

Modeling and Simulation for Acquisition, Requirements and Training: The Army SMART Model

Presentation to: The National Summit on U.S.
Defense Policy:
Acquisition, Research, Test and Evaluation

Michelle T. Bevan
IIT - Research Institute
26 March 2001

Report Documentation Page

Report Date 26032001	Report Type N/A	Dates Covered (from... to) -
Title and Subtitle Modeling and Simulation for Acquisition, Requirements and Training: The Army SMART Model	Contract Number	
	Grant Number	
	Program Element Number	
Author(s) Bevan, Michelle T.	Project Number	
	Task Number	
	Work Unit Number	
Performing Organization Name(s) and Address(es) IIT - Research Institute	Performing Organization Report Number	
Sponsoring/Monitoring Agency Name(s) and Address(es) NDIA (National Defense Industrial Association 2111 Wilson Blvd., Ste. 400 Arlington, VA 22201-3061	Sponsor/Monitor's Acronym(s)	
	Sponsor/Monitor's Report Number(s)	
Distribution/Availability Statement Approved for public release, distribution unlimited		
Supplementary Notes Proceedings from National Summit on U.S. Defense Policy: Acquisition, Research, Test and Evaluation, 26-30 March 2001 sponsored by NDIA.		
Abstract		
Subject Terms		
Report Classification unclassified	Classification of this page unclassified	
Classification of Abstract unclassified	Limitation of Abstract UU	
Number of Pages 22		

Simulation Based Acquisition (SBA)

Definition of SBA

An iterative, integrated product and process approach to acquisition, using modeling and simulation, that enables the warfighting, resource allocation, and acquisition communities to fulfill the warfighter's material needs, while maintaining Cost As an Independent Variable (CAIV) over the system's entire lifecycle and within the DoD's system of systems.

**SBA: A New Approach, 1997-1998, DSMC Military
Research Fellows**

SBA Vision & Goals

Vision

...to have an Acquisition Process in which DoD and Industry are enabled by robust, collaborative use of simulation technology that is integrated across acquisition phases and programs.

Goals

- Substantially reduce the time, resources and risk associated with the entire acquisition process;
- Increase the quality, military worth and supportability of fielded systems, while reducing their operating and sustaining costs throughout the total life cycle;
- Enable Integrated Product and Process Development (IPPD) across the entire acquisition lifecycle.

