Realizing the Model Based Enterprise

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Advanced Mfg Enterprise Subpanel

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Outline

- The DoD-wide Manufacturing Technology Program
  - The JDMTP
  - How the Strategic Plan addresses MBE
  - Birth of the AME Subpanel
- Define “MBE”
- Challenges

Manufacturing Technology

- Defense-Wide Manufacturing S&T Mission
  - Concurrently develop and mature cross-cutting manufacturing processes with new and emerging technologies
- Objectives
  - Be a cost-efficient and collaborative development process
  - Reduce cross-cutting manufacturing and technology risk and accelerate product-ready technology insertion
  - Align R&D investments with suitable levels of technology maturity or corrective options in advance of Milestone B decisions
- Metrics
  - Increase affordability, producibility, reliability, and predictability of performance
  - Decrease cycle time, manufacturing cost, life cycle cost

Manufacturing Technology Overview

ManTech carries out its mission through programs in the Military Departments, participating Defense Agencies and OSD.

ManTech Mission:

ManTech anticipates and closes gaps in manufacturing capabilities for affordable, timely, and low-risk development, production, and sustainment of defense systems.

Defense Manufacturing Vision:

A responsive, world-class manufacturing capability to affordably and rapidly meet warfighter needs throughout the defense system life cycle

ManTech Strategic Plan

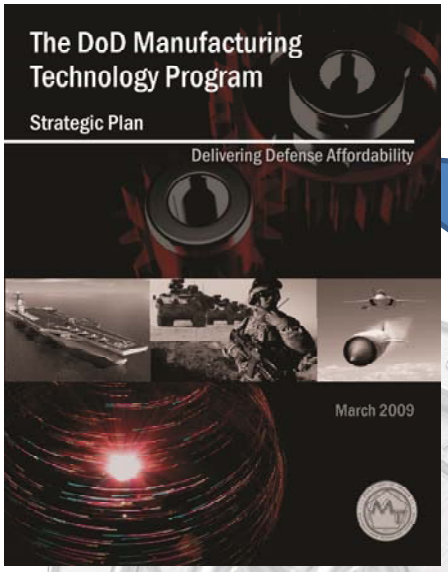
- The DoD ManTech Strategic Plan
  - The Strategic Plan congressionally directed by NDAA (Section 238) 2008 language was signed by AT&L on March 2009

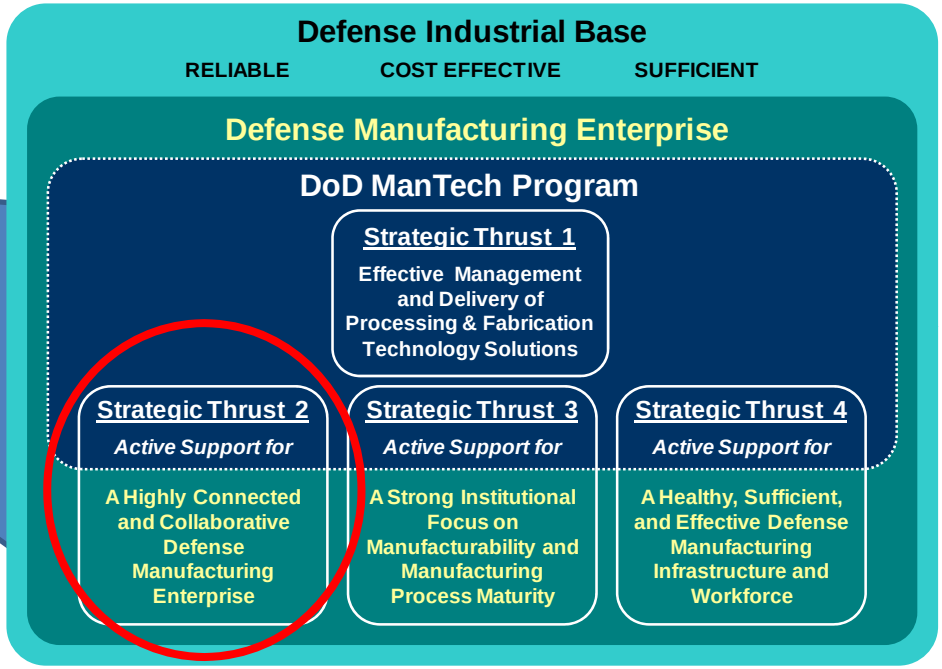
- Strategic messages include:
  - Strong, positive support for ManTech program in all camps
  - Affordability remains an overarching concern
  - Workforce concerns are pervasive
  - Institutional focus on "Manufacturability" is strategically critical
  - Important--keep championing Manufacturing Readiness

Report can be found at www.dodmantech.com

The Strategic Plan reinforces ManTech's critical role in defense acquisition and sustainment.

