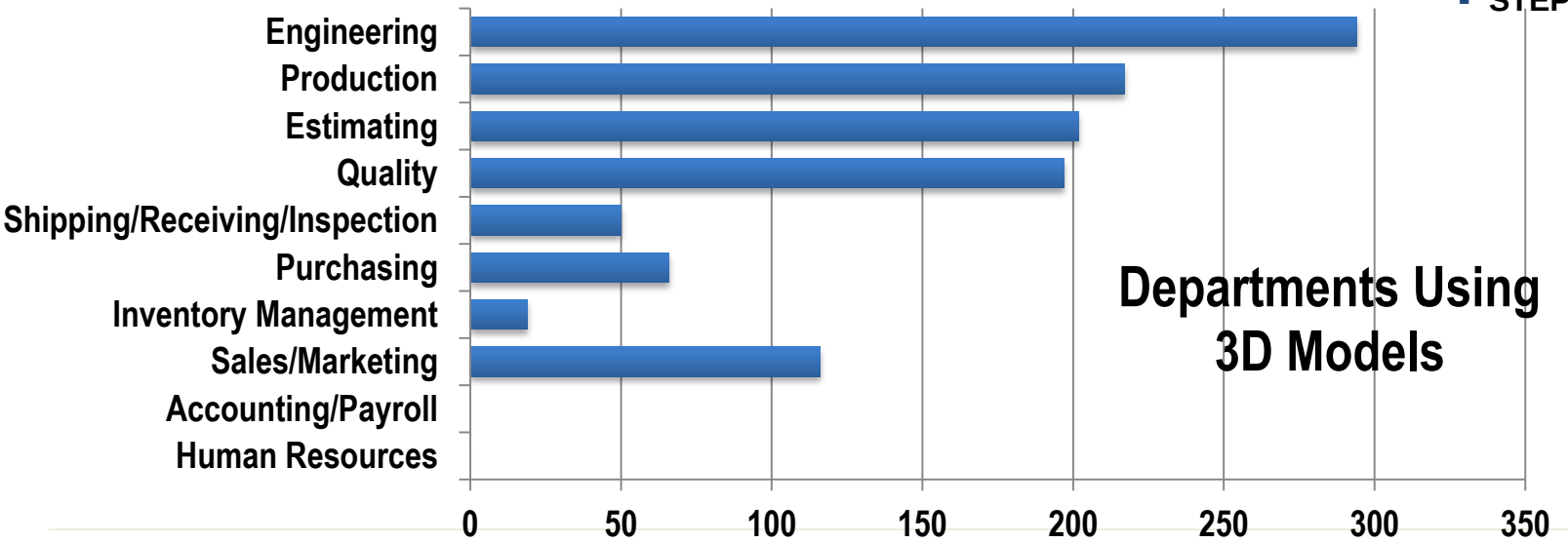


Which of the following data formats can your company utilize?

- **PDF:** 80%
- **DXF:** 70%
- **IGES:** 64%
- **STEP:** 62%

Which do you use most often?

- **PDF:** 24%
- **DXF:** 12%
- **IGES:** 11%
- **STEP:** 26%



2009 ASSESSMENT RESULTS

MBE Familiarity & Interest

- **Are you familiar with the concept of MBE?**
  - Level 1: 42% Yes; 49% No; 9% No Answer
  - Level 2: 77% Yes; 22% No; 1% No Answer
  - Level 3: 91% Yes; 9% No
  - Level 4: 100% Yes
- **Are you aware of the DOD move to 3D?**
  - Level 1: 51% Yes; 40% No; 9% No Answer
  - Level 2: 73% Yes; 26% No; 1% No Answer
  - Level 3: 100% Yes
  - Level 4: 100% Yes
- **Are you interested in learning about MBE and how it works?**
  - Yes 89%
  - No 8% (*37 of the 38 suppliers that answered "No" were Level 1 companies)*
  - No Answer 3%
- **Would you be willing to operate your production facility or line as an integrated part of an MBE environment?**
  - Level 1: 37% Yes; 16% No; 47% No Answer
  - Level 2: 73% Yes; 22% No; 5% No Answer
  - Level 3: 93% Yes; 7% No
  - Level 4: 100% Yes

2009 MBE Supply Base Assessment and 2010 MBE Documentation Pilots

Observations and Conclusions

- **MBE "capabilities" and "readiness" are not the same thing**
- **Not all companies need to operate at highest MBE capability levels**
- **Fidelity of MBE / 3D TDPs still evolving – model validation critical**
  - *Strongly supports DOD MBE Model Validation/Certification work*
- **3D Models are helping overall manufacturer efficiencies … somewhat**
  - Companies streamlining certain engineering, business functions because of 3D MBE models … BUT …
  - Companies generally not changing overall operational approach to fully capitalize on benefits of 3D models
- **Manufacturers need to continue to be educated about MBE importance**

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Suppliers: Raising MBE Literacy via The MBE Website

Developed by Catalyst Connection (SW PA MEP Center) to house info, resources to keep suppliers informed of MBE implementation efforts, development opportunities, events, etc.