SBA Special Interest Area www.msiac.dmsi.mil/sba/

SBA Roadmap Presentation, Robin Frost, SIW Spring 99

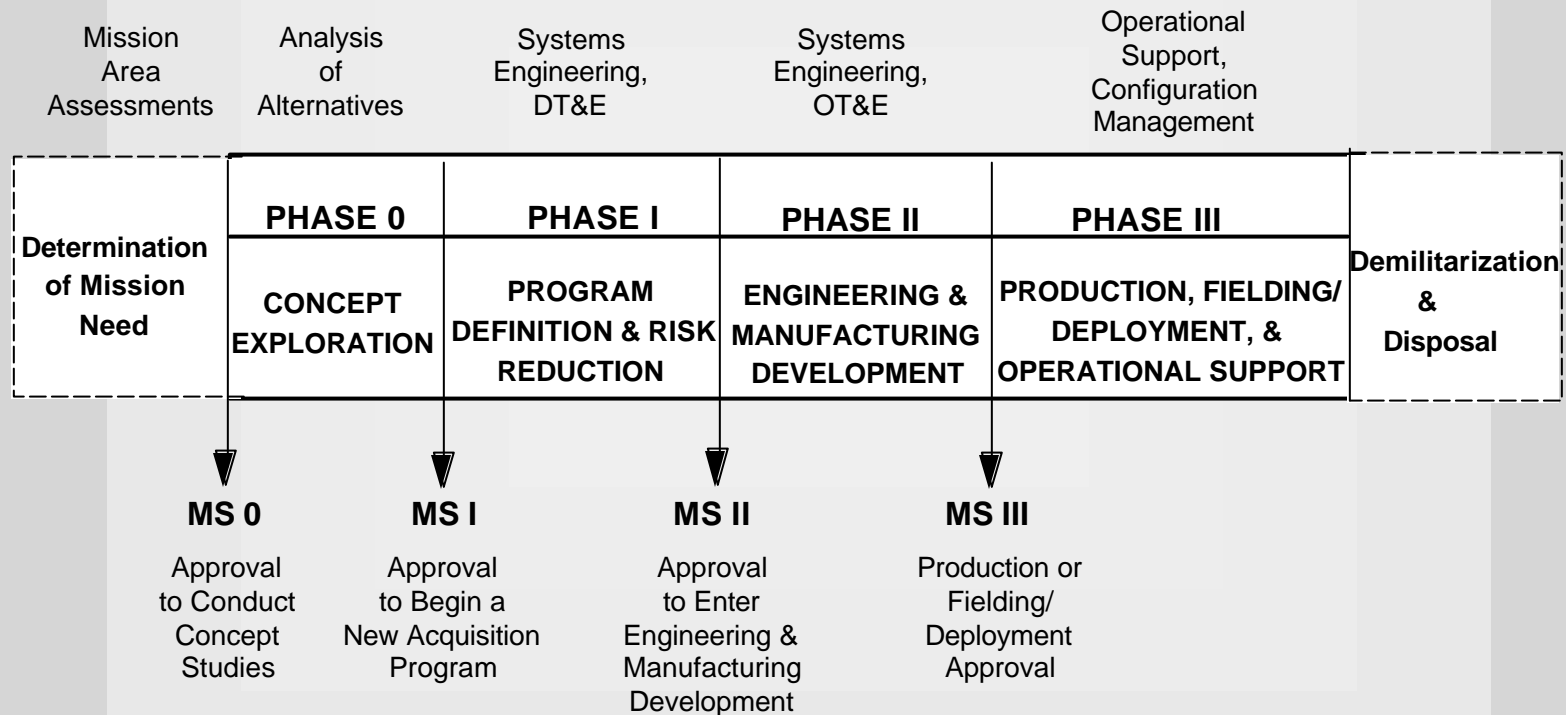
SBA is SMART for the Army*

“SBA is an Office of the Secretary of Defense (OSD) initiative to *reform the acquisition process* so that the acquisition community *uses modeling and simulation (M&S)* robustly throughout the acquisition life cycle. The goals of SBA are to *reduce the time to field systems*, *reduce total costs*, and *increase the military utility of fielded systems*. These goals are of primary concern to the Army, but we recognize that we cannot achieve them through the efforts of the acquisition community alone. It requires the *combined, integrated efforts* of the *Acquisition Workforce* along with the *requirements and training communities*, hence the name SMART.”

***From an article of the same name by LTG Paul J. Kern and Ellen M. Purdy, RDA Magazine, May 1999**

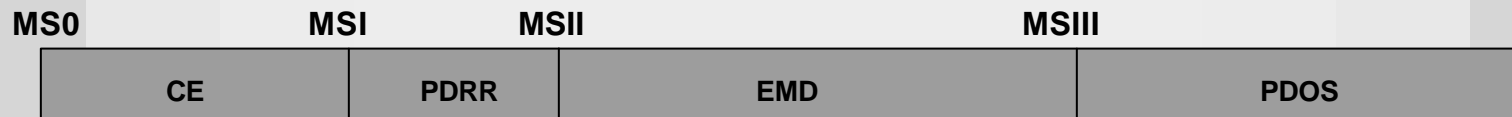
Acquisition Life Cycle: The Traditional View

Major Phase Activities

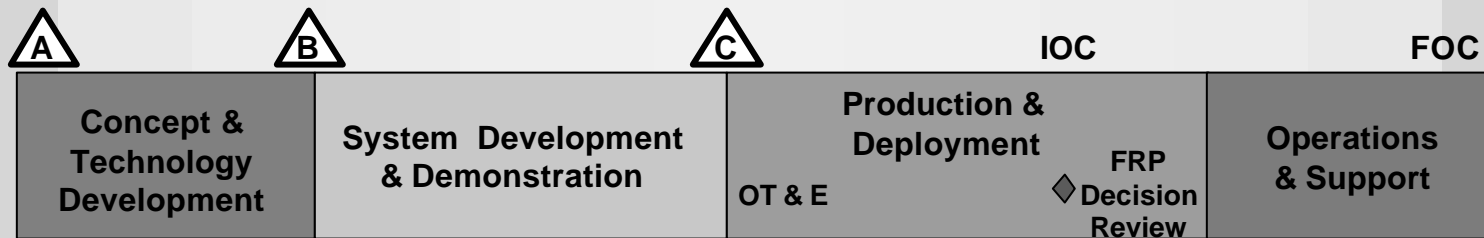


New Acquisition Process

OLD:



