

Modeling and Simulation Syllabus

- 1) **Course name:** M&S in the Acquisition Process, Part 2
- 2) **Course coordinator / point of contact and contact information**
Jim Campbell, GMU, jcampbell@alionscience.com, 703-933-3356
- 3) **Course description:** At the completion of this course, students will be able to describe the M&S used in the final phases of the Acquisition Life Cycle, using the progression of different modeling and simulation applications in use in each phase as a benchmark. They will be able to identify a particular tool and apply it appropriately to the correct point in the lifecycle and relate specific tools to the decision points that separate the acquisition phases. They will be able to identify sustainment and training support M&S for a representative system.
- 4) **Educational Skill Requirements (ESR) that the course supports.** This course incorporates a number of ESR that will make students more proficient in the performances of their acquisition related duties and responsibilities. Students will be able to:
 - a) Describe the types, role and value of formal Modeling and Simulations, and their various characterizations for application to systems management, particularly with regard to design, testing, training, production, cost estimation, manning, and logistical simulations.
 - b) Understand the critical decisions in the acquisition lifecycle and how/what M&S is used to inform those decisions in order to reduce the time resources and risk associated with the acquisition process
 - c) Describe the role of modeling and simulation prior to the concept decision to identify and quantify capability gaps and to estimate how well new program concepts might address those gaps.
 - d) Know models and simulations used in a given phase of the acquisition process, their inputs and outputs, and their capabilities and limitations.
- 5) **Prerequisites:** Students must have completed M&S in the Acquisition Process, Part 1 prior to attending this course and should have completed ACQ 101, ACQ 201, and Essentials of Modeling and Simulation prior to that.
- 6) **Course maturity:** Development complete.
- 7) **Number of contact hours and pace contemplated** 42 contact hours, in 14 three-hour sessions
- 8) **Delivery** format is for classroom, face-to-face or VTC, presentation of course material.
- 9) **References and texts:**

a) Acquisition M&S Course Bibliography:

- i) Bestercy, Robert, "The Hybrid Supply Chain Model: Commercial Logistics Support and Performance Based Logistics for the Department of Defense." In the *Journal of Contract Management*, p 97-108, September 2008.
<http://www.ncmahq.org/files/Articles/JCM08%20-%20pages%2097-108.pdf>
- ii) Committee on Modeling and Simulation for Defense Transformation, National Research Council. Defense Modeling, Simulation, and Analysis: Meeting the Challenge. Washington, D.C.: The National Academies Press, 2006.
- iii) Committee on Modeling and Simulation Enhancements for 21st Century Manufacturing and Defense Acquisition, National Research Council. Modeling and Simulation in Manufacturing and Defense Acquisition: Pathways to Success. Washington, D.C.: The National Academies Press, 2002.
- iv) Computer Aided Design (CAD) Spaghetti, "CAD Report Sees New Growth in 3D," CAD newsletter of Business Advantage, Inc., 1 August 2009,
<http://www.ictspaghetti.com/CAD/vol3issue1/jpr.php>
- v) Computer Science and Telecommunications Board. Modeling and Simulation: Linking Entertainment and Defense. Washington, D.C.: The National Academies Press, 1997.
- vi) Department of Defense, Deputy Secretary of Defense, Defense Acquisition Performance Assessment, Washington, DC, January 2006
- vii) Department of Defense, Under Secretary of Defense for Acquisition, Technology, Deputy Director Test Systems Engineering and Evaluations, Study on the Effectiveness of Modeling and Simulation in the Weapon System Acquisition Process, Washington, DC, October 1996.
- viii) Duggal, Vijay, CADD Primer: a General Guide to Computer Aided Design and Drafting, Mailmax Publishing, Elmhurst, New York, 1999.
www.caddprimer.com
- ix) Johnson, Michael V.R., McKeon, Mark F., and Szanto, Terrence R. Simulation Based Acquisition: A New Approach. Fort Belvoir, VA: Defense Systems Management College Press, 1998.
- x) McKinzie, LTC Kaye and Barnes, J. Wesley, A Review of Strategic Mobility Models Supporting the Defense Transportation System, Austin, TX: University of Texas, 2003.
http://www.me.utexas.edu/~barnes/research/files/update_06_2003/RSMMSD TS.pdf

