Modeling and Simulation Education for the Acquisition and T&E Workforce

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M&S could better realize its potential for cost savings in DoD.

- Users of M&S need to better understand how to employ M&S more effectively.
  - Which tools to use, when to use them, how to use them, how to get them.
  - Risk and benefits of using M&S need to be better understood.

- Pre-existing educational gaps need to be filled.
  - Education can help drive wider acceptance and use of M&S.
In 2006, the **Defense Modeling and Simulation Coordination Office** and the **Navy Modeling and Simulation Office** tasked the Naval Postgraduate School to develop an M&S curriculum focused on the users of M&S, specifically those in DoD Acquisition and Test and Evaluation (T&E). Recently, in 2008 the **US Army** jumped on board with vested interest in the project.
• NPS partnered with seven of the best academic institutions and began to develop a lifelong learning suite for acquisition and T&E professionals in the area of Modeling in Simulation.
• Develop educational offerings using the best US university programs

• Make them widely available
  – Web
  – DAU CLMs
  – University Courses
  – Short courses
  – Public domain

• Track return on investment longitudinally

• Education suite available to the public
Why start with Acquisition?

128,000 workforce members controlling over $150B/year*

Coming to a University Near You January 2009

FULL ACADEMIC COURSES
SHORT ACADEMIC COURSES
WEB-BASED MODULES

16 NEW COURSES
M&S in the Acquisition Life Cycle, Parts 1 and 2
M&S Strategy and Support Plans
M&S Requirements and Evaluating M&S Proposals
Contracting for M&S
Best Practices in M&S
M&S in Decision Risk Analysis and Mitigation
M&S Environments
M&S Data Strategies
M&S for Test and Evaluation, Introduction and Advanced
Introduction to Engineering M&S Applications
Physics-based M&S
Basic Engineering Concepts in M&S, Parts 1 and 2
Topics in the Application of Engineering M&S
FOUR CERTIFICATE PROGRAMS

M&S MANAGEMENT
- Intro to DoD M&S
- M&S in the Acquisition Life Cycle, Parts 1 and 2
- Best Practices in M&S

M&S ACQUISITION
- M&S Strategy and Support Plans
- M&S Requirements & Evaluating Proposals
- Contracting for M&S
- M&S in Decision Risk Analysis

M&S TEST AND EVALUATION
- M&S for Test and Evaluation, Introduction and Advanced
- M&S Environments
- M&S Data Strategies

M&S ENGINEERING INTEGRATION
- Physics-based M&S
- Basic Engineering Concepts in M&S, Parts 1 and 2
- Selected Topics in the Application Engineering M&S

Certificates can be credited toward resident and non-resident NPS degree programs.
Modeling & Simulation for Shelf Design Analysis

Here we see a "finite element analysis" simulation of the static loading of the shelf. Our two design criteria of deflection and stress are determined by the simulation, for the given loading.

The System Design Process

Once a preliminary design has been established, the various subsystems and components are then designed, in a similar process to that described earlier.

Statically Determinate and Indeterminate Structures

- Statically Indeterminate Structure
  > Let’s see some statically indeterminate structures

1. Beam structure
2. Two different materials
3. Torsion
4. Shear

Physics based M&S and Basic Engineering Concepts in M&S

Acquisition applications [NRC, 2002]
- System design
  - Simulate alternative system designs to assess capability and reliability ("Engineering" level)
- System selection
  - Compare combat effectiveness of alternative notional weapons systems

Acquisition example: FCS

Future Combat System
- Concept for future Army fighting
- "System-of-Systems" linking different elements
- Concept to be refined using simulations
- Janus and CASTFOREM used for initial trials [Cresty, 2005]

M&S Environments and M&S Test & Evaluation

Live, Virtual, Constructive

NRC Environment Stack
A prototype curriculum in the form of short and long courses is being offered by the partnered universities. Assessment feedback from the test offerings will be incorporated into final materials.

Ongoing test offering opportunities are posted online at [www.nps.edu/msacq](http://www.nps.edu/msacq)
NPS Engineering Case Studies

- Supplemental program material for courses.
- Case studies developed primarily for acquisition professionals who do not possess engineering degrees.
- Case study content focuses on describing underlying engineering concepts.

8 of 10 Case Studies Available Online at www.nps.edu/msacq
NPS Engineering Case Studies, Cont.

- Ship Shock Simulation
- Life Limiting Damage in Railguns
- Ship Maneuvering and Control for DoD Acquisition
- The Use of M&S to Assess Weapon System Performance
- Assessing Design Adequacy of a Common Machine Part
- Finite Element Analysis to Reduce Acquisition Cost
- Improving the Fuel Efficiency of Light Trucks
- M&S as an Integral Part of Assessing Overall System’s Performance and Control Robustness
- Thermo-mechanical Analysis of Directed Energy Weapons on Satellites – M&S with an Acquisition Perspective.
- The Importance of Heat Transfer Engineering in Making Knowledge Based Decisions by the Acquisition Workforce.

8 of 10 Case Studies Available Online at 
www.nps.edu/msacq
• Courses available **January 2009**
• **Beginning** and **intermediate** level courses.
• Developed for government employees, but available to public.
• Full and short academic courses, DAU web based modules, Distance Learning courses.
• Any US university selecting to offer courses will implement the courses differently. Registration for courses will follow participating university enrollment guidelines.

- Military
- Government Employees

- Public Domain
- DoD Contractors

US University
Resources Available Online

www.nps.edu/msacq
Program Benefits

• Comprehensive educational program focused on consumers of M&S. Significant step towards satisfying DoD M&S educational needs.
• Partnership of government and academia - opportunity to influence the culture of M&S education.
• Improved workforce capabilities across all Services, activities and programs that utilize M&S.
• Increased use of M&S in acquisition to realize potential savings from simulation based acquisition in the DoD not being realized today.
• All learning materials created from this project will be public domain – the nation will not have to pay for this work again.
• 80% of course materials will support all 6 communities, and the program is constructed in a way to facilitate reuse.
Questions?