NEW:



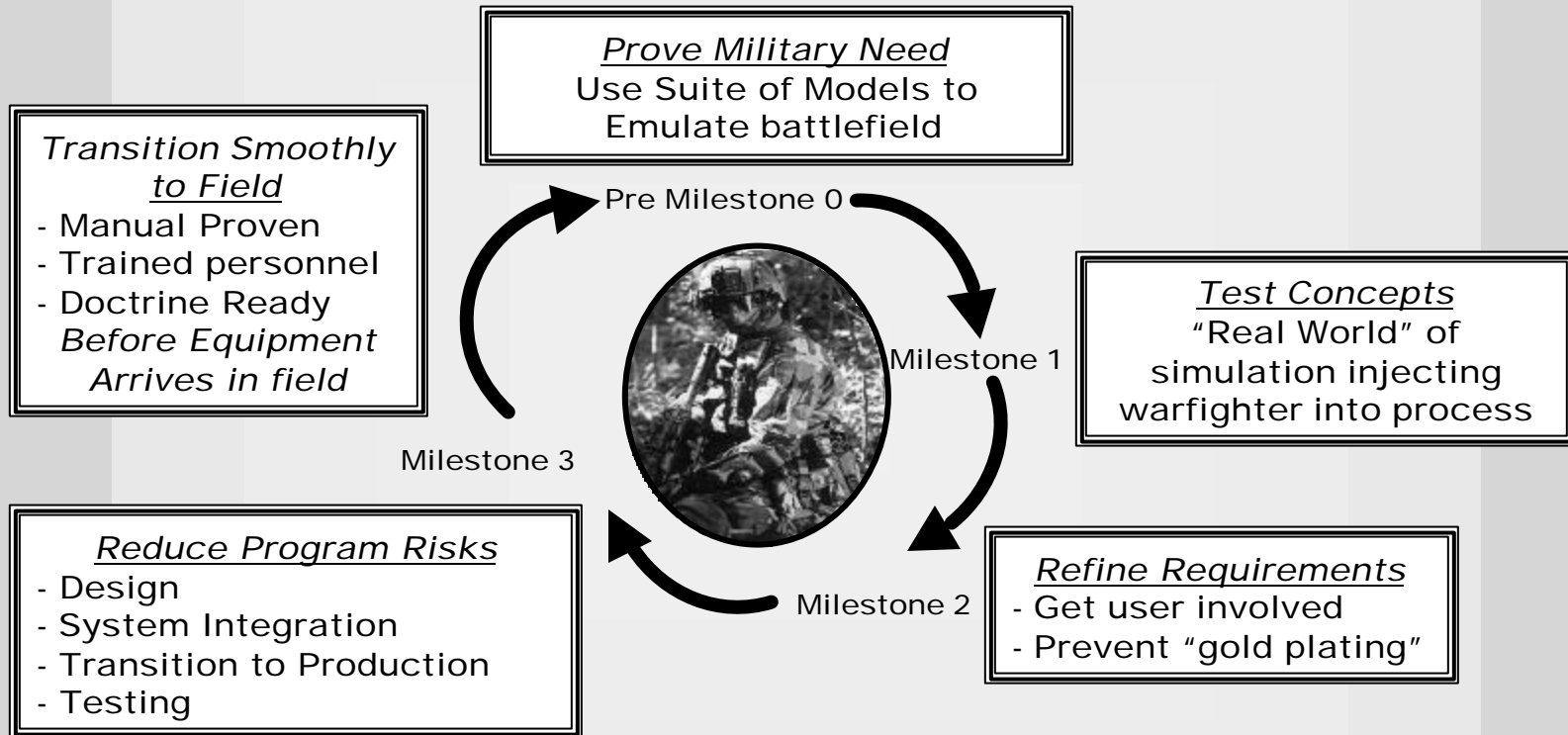
Pre-Systems
Acquisition

Systems Acquisition
(Engineering & Manufacturing,
LRIP & Production)