- xi) Modeling and Simulation Committee Study Task Report, National Defense Industrial Association, Systems Engineering Division. M&S Support to the New DoD Acquisition Process. Washington, D.C.: National Defense Industrial Association. February 2004
- xii) Moulton, Nancy A., Noyes, Eric R., “High Mobility Trailer: Diverse Team Surmounts Design Problems to Produce a Trailer Capable of Living Up to its Name,” PM Magazine, Washington D.C., November-December 2001.
- xiii) NASA, Mars Climate Orbiter Mishap Investigation Board, Phase I Report, November 10, 1999
- xiv) Office of the Deputy Under Secretary of Defense for Acquisition and Technology, Systems and Software Engineering, Developmental Test and Evaluation (ODUSD(A&T)SSE/DTE). Modeling and Simulation Guidance for the Acquisition Workforce, Version 1.0. Washington, DC:, 2008
- xv) Sabbagh, Karl. Twenty-First-Century Jet: The Making and Marketing of the Boeing 777. New York: Scribner. 1996.
- xvi) Schrage, Michael. Serious Play: How the World’s Best Companies Simulate to Innovate. Boston: Harvard Business School Press. 2000.

b) Publications and Regulations

- i) DoD Directive 5000.01, Defense Acquisition System, 12 May 2003
- ii) DoD Instruction 5000.02, Operation of the Defense Acquisition System, 2 Dec 2008
- iii) DoD Directive 5000.59, DoD Modeling and Simulation (M&S) Management, 8 August 2007
- iv) DoD 5000.59M, DoD Modeling and Simulation (M&S) Glossary, January 1998
- v) DoD Instruction 5000.61, DoD Modeling and Simulation (M&S) Verification, Validation, and Accreditation (VV&A), 13 May 2003
- vi) Defense Acquisition Guidebook, Version 1.0, 17 October 2004
- vii) DoD Acquisition Modeling and Simulation Master Plan (AMSMP), 17 April, 2006

- viii) Verification, Validation and Accreditation (VV&A) Recommended Practices Guide – RPG Build 3.0, September 2006. <http://vva.dmsso.mil/>
 - ix) MIL-STD-3022, Department Of Defense Standard Practice, Documentation Of Verification, Validation, and Accreditation (VV&A) For Models And Simulations, 28 January 2008
 - x) Strategic Plan for Transforming DoD Training, Office of the Under Secretary of Defense for Personnel and Readiness Director, Readiness and Training Policy and Programs, 8 May 2006
 - xi) Test and Evaluation Management Guide, Fifth Edition, The Defense Acquisition University Press, Fort Belvoir, VA, 2005.
- c) Joint Chiefs**
- i) CJCSI 3137.01C, The Functional Capabilities Board Process, 12 November 2004, Current as of 7 November 2007
 - ii) CJCSI 3170.01G, Joint Capabilities Integration and Development System, 1 Mar 2009
- d) Services**
- i) AR 70-1, Army Acquisition Policy, 31 December 2003
 - ii) AR 5-11, Management of Army Models & Simulations, 1 February 2005
 - iii) DA PAM 5-11, Verification, Validation and Accreditation of Army Models and Simulations, 30 September 1999
 - iv) DA PAM 5-12, Simulation Support Planning and Plans, 2 March 2005
 - v) DA Pam 70-3, Army Acquisition Procedures, 28 January 2008
 - vi) SECNAVINST 5000.2C, [Operation of the Defense Acquisition System], 19 November 2004
 - vii) SECNAVINST 5200.38A, Department Of The Navy Modeling And Simulation Program, 28 February 2002
 - viii) SECNAVINST 5200.40 VV&A, 19 April 1999

