



Modeling, Simulation, & Analysis: Enabling Early Acquisition Decisions

**Panel – 3
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Bottom Line Up Front



- We claim M&S provides both cost efficiencies and enhanced capabilities
- **USD (AT&L) has DoD lead for M&S**
- M&S has made significant advances in interoperability and reuse but is ...
- Still not an integral part of AT&L portfolio
- Acquisition community can leverage the enabling benefits of M&S in every stage of the systems process

M&S in AT&L – Short History



- 1988 - DSB led by Dr. Anita Jones
 - Computer applications for training
 - Advocated interoperable and reusable distributed training environments
- 1990s - USD (AT&L) becomes responsible agent and DMSO formed under DDR&E
- 2000s Simulation Based Acquisition (SBA) incorporated in Def Acq Guidebook

“We must make far greater use of M&S to cut costs, as well as shorten development cycles ...”

Hon. Jacques S. Gansler, USD(AT&L) Sep 22, 1999

M&S in Industry – Short History

- **Aircraft design and development**
 - Boeing used computer models to develop airframes for 767 and 777
 - Boeing could test far more designs on the computer than it ever could with wind tunnels
- **Auto industry now uses computers for model based designs – target to reduce cost (\$4B+) & time (by 50%) to introduce new models**
 - Virtual models avoid costly and time consuming clay physical “models”
- **Architects and Engineers have used CAD / CAM software for more than 2 decades**
- **Daimler Chrysler and Boeing claim M&S benefits in design, market forecasting, & training**

Streamlining Acquisition



- **Some perceptions on Defense acquisition**
 - Slow, need to shorten development cycles
 - Significant labor requirements to satisfy the “process”
 - Services report they are spending too much time and money producing acquisition documents which no one reads
 - Capabilities frequently reach concept decision and enter into Milestone A or A/B without sufficient “concept refinement”
 - Senior managers request need for analysis driving decisions for program start up or go – no go earlier in concept process
- **SBA Goals**
 - Reduce time, resources, and risk associated with entire acquisition process
 - Increase quality, military worth, and supportability
 - Reduce ownership costs over system life
 - Enable integrated product development

Target Applications for M&S



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- **Requirements refinement and management**
 - Models / prototypes can pin down and refine system requirements early in the product life cycle
 - Simulations can mimic performance characteristics of hardware as well as software components
 - Early prototypes can carry forward into design development and test phases
 - **Project Management**
 - Simulation can enable more accurate predictions of cost and schedule
 - M&S is inherently more accurate than cost models based on historic data since it accommodates specific process dynamics
 - **Process Improvement**
 - Simulation supports all levels of software Capability Maturity Model
 - Forces manager to address metrics and process behavior

Target Applications for M&S (2)

- **Systems Design and COTS Integration**
 - Many weapons systems require very complex software systems to perform effectively
 - Building software systems usually begins with addressing system architecture
 - Models allow some optimization of competing attributes (reliability, supportability, maintainability, reusability, survivability, mobility, etc) and their interdependencies
- **Risk Management**
 - Simulation can identify project risks and help design less risk-prone strategies
 - Quantitatively predict consequences of alternate decisions
- **Acquisition Management**
 - Simulation can help validate contractors estimates of costs and schedules and provide insights into system performance

State of Simulation Technology



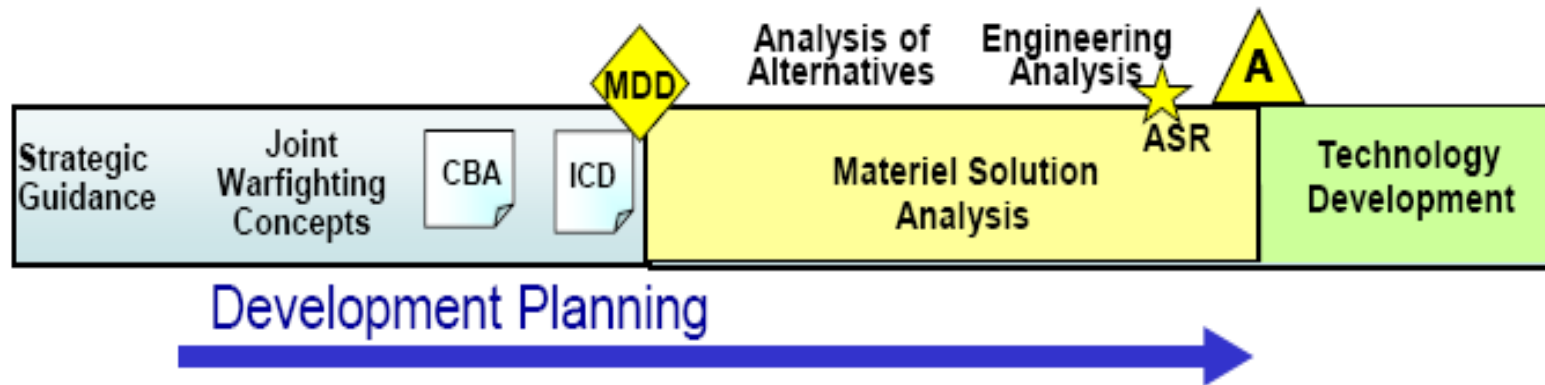
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- **Evolution of model building environment**
 - In the past programmers developed models by textual coding
 - Graphical simulation tools are now available
 - Rapid model development through drag & drop icons
 - Graphic element linking
 - Syntactic constraints on linking elements
 - **Network-based simulation tools**
 - Facilitates rapid development of large detailed models
 - Supports up-front systems engineering
 - Requires significantly less training of the workforce
 - Focus more on the model's semantic validity
 - Additional incremental costs may be incurred for reuse

Future Environment



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- **Tight budget, short timelines, rapidly changing events, increased uncertainty**
 - **Requirements for interoperable systems and tools for planning, training, and testing applications**
 - **Net-centric operations with joint, inter-agency and multi-national information sharing**
 - **Cross domain information sharing with increased needs for security assurance and cyber protections**

Pre-Milestone A



- Systems Engineering & Systems Analysis sand box
- Target rich environment for early M&S applications
- Build systems prototypes early and extend into model based design and model based development

RFP = Request for Prototype?

Summary



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- **M&S can be used as a key enabler to meet goals of acquisition reform**
 - **Combination of constructive simulations and virtual simulators can be introduced early to refine user needs and technology opportunities**
 - **Is the acquisition community ready now to expand use of M&S?**

Questions?