Sustainment

DoDI 5000.2; Operation of the Defense
Acquisition System; 23 October 2000

Iterative Acquisition Process



Simulation and Reform of the Acquisition Process.
Adapted from Shiflett et al. (1995)

The SMART Model

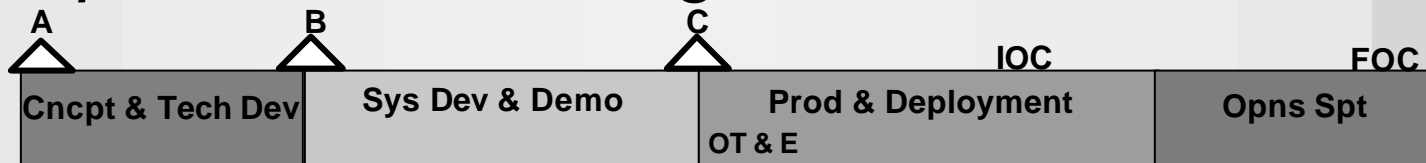
3 Components:

- *Process* - Iterative and 'model-test-model' rather than 'test-fix-test'. *HOW?*
- *Environment* - Collaborative, seamless, web-oriented. *WHERE?*
- *Culture* - Integrated teams, changing roles and responsibilities. *WHO?*

SMART Process

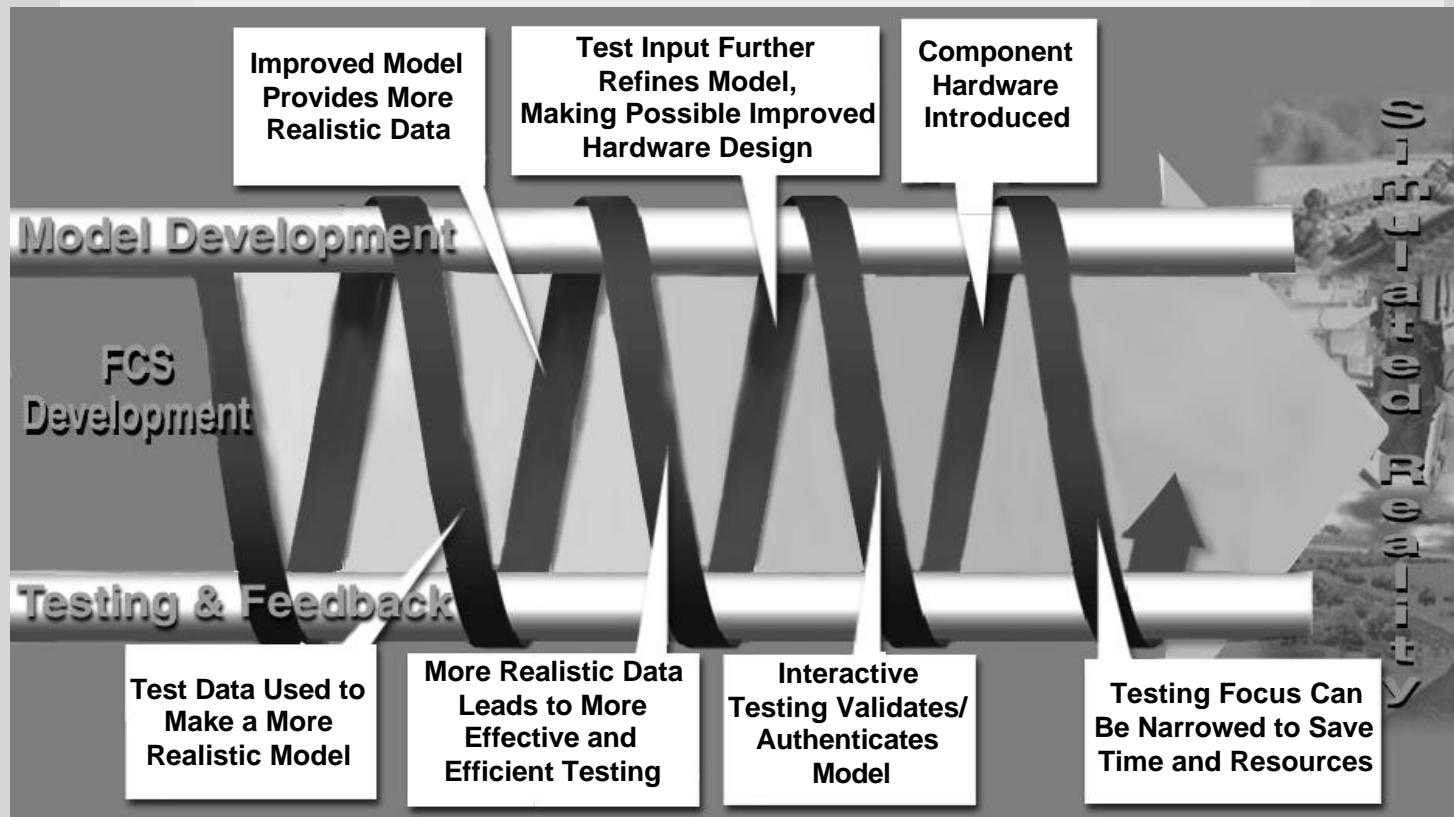
- Integration of:
 - Requirements
 - Functional Design
 - Implementation Design

