



**Modeling & Simulation Leadership Summit 2009
Alabama Modeling and Simulation Council
Position Paper**

Position Paper

from the

Alabama Modeling and Simulation Council (AMSC)

to the

**U. S. House of Representatives
M&S Caucus**

Modeling & Simulation Leadership Summit Meeting

February 2, 2009



I. Introduction

This paper expresses the Alabama Modeling and Simulation Council (AMSC) position on the importance of Modeling & Simulation (M&S) as a critical national technology; and it summarizes a selection of current AMSC activities and capabilities, together with related concrete recommendations for action by the M&S Caucus.

II. AMSC Position on M&S as a Critical National Technology

The AMSC leadership is fully committed to the proposition that Modeling and Simulation is a “National Critical Technology” as declared in House Resolution 487¹. In addition, the AMSC recognizes that economic, technical, and social welfare posture of the United States are less than auspicious and that serious, concerted effort by the Nation will be required to attain acceptable posture in the international community of nations. In view of this challenge, the AMSC hereby subscribes to the following proposition:

“America must invest now, promptly, comprehensively, intentionally, and confidently to use the power of modeling and simulation as a uniquely influential “national critical technology” to:

- 1. assist in national economic recovery, and**
- 2. re-establish the nation’s prominence in scientific, economic, industrial, cultural, and moral leadership for the remainder of the twenty-first century.**

M&S is the only critical technology that can influence all phases of the national well-being including: education revitalization; energy sufficiency; electrical, transportation, and communications infrastructure refurbishment; health and welfare evolution; industrial productivity; national security; homeland defense.”

The Alabama Modeling and Simulation Council will focus its agenda and cooperate with peer and associated organizations to realize the benefits of M&S for the national good.

¹ H. Res. 487, *In the House of Representatives, U. S., July 16, 2007.*



III.AMSC Activities and Capabilities

AMSC organizes activities into four topics areas: technology, workforce development, industrial development and organizational relations, and business practice and economic impact. Selected current activities and capabilities of AMSC members are summarized here in each of those areas together with suggestions for consideration of action by the Congressional Caucus in support of all such regional industrial development organizations.

A. Technology

Conceptual Modeling: Conceptual modeling is the art of abstracting from the real-world domain of interest the important objects, activities, attributes, and relationships that will subsequently be implemented in the corresponding simulation. Every simulation has its own conceptual model that determines what kinds of scenarios the simulation can model, the kinds of questions an analyst-user can reasonably ask of the simulation, the quality of the simulation's predictive outputs, and the degree to which any one simulation's results will be compatible with any other simulation's inputs or outputs. Conceptual model management effectively determines the credibility, utility, and value of every simulation artifact and investment. AMSC's Technology Committee has conducted conceptual modeling workshops and contributed to NATO and DOD conceptual modeling best-practice.

Congressional support in establishing an 'M&S Research Agenda' including such topics as 'conceptual modeling' will serve the entire M&S technology and workforce development community.

Distributed T&E: Using Distributed Simulation protocol techniques, a Test and Evaluation (T&E) framework can inject a synchronized, real-time, threat scenario into real, geographically separated, tactical sensors, weapons and C2 systems. Participating at their home station, the tactical assets or simulations representing the assets appear to the uniformed service operators as though they were together on a battlefield somewhere else in the world. The tactical systems respond in real time, just as they would in combat, via the Joint Data Network's tactical communications which allows the individual tactical system to operate synergistically in a tactically realistic and synchronized simulated battlefield. Distributed simulation can permit systems to be evaluated without endangering operators or damaging the environment. Numerous organizations in the SE have developed robust T&E frameworks in support of MDA, SMDC, the Army and NASA. Use of distributed simulation driven T&E environments provides significant cost saving relative to live tests and collocated T&E activities. AMSC member companies are at the forefront of supporting test and evaluation, in simulation, of new military and civilian systems like the Future Combat Systems, and the Secure Border Initiative.



