JCSEM Producibility
M&S Sub-Committee
Mid-Year Progress

Dr. Al Sanders, Chairman
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JCSEM M&S Sub-Committee Core Team (Active Participants)

- Al Sanders - Chair (Honeywell)
- John Allen (Honeywell)
- Kevin Fischer (Rockwell Collins)
- Greg Pollari (Rockwell Collins)
- Charlie Stirk (Cost Vision)
- Gary Belie (LMCO)
- Simon Frechette (NIST)
- Tim Comerford (Missouri University)
- Scott Frost (Anser)

* 17 members on initial roster
Advancing Defense Manufacturing for Affordability and Security

Percent of Life Cycle Costs

100
80
60
40
20
10
30
50
70
90
Production Start
Design Final
Requirements Set
Costs Determined by Decisions on Requirements and Design
Actual Dollars Spent


Most Producibility Issues Driven by Early Decisions

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Motivation for Up-Front M&S

- Most producibility issues driven by architecture shortfalls not identified until late in design
- Current producibility analyses are rule-based CAD plug-ins that drive late risk identification
- Low-fidelity M&S capabilities needed to guide up-front SE trades to identify risk early on
- Quantitative analysis capability needed to enable balanced performance/producibility trades
“Identify industry M&S analysis needs to facilitate the integration of producibility concerns into the earliest phases of the system engineering process”

In-Scope:
- Validated models to help answer early MRL 1-6 questions
- Product/process centric producibility analyses for trade studies
- Factory and supply chain analyses to guide industrial base design
- Cost modeling analyses and approaches that enable CAIV trades
- Methodologies to enable SE performance/producibility trade studies

Out-of-Scope:
- Virtual collaboration tools and existing SW enhancements
- Data standards and interoperability requirements
- Digital/IT type solutions to facilitate information sharing
Objectives and Focus Areas:

1. Identification of *product/process centric analysis needs*
2. Development of *methodology for SE trade study integration*
3. Identification of *industrial base war gaming analysis needs*

**2009 Deliverables:**

1. Development of a matrix describing product/process centric producibility analysis needs that maps to both the MRL criteria and the DoD 5001 systems engineering process
2. White paper describing product/process centric producibility analysis needs and a proposed framework and guidance document for system engineering trade study integration
3. White paper describing top supply chain risk drivers and enterprise “system-of-systems” analysis needs for defense industrial base war gaming applications
JCSEM M&S Sub-Committee Progress & Next Steps

What’s been done to date:
1. Draft industrial base war gaming white paper completed
2. Product/process centric analysis needs matrix complete

Next steps:
1. Develop methodology for M&S-based performance/producibility trade study integration into the SE process (currently performance based)
2. Develop white paper describing product/process centric producibility analysis needs and guidance document for SE trade study integration
3. Finalize white paper for industrial base war gaming based on ManTech feedback to help define future investment focus areas
Matrix Focus Areas:

- Cost analyses
- Mechanical yield prediction
- Electronics yield prediction
- DFX analyses
- Process modeling
- Production line modeling
- Physics based mechanical analyses, e.g., casting
- Physics based electronics analyses, e.g., solder flow
- Ergonomics modeling
- “Green” manufacturing

* analysis of yield target feasibility risk per configuration item
* integration, assembly, and test yield modeling
* prediction of yield impact on assembly cost, cycle time, and capacity constraints
* identification of assembly simplification and yield improvement opportunities
* prediction of assembly attributes on yield fallout (interfaces, connectors, cables, tolerances, attachment complexity, configuration item quantify, etc.)
### Analysis Focus Areas:

- Logistics factors
- Environmental factors
- Strategy factors
- Sustainability factors
- Product design factors
- Material factors
- Process factors
- Technology maturity factors
- Infrastructure factors
- Policy factors
- Work force factors

### Proposed Approach:

- Extend proven SE M&S approaches to facilitate supply chain analyses
- Develop standard supply chain architecture definitions and behavioral models
- Model transient and dynamic response of “system” due to disruptions and rate changes

#### Three application areas:

- R&D and technology demonstration segment
- New product introduction segment
- Legacy product sustainment segment

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“Advancing Defense Manufacturing for Affordability and Security”
Capture and clarify needs, objectives, and requirements

Translate operational requirements into functional model

Identify components / subsystems

Identify specific requirements directly impacting system cost and producibility

Develop strategy and plan to meet product cost and producibility goals that is aligned with supply chain strategy

Identify top components / subsystems driving cost and producibility risks into design

Define what the System must do

Define Functional Breakdown

Define how the System will be Architected

Define Constraints

Define Constraints

Define Constraints

Align Strategies

Align Strategies

Align Strategies

Develop Baseline

Develop Baseline

Develop Baseline

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Deliverable Progress:
– Product/process producibility analysis need matrix complete
– On-track to finalize industrial base war gaming white paper
– On-track to complete SE-based producibility analysis white paper

Issues/Concerns/Challenges:
– Challenge has been to maintain in-scope focus, i.e., identify next-generation analysis needs rather than use of existing software apps
– Aggressive year one deliverables require shifting focus away from analysis needs to developing a methodology to perform SE trades

Areas for Help:
– Need a few strong SE “engineers” on sub-committee to complete remaining deliverables, i.e., develop methodology and framework to integrate new producibility M&S analysis output into SE trade process