*Throughout the Lifecycle
Technology Insertion at Any Point
Reusing Data from Previous M&S*



- Rapid Evaluation of Multiple Options
- Electronic Exchange of System Models
- Iterative, spiral process

Spiral Development



LTG Paul J. Kern Presentation to Army Test and Evaluation Days, 7/26/00

SMART Environment

- Collaborative, distributed engineering
- Information Repository
- User Transparent Web-style Access



Crusader Example:
Integrated Data Environment:

The Army's Next Generation
Self Propelled Howitzer (SPH) and
Resupply Vehicle (RSV)

SMART Culture

- Changing Roles and Responsibilities
- Enabled Integrated Process Teams
- Using M&S Data Through the Acquisition Lifecycle

Comanche (RAH-66) Example:
Integrated Data Teams

Boeing/Sikorsky/Government



SMART Difference

Drafting Board



Wind Tunnel Tests



Construction
in Plant



Test & Evaluation



**Traditional Mock-up & Full
Scale Prototyping**

- Employs excessive personnel and facilities
- Time consuming & expensive

Sensor Team



T&E Team



Airframe Team



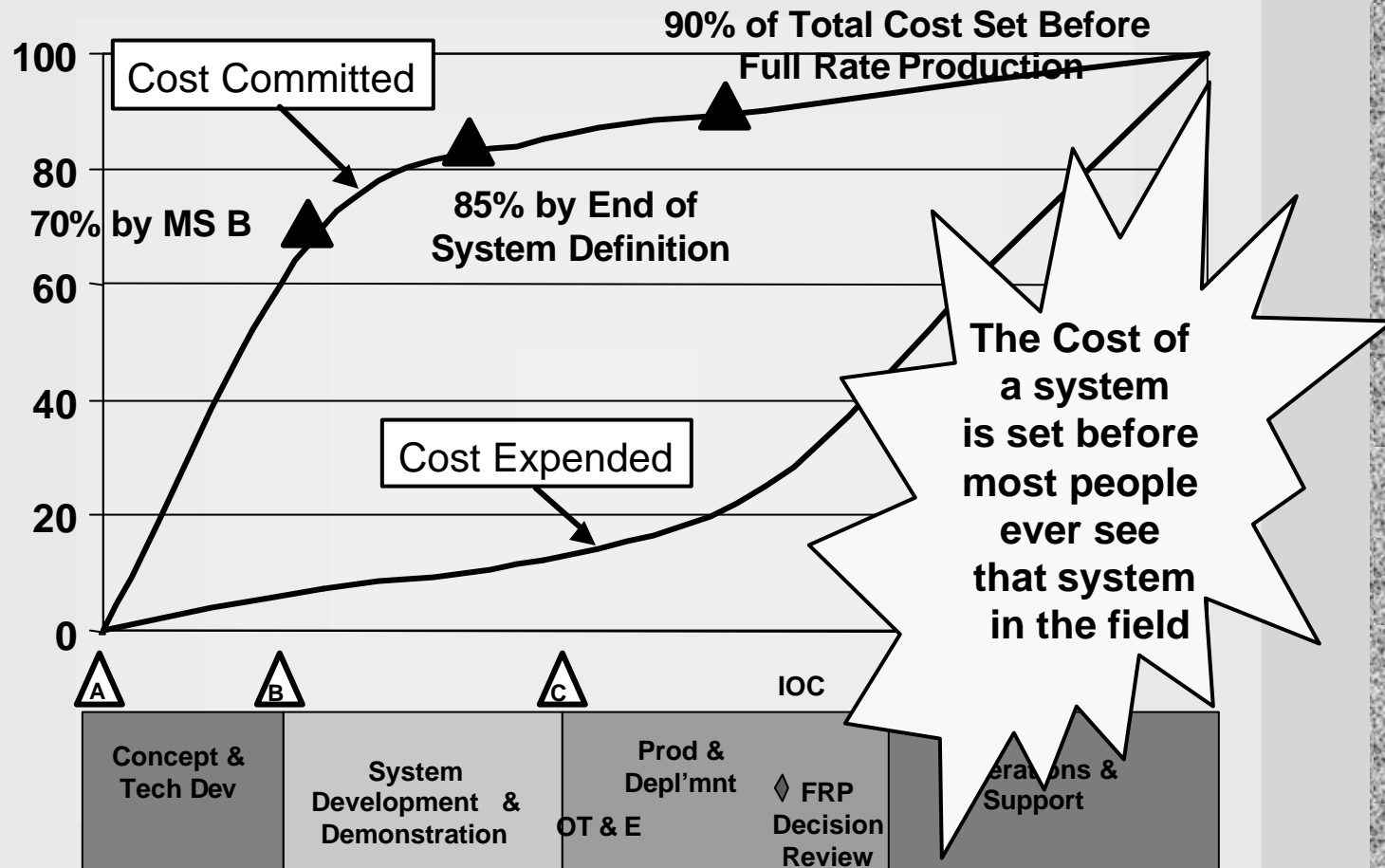
Production
Team



Collaborative Virtual Prototyping

- Employs latest technology
- Investigates unlimited design options
- Reduces cost & improves time to first article

Where Is Cost Determined?



M&S in Acquisition

Pre-Milestone A

Extended Air Defense Simulation (EADSIM)