Designed for suppliers to consult for info, updates, guidance

Valuable for suppliers to learn how to establish themselves as MBE-capable

www.model-based-enterprise.org

Suppliers Understanding MBE Capabilities *via MBE Website*

- MBE Assessment
  - Suppliers should first conduct a self assessment to determine baseline MBE capabilities
    - *Self assessment tool can be accessed via MBE website*
  - Suppliers should consider market implications associated with their MBE capabilities state to determine whether they need to be at another level
    - Should involve interactions with and consideration of current, future customers
    - *Consider consultation with local MEP Center*
    - *MEP links available via MBE website*

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- More formal process involving potential MBE capabilities certification evolving

THE MEP PROGRAM IN SHORT….

- **MISSION – "To act as a strategic advisor to promote business growth and connect manufacturers to public and private resources essential for increased competitiveness and profitability. "**
- Program started in 1988 to address "market failures" affecting competitiveness of small U.S. manufacturers.
- 60 centers with ~ 370 field locations
  - System wide, Non-Federal staff is over 1,450
  - Contract with over 2,300 third party service providers

MEP • MANUFACTURING EXTENSION PARTNERSHIP

- MEP System budget ~ $300M – Federal / State / Industry
  - 1/3 Federal ($128.4M FY11), 2/3 State and Industry (fees for services)
- MEP Program and Center performance measured per impact of services on client firms.
  - Over 34,000 manufacturing client interactions in FY10 (projects, workshops, etc.)
  - Aggregate impacts include $8.4B increased/retained sales; $1.9B new client investment; $1.3B cost savings; 72,075 jobs created and retained *

**Based on 2010 independent survey of clients w/projects completed in FY09*

MBE SUPPLIER CAPABILITIES CERTIFICATION

A Potential Next Step to Pull it all Together

An MBE Supplier Capabilities Certification would allow:

1. Govt. Agency / OEM customers to have a *reliable system of MBE capabilities evaluation for the supply base*.
   - *could also have commercial applicability*
2. The govt. / OEMs to clarify intent regarding MBE and *provide a clear path forward for suppliers* looking to develop business relationships with these customers
3. A *fair and reliable way for manufacturers to demonstrate, advertise their commitment to MBE operations and their capability* to operate in an MBE environment
   - *potentially for both defense and commercial markets*
4. A *coordinated govt. implementation path to ensure supply base transformation* as intended by the govt.'s significant MBE investments.

POTENTIAL MBE CERTIFICATION PROCESS FOR COMPANIES

- Certification could occur via appropriate registrar(s) / enforcement using the selected, adopted national standard
  - (Mil-Std, Industry/ASME/ISO, hybrid)
- Assistance could be made available to companies to help:
  - understand and navigate certification process
  - understand appropriate certification level to target for each individual company in line with business strategies, objectives
  - progress toward desired, advanced levels

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SUMMARY AND NEXT STEPS

- MBE enables streamlined, efficient computer integrated manufacturing operations

- MBE is the future of government supply chain ops, including OEMs for DOD and NASA

- Work conducted to date relating to MBE Supplier Assessment and Development indicates U.S. manufacturing supply base is ready to implement MBE at a basic level

- Significant work is occurring and progress is being made to develop the technical and program/policy infrastructure for MBE

SUMMARY AND NEXT STEPS

- Supplier Capabilities Assessment is appropriate 1st step for manufacturers interested in pursuing MBE as part of their approach to supplying to government
  - *could eventually lead to MBE Capabilities Certification*

- MEP is natural resource to assist supplier MBE implementation and raise "Supplier MBE Literacy"
  - *national coverage – interact with tens of thousands of U.S. manufacturers each year*
  - *significant participation in Supply Base Assessment, Supplier awareness, MBE pilots*
    - *additional MBE Supplier Summits targeted for 2011, 2012*
  - *already serve similar functions for Lean, Quality certification programs*

- ***MBE Website contains relevant info, resources, updates, announcements that suppliers will need to implement MBE.***