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In light of potential reallocation of defense and NASA budgets, Congressional support for expanded research and development in distributed T&E frameworks, and emphasis on complete testing of new systems and development of new and innovative ways, offers a robust cost effective solution for complex system level performance assessment in areas of defense; aerospace; transportation, information, and power infrastructure; and homeland security.

Standards: Standards are voluntarily developed and freely balloted methods of ensuring that simulations or systems will interoperate and support economic re-use. Without well thought out standards, there can be no hope of producing products that will work together. AMSC members are leading such national and international standards bodies as the Simulation Interoperability Standards Organization (SISO) and the NATO Conceptual Modeling Subcommittee.

Congress can support development of simulation systems vital to the national interest by encouraging that simulations be developed to available national standards and that government organizations participate in standards development and use.

Conferences and technical workshops: AMSC continues to contribute to the conduct of technical meetings and workshops on subjects of national interest. Recent activity has included the annual Huntsville Simulation Conference, the bi-annual Terrain Simulation Conference, and support of Capital Hill congressional exhibitions.

AMSC recommends that the M&S Caucus continue to support disclosure of the diversity and effectiveness of M&S technology by hosting M&S exhibitions in House office buildings.

B. Workforce development

M&S Body-of-Knowledge: The body-of-knowledge (BOK) for modeling and simulation is the set of information and related functional capabilities that define the M&S discipline, profession, and industry. A consensus, comprehensive specification of the index to the M&S BOK is essential for identification of research opportunities, development of academic curriculum, establishment of professional certification criteria, and specification of industrial classification codes. Unfortunately no such M&S BOK index exists. Effort supported by the AMSC Technology Committee and pursued in cooperation with *SimSummit* and its organizational affiliates is intended to publish such an index for full and open public use during CY 2009. Conducted as an open source, collaborative, web-based enterprise; the M&S BOK Index effort is supported by more



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than forty Advisory Board members from academia, industry and government and an as-yet unknown number of practitioner contributors.

Support from the Congressional Caucus in the form of description and URL reference in caucus web page reports would significantly facilitate the progress of the M&S BOK collaborative effort.

Participation in CMSP revitalization: The Certified Modeling and Simulation Professional (CMSP) designation, awarded to individuals upon successful completion of a rigorous and extensive examination by the National Training and Simulation Association, is increasingly becoming the community-recognized professional certification for M&S practitioners and managers who have achieved a depth of knowledge and experiences to be considered M&S professionals. In a field changing as rapidly as M&S, it is important to ensure that the CMSP examination and process remain consistent with current M&S best practices. AMSC members are taking a major role in the on-going round of CMSP updates; their contributions include process redesign, exam question creation, and quality control.

AMSC recommends that members of Congress consider identifying CMSP certification as required or desirable qualifications for bidders in federal M&S acquisitions.

M&S degree programs: M&S is emerging from its roots as a collection of techniques used by scientists and engineers from many disciplines to become a distinct and coherent academic discipline in its own right. University program offering degrees in M&S, such as the successful programs at Old Dominion University (Norfolk VA) and the University of Central Florida (Orlando FL), are providing comprehensive education to students in the M&S discipline and producing graduates that are immediately employable by the M&S community. The University of Alabama in Huntsville (Huntsville AL), an AMSC member, is in the process of creating an M&S degree program that will offer M.S. and Ph.D. degrees so as to meet the expressed needs of organizations in Huntsville, Alabama, and the Southeast.

AMSC recommends that Congress appropriate funds for implementation of the M&S Programs portion of H.R. 4137², which provides federal grants for universities developing M&S degree programs.

Collaboration with peer academic institutions: Collaboration between academic institutions can include the sharing of specialized courses (via distance learning) and pre-arranged inter-institution acceptance of transfer credit for shared courses. Such

² H.R. 4137 Higher Education Opportunity Act, Title VIII – Additional Programs, Section 801 Additional Programs, referred to as Part V – Modeling and Simulation Programs, Section 891 Modeling and Simulation. This bill became Public Law 110-315 on 8-14-2008.