Strategic Plan and MBE





"…collaborative design environment between engineering and design, production and test, and the manufacturing supply chain…a highly integrated design for manufacturability capability, increased fidelity cost modeling, pre-production test and validation, and first article quality."

"…the structure required for a synchronized and secure defense manufacturing enterprise, with real-time visibility into both product lifecycle design data and manufacturing and support capabilities."

"adoption and integration of commercial manufacturing practices within the defense manufacturing enterprise."

AME Subpanel Genesis:
DoD ManTech Strategic Plan

Defense Industrial Base

RELIABLE COST EFFECTIVE SUFFICIENT

Defense Manufacturing Enterprise

DoD ManTech Program

Strategic Thrust 1
Effective Management and Delivery of Processing & Fabrication Technology Solutions

Strategic Thrust 2
Active Support for
A Highly Connected and Collaborative Defense Manufacturing Enterprise

Strategic Thrust 3
Active Support for
A Strong Institutional Focus on Manufacturability and Manufacturing Process Maturity

Strategic Thrust 4
Active Support for
A Healthy, Sufficient, and Effective Defense Manufacturing Infrastructure and Workforce

JDMTP Subpanel Structure

Strong, Traditional JDMTP Focus on Material Transformation (Strategic Plan Thrust 1)

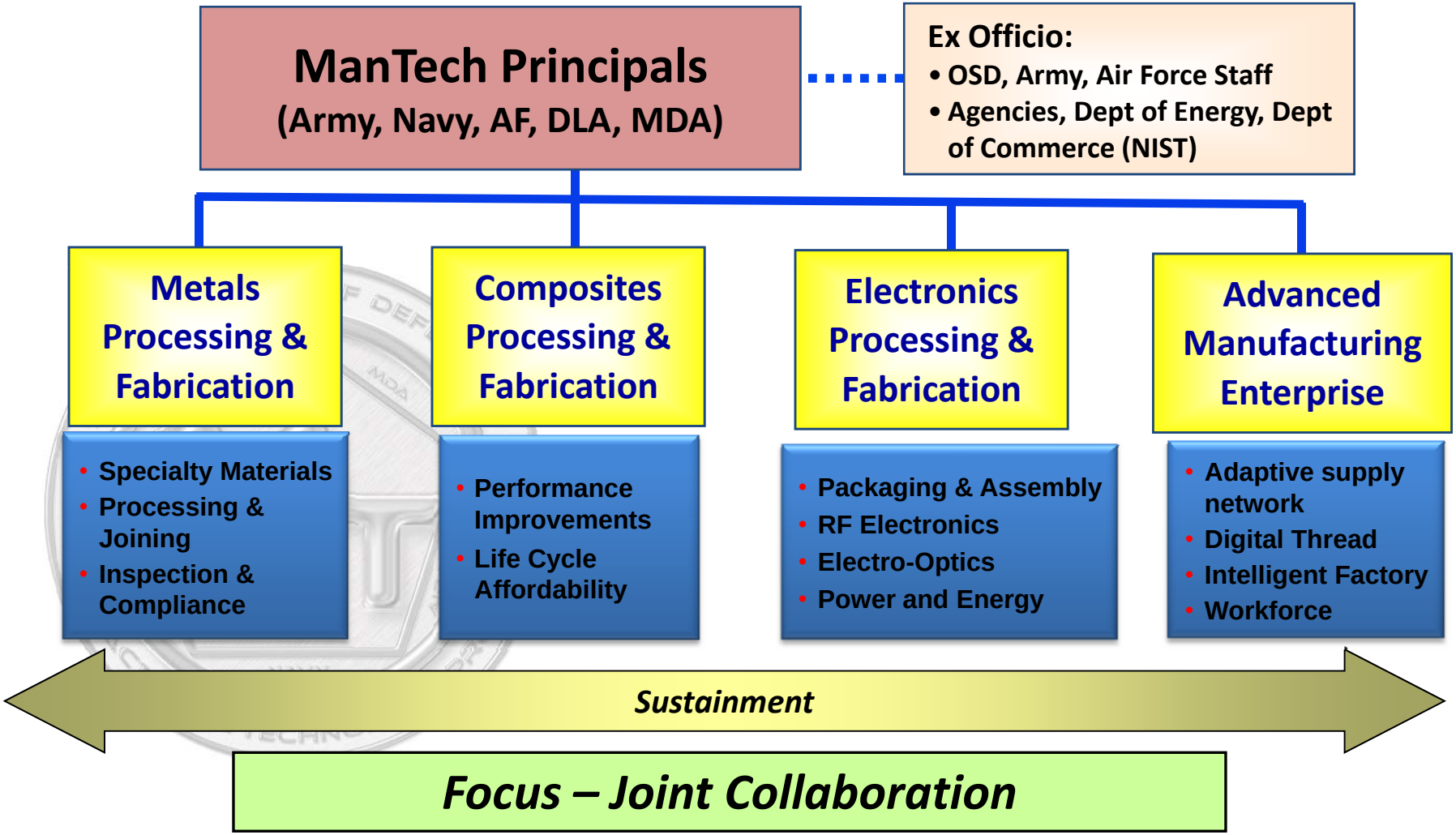
- Metals
- Composites
- Electronics
- AME