Mission Area Assessments

Use suite of models & simulations

Mission Need Statement (MNS)

Use campaign & theater level models
in conjunction
with results of lower level models



EADSIM is an example of a constructive model at the mission level.

M&S in Acquisition

Concept and Technology Development

ORD Generation

Use operational effectiveness & supportability models

Use threat models

Analysis of Alternatives

Use cost & operational effectiveness models

Use support models

RFP

Specify government-owned M&S products

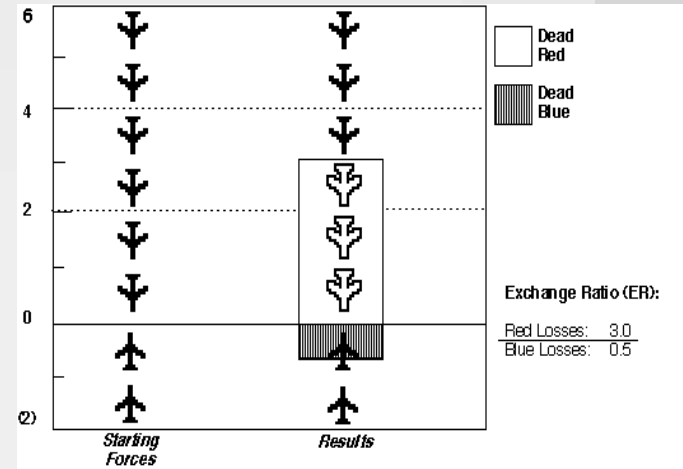
Identify M&S requirements

System Cost Elements

Use cost models (program & life cycle)

Program Planning

Use schedule, risk, plans models



BRAWLER, a constructive model at the engagement level, can be used in all phases of acquisition to predict system performance.

iac.dtic.mil/surviac/prod_serv/model_guide/brawler.html

M&S in Acquisition

System Development & Demonstration

Acquisition Strategy

M&S Strategy

Use repository

VV&A

Systems Engineering

Use Engineering M&S of proposed systems for specification development

Use HW/SW-in-the-loop for design evaluation & risk reduction

Use CAD/CAM for design & producibility planning

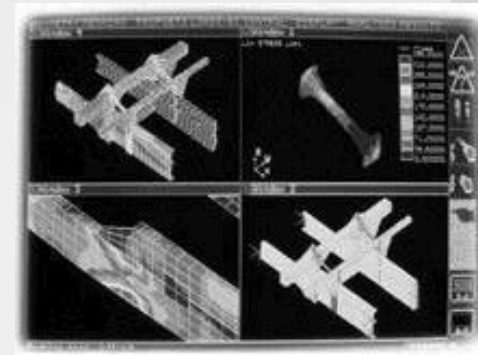
Use support & operational models to evaluate logistics/combat support concepts & plans