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collaboration is especially valuable in new academic disciplines, as the collaborating institutions can offer complete degree programs even if their in-house expertise does not yet cover the entire field. The University of Alabama in Huntsville (Huntsville AL), an AMSC member, and the University of Central Florida (Orlando FL) are working towards an articulation agreement to enable such collaboration in their respective M&S degree programs, to their mutual benefit; similar collaboration with other universities, including Old Dominion University (Norfolk VA) and the University of Alabama in Birmingham (Birmingham AL) will also be pursued.

AMSC recommends that Congress ask the Department of Education to encourage such collaborations in their implementation of the M&S Programs portion of H.R. 4137¹.

Collaboration with regional secondary schools: The potential for influence of modeling and simulation in secondary education is well appreciated; and the diversity of mechanisms whereby such influence may be exercised admit to considerable innovation. The AMSC has begun assisting Huntsville's New Century Technology High School faculty to develop a modeling and simulation curriculum to provide the basis for the next generation of simulation leaders for the US. AMSC supports science fairs, and IEEE Future City competitions providing special awards to students demonstrating imaginative and sound use of modeling and simulation tools and techniques. Special after school programs providing students to be immersed in virtual professional environments and to use simulation tools in role-playing exercises as scientists and engineers are being planned. Alabama's Space Camp program consistently uses simulation based role playing and virtual space shuttle mission exercises to stimulate students' interest in science and mathematics.

Congressional cognizance and support for these types of innovative, exploratory cutting edge collaborations would help ensure that the US would remain preeminent in the world of modeling and simulation.

C. Industrial development and organizational relations

National M&S peer-to-peer relationships: Numerous formal organizations exist throughout the US with a focus towards the applicability of M&S across a broad set of disciplines. The structure of individual organizations varies based on the stated goals of the group and its relationship with regional state and federal offices. At the most basic, each group seeks to enhance the role of M&S in support of the nation's role in science and technology. AMSC represents the SE region in an attempt to link other regional centers of M&S to: develop an integrated base of M&S political visibility in the US; share information, capabilities and issues effortlessly across the country; generate larger



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technical partnerships to improve M&S utility; and provide a visible, increased capability for M&S applications to support the US economic recovery.

Congress should foster the collaborative environment for M&S centers across the US by supporting the requirement for a national consortium of M&S practitioners.

Collaboration with Professional Societies: Collaboration between geographic M&S industrial development agents and members of such professional societies as the Society for Modeling and Simulation International (SCS), National Training and Simulation Association (NTSA), the Association for Computing Machinery Special Interest Group on Simulation (SIG-SIM), and the Simulation Interoperability Standards Organization (SISO), and *SimSummit*, afford valuable opportunities for collaboration on topics of national interest in M&S. AMSC maintains standing memoranda of agreement and robust working relationships with such organizations in order to establish consensus on national agendas and consensus on topics relating to M&S technology , workforce development, industrial development and business practice.

AMSC recommends that M&S Caucus members be invited to attend the next Huntsville Simulation Conference (HSC) in order to confer with local representatives and M&S community-of-practice and legislative cohorts as per face-to-face meetings at IITSEC 08.

Membership in Congressional Caucus: Members of the Alabama congressional delegation, including Representative Robert Aderholt (R-AL 04) and Former Representative Bud Cramer (D-AL 05), have long been members of the M&S Congressional Caucus. Recently, AMSC has coordinated with the staff of newly elected Representative Parker Griffith (D-AL 05) in order to identify the Caucus as a powerfully influential group and to encourage positive response from the Caucus to join on behalf of constituents in North Alabama and across the state. In addition, AMSC has launched a campaign to contact all the states' Representatives with similar intent.

AMSC respectfully requests the Caucus to contact Representative Griffith and other Alabama members with invitations to participate in the Caucus and volunteers its own efforts to communicate the significance of the Caucus to Alabama M&S professionals, education, and industrial development.