- ix) OPNAVINST 5200.34, Navy Modeling and Simulation (M&S) Management, 28 May 2002
- x) DON M&S VV&A Implementation Handbook, Volume I VV&A Framework, 30 March 2004
- xi) AFPD 63-1 Capabilities-Based Acquisition System, 10 July 2003
- xii) AFI 63-101, Operations Of Capabilities Based Acquisition System, 29 July 2005
- xiii) AFPD 16-10 Modeling And Simulation (M&S) Management, 30 January 1995
- xiv) AFI 16-1001, Verification, Validation and Accreditation (VV&A), 1 June 1996
- xv) AFI 16-1002, Modeling and Simulation (M&S) Support to Acquisition, 1 June 2000
- xvi) Department of Defense Acquisition Modeling and Simulation Master Plan, 17 April, 2006

10) Course learning objectives:

- a) Describe primary and secondary types of M&S functions that support the Design Review Assessments (P/CDR-A).
- b) Identify the intended use of each type of M&S supporting the P/CDR-A.
- c) Identify representative examples of each type of M&S supporting the P/CDR-A.
- d) Identify the principal M&S applications used during System Capability and Manufacturing Process Demonstration.
- e) Describe representative examples of M&S used for each type of application.
- f) List the inputs, outputs, capabilities and limitations of each example M&S.
- g) Describe primary and secondary types of M&S functions that support MS C.
- h) Identify the intended use of each type of M&S supporting MS C.
- i) Identify representative examples of each type of M&S supporting MS C.
- j) Describe the cost/benefits of physical testing vis a vis modeling and simulation
- k) Describe the risks of physical testing vis a vis modeling and simulation
- l) Describe how physical test, M&S and historical data can be combined to provide effective decision support.
- m) Describe primary and secondary types of M&S functions that support the Full Rate Production Decision (FRPD).
- n) Identify the intended use of each type of M&S supporting the FRPD.
- o) Identify representative examples of each type of M&S supporting the FRPD.
- p) Identify the principal M&S applications used in support of equipment fielding.

- q) Describe representative examples of M&S used for each type of application.
- r) List the inputs, outputs, capabilities and limitations of each example M&S.
- s) Identify the principal M&S applications used for training during operations and sustainment.
- t) Describe representative examples of M&S used for each type of application.
- u) List the inputs, outputs, capabilities and limitations of each example M&S.
- v) Identify the principal M&S applications used for life cycle sustainment.
- w) Describe representative examples of M&S used for each type of application.
List the inputs, outputs, capabilities and limitations of each example M&S.

11) Course assessment plan: Examination, quiz, and research paper and presentation.

12) Topic list by hour of instruction and reference.

- i) Lesson one: Introduction and Review
 - (1) Hour one: Introduction and overview (course notes and syllabus)
 - (2) Hour two: Review of M&S in Acq Part 1 (course notes, materials provided in the previous course)
 - (3) Hour three: Mini case/case review (course notes and syllabus, DoDD 5000.59, AMSMP)
- ii) Lesson two: M&S Completing EMD
 - (1) Hour one: M&S in EMD: Computer Aided Design (CAD Report Article, CADD Primer, DoDI 5000.2, Defense Acquisition Guidebook, course notes)
 - (2) Hour two: M&S in EMD: System Capability and Manufacturing Process Demonstration (CADD Primer, DoDI 5000.2, Defense Acquisition Guidebook, course notes)
 - (3) Hour three: M&S in support of the Milestone C Decision (DoDI 5000.2, Defense Acquisition Guidebook, course notes)
- iii) Lesson three: Practical Application
 - (1) Hour one: Practical Exercise (Defense Acquisition Performance Assessment Summary, 21st Century Jet, Ford Article, Defense Acquisition Reform Article, course notes)
 - (2) Hour two: Practical Exercise (Defense Acquisition Performance Assessment Summary, 21st Century Jet, Ford Article, Defense Acquisition Reform Article, course notes)
 - (3) Hour three: Quiz (course notes and syllabus)
- iv) Lesson four: M&S in Test and Evaluation
 - (1) Hour one: T&E Overview (DoDI 5000.02, Defense Acquisition Guidebook, course notes)
 - (2) Hour two: M&S in Test and Evaluation (DoDI 5000.2, Defense Acquisition Guidebook, course notes)
 - (3) Hour three: Mini Case NPS Ship Shock Case
- v) Lesson five: M&S in Production and Deployment
 - (1) Hour one: M&S in Support of the Full-Rate Production Decision (DoDI 5000.2, Defense Acquisition Guidebook, course notes)