TEMP

Plan M&S applications to be used in DT&E, OT&E

Plan use of DT&E to validate models

Establish test facility M&S compatibility requirements



The Dynamic Analysis and Design System (DADS) permit engineers to completely design, model and test a vehicle before it is ever built.

<http://www.fmtvtruck.com/>

M&S in Acquisition

Production and Deployment

Review M&S Requirements & Products Being Used

T&E

Use M&S to quantify test conditions,
Design tests, and
Predict, quantify & extrapolate test results

“Continue” VV&A Activities

Coordinate with repository for M&S
Use production planning
Use manufacturing process and DPD models
Use factory simulations

Logistics Planning

Use M&S to identify logistics support tasks & requirements
Complete support plans



STORM (Simulation Training Operations Rehearsal Model) a federation of 14 models allowed test size to expand from Brigade minus to Division plus through simulation

www.cdt.com/fs31pr.html

M&S in Acquisition

Operations and Support

Update manufacturing process models & factory simulations

Use operations, support tracking & prediction models

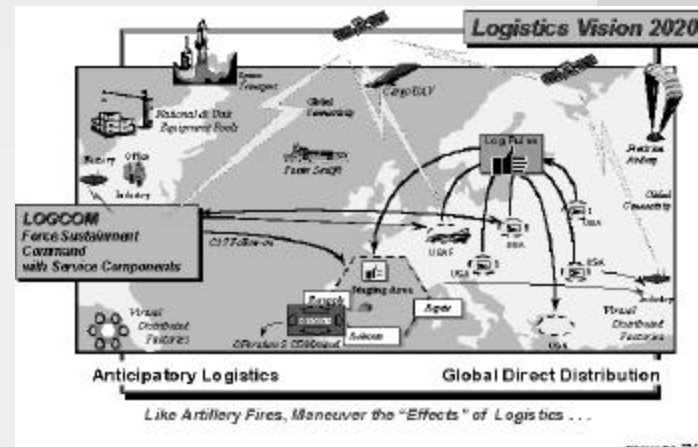
Update M&S tools for FOT&E

Provide M&S applications descriptions to repository

Evaluate operations & support deficiencies

Analyze alternative corrective actions

Training and Education



The Optimum Stockage Requirements Analysis Program (OSRAP) quantifies tradeoffs in cost/weight/cube versus readiness when planning contingency packages for fielded equipment

<http://lrc3.monmouth.army.mil/cecom/lrc/leo/eladiv/logistics/modeling/osrap.html>

SMART GUIDELINES

- Overview of SMART
- Simulation Support Plan
- How SMART is applied in Functional Areas
- Special Considerations
 - High Level Architecture
 - Using M&S to Stimulate C4I Systems
 - Synthetic Natural Environment
 - Contracting Implications
- Configuration Management (CM)
- Verification, Validation and Accreditation (VV&S)

*Army Model and Simulation Office (AMSO) Homepage:
<http://www.amso.army.mil/documents/smart/guidelines>*

Sources of Information

- Modeling and Simulation Information Analysis Center (MSIAC) <http://www.msiac.dmsso.mil>
- SMART Conference
<http://www.amso.army.mil/smart/conference>
- Simulation Interoperability Standards Organization (SISO) <http://www.sisostds.org>
 - Simulation Interoperability Workshops (SIW) - March and September in U.S., June in Europe; Computer Generated Forces Conference, more.
- Industry/Interservice Training Simulation and Education Conference (I/ITSEC) <http://www.iitsec.org>
- International Test and Evaluation Association (ITEA) <http://www.itea.org/events/index.html>

Summary

- Several types of simulations, including virtual, constructive, and live can be used alone or in combination to support acquisition.
- Modeling and Simulation can support acquisition tasks in all phases of the acquisition cycle.
- SMART is the Army model for Simulation Based Acquisition, and requires changes in the culture, environment and processes of the Acquisition lifecycle.