National government collaboration: Groups with diverse interests working together to solve problems that no member could solve individually becomes collaboration. This is important because it provides a solution path that would not be available if the collaborators were not working cooperatively. One fundamental difficulty for regional M&S advocacy groups such as AMSC is to establish meaningful contacts and dialogue



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with federal government departments regarding their M&S agendas, infrastructure, and planned usage. AMSC has been working successfully with the Department of Defense through both the OSD M&S CO and via DoD agencies active in Alabama: e.g. U. S. Army Materiel Command (AMC), U. S. Army Space and Missile Defense Command (SMDC), Missile Defense Agency (MDA), Defense Intelligence Agency's Missiles and Space Intelligence Center (MSIC), etc. We have collaborated with NASA headquarters as well as with Marshall Space Flight Center (MSFC) agents; and we have approached Department of Energy through TVA and the Division of Energy Assurance. Other departments have been more opaque. AMSC does expect to be fairly advised on matters of Transportation and Infrastructure by virtue of Congressman Parker Griffith's appointment to its subcommittees on: Economic Development, Public Buildings and Emergency Management; Water Resources and Environment; and Aviation. Nevertheless,

AMSC recommends that the Congressional Caucus establish on behalf of all regional groups such as AMSC - perhaps through the office of the Science Advisor to the President or in cooperation with the House Committee on Science and Technology - channels whereby the use of M&S by executive departments may be better and more systematically understood.

Relationships with municipal agencies: Many forms of industrial development depend on successful relationships with municipal agencies. AMSC has begun to pursue agreements, and active collaborations with such organizations in the state of Alabama as have peer industrial development organizations in New England and Mid-Atlantic regions and in states of Virginia, Florida, New Mexico, and Arizona. Typical affiliations include membership in municipal chambers of commerce and liaison with such special-purpose administrative organizations such as the Alabama Emergency Management and Department of Homeland Security offices.

AMSC recommends that the Caucus be aware of such grass-roots affiliations and the opportunities that collaboration through regional M&S industrial development groups to such organizations may present. Since considerable similarity exists nationwide in such organizations' presence and roles (e.g. Department of Homeland Security state operations), and since Congressional Representatives are intimately familiar with such infrastructure; the collective and systematic pursuit of such relationships on the part of organizations such as AMSC may serve to facilitate the establishment of a distributed network leveraging Representatives' existing affiliations and trusted agents to advance Caucus initiatives.



D. Business practices and economic impact

Economics of M&S: The economics of modeling and simulation is a matter of immediate interest. Cost effectiveness of M&S use and the impact of the discipline on local industrial development and social well-being needs to be better understood and leveraged nationally for the collective good. AMSC is involved in aggressively investigating the subject addressed on several fronts.

AMSC recommends Caucus members' maintain awareness (with support of regional M&S industrial development groups) of evolving literature on econ of M&S, e.g.: DoD M&S ROI studies³, Standards cost-effectiveness analysis, proceedings of SISO Standing Study Group on the Economics of M&S, NATO M&S Economics publications⁴, Open-source business practice, etc.

Economic impact study: Disciplines of endeavor, such as M&S, can have a major impact on the economy of a geographic area, given a concentration of discipline-related activities in that area. Community leaders need to understand the relative impact of the disciplines important in their area so that they can support appropriate investments. The University of Alabama in Huntsville (Huntsville AL), an AMSC member, conducted an economic impact study that found that M&S was a major driver in the north Alabama economy, with many of the community's employers and a significant fraction of its high-technology workforce engaged in or connected to M&S in some way.

AMSC recommends that Congress consider the large and expanding economic impact of M&S in future legislative actions relating to it.

BRAC: The base realignment and closing (BRAC) actions are and will have a major impact on regions of direct interest to AMSC. With the arrival of MDA, AMC and ATTC into northern Alabama, significant opportunities exist for growth and evolution of M&S capabilities to support the missions of the arriving organizations. AMSC is actively identifying the needs of these organizations, the potential applications of M&S that could be appropriate, the existing M&S infrastructure, and the enhancements needed to make the transition under BRAC an economic and technological success.