- (2) Hour two: M&S in Support of Equipment Fielding (DoDI 5000.2, Defense Acquisition Guidebook, course notes)
- (3) Hour three: The Simulation Support Plan (DA Pam 5-12, MSSP Template(in class handout), Defense Acquisition Guidebook, course notes)
- vi) Lesson six: Practical application (DoDI 5000.02, Defense Acquisition Guidebook, course notes)
 - (1) Hour one: Practical Exercise overview (Student handouts, course notes and syllabus)
 - (2) Hour two: Student Activity (course notes and syllabus)
 - (3) Hour three: Student Presentations (course notes, DoD 5000.59M, DoDI 5000.61)
- vii) Lesson seven: M&S for Training
 - (1) Hour one: M&S for Training (DoDI 5000.02, Defense Acquisition Guidebook, Strategic Plan for Transforming DoD Training, course notes)
 - (2) Hour two: M&S for Training (DoDI 5000.02, Defense Acquisition Guidebook, Strategic Plan for Transforming DoD Training, course notes)
 - (3) Hour three: M&S for Training (DoDI 5000.02, Defense Acquisition Guidebook, Strategic Plan for Transforming DoD Training, course notes)
- viii) Lesson eight: Individual Topic Review and Independent Research Guidebook, course notes)
 - (1) Hour one: Office hours and library research
 - (2) Hour two: Office hours and library research
 - (3) Hour three: Office hours and library research
- ix) Lesson nine: M&S for Sustainment
 - (1) Hour one: M&S for Sustainment (The Hybrid Supply Chain Model Article, Strategic Mobility Models Paper, DoDI 5000.02, Defense Acquisition Guidebook, course notes)
 - (2) Hour two: Practical Exercise: M&S for Sustainment (Student Handouts, The Hybrid Supply Chain Model Article, Strategic Mobility Models Paper, DoDI 5000.02, Defense Acquisition Guidebook, course notes)
 - (3) Hour three: Practical Exercise/Student Presentations
- x) Lesson ten: Individual Student Papers
 - (1) Hour one: Student Paper Presentations
 - (2) Hour two: Student Paper Presentations
 - (3) Hour three: Student Paper Presentations
- xi) Lesson eleven: Case Study
 - (1) Hour one: M777, Light Weight Howitzer Overview(DoDI 5000.02, Defense Acquisition Guidebook, case study handout)
 - (2) Hour two: Student Activity (course notes and syllabus)
 - (3) Hour three: M777, Light Weight Howitzer Student Presentations (course notes, DoD 5000.59M, DoDI 5000.61)
- xii) Lesson twelve: M&S System Support (DoDI 5000.02, Defense Acquisition Guidebook, course notes)
 - (1) Hour one: Group presentation
 - (2) Hour two: Group presentation

- (3) Hour three: Group presentation
- xiii) Lesson thirteen: M&S
 - (1) Hour one: Mini Case Study Environmental Modeling (Student handouts, course notes and syllabus)
 - (2) Hour two: Case Study Student Presentations (course notes and syllabus)
 - (3) Hour three: Course Review (course notes and syllabus)
- xiv) Lesson fourteen: Examination