AME Subpanel Provides for Increased Program Focus on New Strategic Thrusts 2, 3, & 4

The AME Subpanel enables a strong organizational focus on Strategic Plan Thrusts 2, 3, & 4, improving program "balance" across all four thrusts

ManTech Overview

Joint Defense ManTech Panel (JDMTP)



AME
Problem Space

- The enterprise for design and mfg of (defense) products is increasingly distributed
  - OEMs more focused on systems integration – and aftermarket
  - Global partnerships necessary, but create new problems
  - Serious technical barriers to fully effective collaboration
- Product Development takes too long, costs too much
  - Systems engineering tools and design capabilities do not keep up with increasing system complexity
  - Engineering change costs are huge opportunity
  - Warfighter cannot wait 10-12 years for solutions
  - Information created and lost (repeatedly) over system life cycle
- Smaller lot sizes and faster response critical
  - Disconnect volume from break-even equation
  - More autonomy, flexibility essential
  - Rapid insertion of new technology and fast qualification
- Infrastructure and culture do not emphasize potential impacts

AME
Solution Space

"Active support for a highly connected defense manufacturing enterprise"

- ***Connect the Enterprise*** *Enable seamless interoperability of data and processes across organizational boundaries.*

- ***Build the Digital Thread*** *Drive a continuous flow of integrated design, analysis, and manufacturing information throughout the product/system life cycle.*

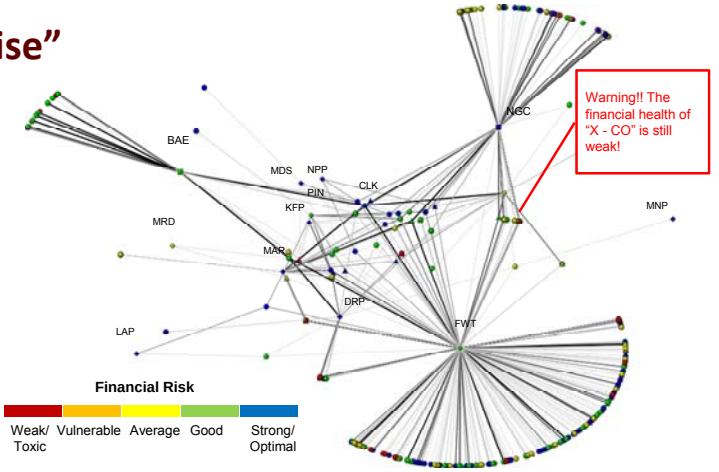
- ***Create an Agile Factory Floor*** *Develop adaptive manufacturing capabilities that integrate factory floor resources for rapid response to the warfighter.*

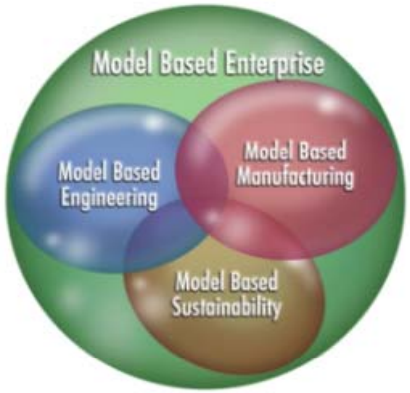
- ***Provide for Industrial Base Readiness*** *Actively support initiatives and policies to ensure manufacturing infrastructure health and U.S. global mfg superiority.*

AME Taxonomy (1)

Manufacturing Networks: "Connecting the Enterprise"

- Organize and manage the extended enterprise for rapid, profitable reaction to warfighter needs
- Accessible, adaptable network of customers, partners, suppliers, and service providers
- Advanced supply chain management practices that cope with complexities
- Enterprise integration technologies & tools to enable collaboration