³ Metrics for Modeling and Simulation (M&S) Investments, REPORT No. TJ-042608-RP013, The AEGis Technologies Group, Inc., November 2008.

⁴ The Cost Effectiveness of Modelling and Simulation (M&S) MSG-031 Final Report, PUB REF NBR (e.g. RTO-TR-IST-999), 2008.



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Congressional support to fully fund the brick and mortar components required to prepare the region for a successful BRAC activity are vital in attracting the necessary M&S professionals to the region.

Liaison with Alabama Economic Development Agency: Presence of the modeling and simulation industry and use of M&S in support of economic development agendas are appreciated to be potentially powerful compliments to traditional development strategies. Meetings are scheduled between AMSC officers and agents at the North Alabama Industrial Development Association (NAIDA) regarding discussions with Congressman's Parker Griffith's staff about the potential of Modeling and simulation relative to economic development and industrial recruitment.

Congress should be aware of the rationale educed in such discussions in Alabama and elsewhere in the nation and support the establishment of coherent expression of the prospective leverage of M&S on behalf of economic welfare nationwide.

NAICS Codes: The North American Industry Classification System (NAICS) is the standard used by Federal statistical agencies to classify business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy. Because no NAICS has been established for M&S, the growth of M&S as an industry and the contribution of M&S to the overall economy remain unmeasured by the government. OMB issued notice in the Federal Register on January 7, 2009 soliciting proposed changes to the NAICS to be in place by 2012. AMSC is collecting data on the size and scope of the industry to aid the Department of Census and the Small Business Administration in this effort.

The M&S Caucus should encourage similar activity from all districts and states represented in the Caucus and request information from Census and SBA regarding the standing of M&S products and services as recognizable industries within the NAICS.

Patent and intellectual property protection: Some version of the "Patent reform Act" (PRA) is expected to be reprised before the 111th Congress. Last year's PRA met with opposition from hundreds of companies and individual patent holders from around the company due to provisions which were considered likely to have dramatically reduced patent protections. Although the House of Representatives passed the HRA in 2007, the measure failed to achieve approval in Senate pending generation of greater consensus. The M&S industry contains many companies and individuals for whom patent protection may be decisive of economic survival. While there are certainly grounds for adjustment of patent legislation and the processes of review, issuance, and enforcement of protections;



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Congress should consider potential pejorative consequences on emerging M&S industry patent applicants and patent-holders of recommendations such as too-restrictive award of patent protections, and reduced penalties for demonstrated infringement.

Virtual Targets Center: Imaginative forms of business practice are emerging within the M&S community of practice wherein cooperation among industry, government and academia are significantly facilitated. For instance, new and enhanced weapon systems are often tested with M&S, using digital virtual models of the targets they are intended to engage. Those target models must be detailed, accurate, and authoritative if the testing that uses them is to be reliable. The U.S. Army is developing a library of extremely detailed, highly accurate, and carefully validated virtual target models that faithfully represent those targets in the infrared, radio frequency, and visual spectrums and are freely available to qualified users via an on-line accessible repository. Reciprocally, model contributions can be contributed by industry or academic organizations and practitioners to enrich the collective information resource. This activity illustrates the imaginative business practices that enable cooperation among government, industry, and academia to the advantage of all.

AMSC recommends that Congress continue their budgetary support of the Army organizations involved in this activity, and to recognize the potential for business models in which government and industry collaborate to mutual benefit generally.

IV. Conclusion

America's preeminence in the M&S industry makes M&S a critical national technology to be recognized and nurtured with the purpose of maintaining America's position as the market leader for M&S products and services. The member organizations of AMSC and M&S enterprises throughout the Southeast region contribute substantially to the advancement of M&S as critical national technology and provide challenging and rewarding high-end research jobs as well as production jobs for simulations and trainers that enable America to operate with increasing efficiency and effectiveness—to do more, much quicker, and at less cost. AMSC will cooperate with its peer industrial development groups nation-wide to advance the technology, workforce, and business practice of M&S for the benefit of the entire society.