Model Based Enterprise: "Building the Digital Thread"

- Rapid, easily verifiable product development that feeds the digital thread
- Transformed systems engineering process
- Facilitating innovation and collaboration from concept to retirement
- Zero information loss
- Design Optimization Tools
- Virtual Prototyping
- Data Standards Efforts

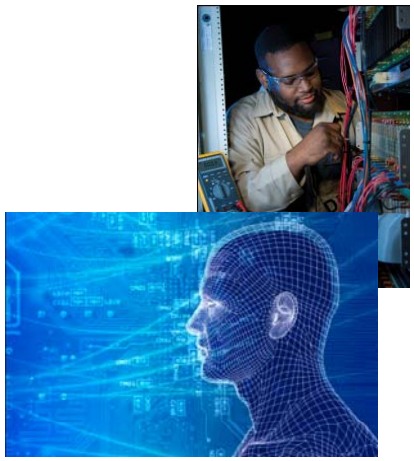
AME Taxonomy (2)

Intelligent Manufacturing Planning and Execution

- Autonomous command and control of execution
- Information-driven manufacturing and MRO
- Factory integration for autonomous operations
- Advanced production planning and scheduling

Industrial Base Infrastructure and Readiness

- Manufacturing readiness body of knowledge development
- Active collaboration to enable effective implementation and sustainment of manufacturing technologies
- Engagement with STEM initiatives

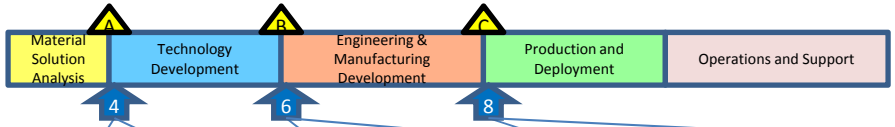


What is MBE?

Model Based Enterprise: “Building the Digital Thread”

- MBE: A fully integrated and collaborative environment founded on 3D product definition detail and shared across the enterprise; to enable rapid, seamless, and affordable deployment of products from concept to disposal
- Benefits:
  - Reduction in prototyping costs virtual prototyping
  - Maximum data reuse
  - Direct use of data in downstream applications – substantially reducing lead times and errors introduced by reentry/translation
  - Full product lifecycle support
  - Reduction in engineering changes ($15B in auto industry)
- Associating requirements analysis, as-built production data, utilization data, etc. with MBE constructs a “digital thread”

MBE Impacts
Building the "Digital Thread"



- **Manufacturing risks** have been identified for **building prototypes** and mitigation plans are in place.
- **Target cost objectives** have been established and **manufacturing cost drivers** have been identified.
- **Producibility assessments** of design concepts have been completed. Key design performance parameters have been identified.

- Cost modeling of design alternatives
- Producibility scoring during AoA
- Distributed, collaborative concept development

- Accommodate significant engineering and/or **design changes**
- **Producibility assessments** of key technologies are complete.
- **Cost analysis** has been performed.
- **Design trades** have been accomplished
- Long-lead and **key supply chain** elements have been identified.

- Cost modeling and analysis integrated with 3D CAD
- Producibility tool integration
- Distributed, collaborative design for virtual prototyping
- Verified product & process models
- Supply network optimization

- **Producible design** is complete and stable.
- Manufacturing and quality processes and procedures have been proven
- **Known producibility risks**
- The **engineering cost model** is driven by detailed design and has been validated with actual data.
- The **supply chain is established** and stable.

- Fully annotated 3D tech data package
- Verified producible design
- Distributed manufacturing process simulation
- Verified component and process cost models
- Visualization of end-to-end production and test processes

Challenges

- Technical
  - Proprietary formats
    - require proprietary viewers
    - limit applicability of best analysis tools
  - Long-standing product data integration problems
  - Standards and practices for long term storage
- Cultural
  - Specialized skill set needed for CAD, PLM
  - Cost barrier for small business
  - Govt “reluctance” to move to 3D policy
- Political
  - Enforcement of contracts
  - Protection of intellectual property

ManTech role: stimulate policy change by focused investment in technology development

Final Thoughts

- Gov't must become a better customer
  - Modern supply chain mgmt principles
  - Smarter buyer…not just hardware
- Technology has outpaced practice
  - Extraordinary capability exists now
  - Entire enterprise needs to ask better questions
- Academia is a willing and (very) able partner
  - The distance from research to implementation is smaller
- The Defense Mfg Technology community is energized

Thank you

Joint Defense ManTech Panel