



**CENTER FOR ADVANCED VEHICULAR SYSTEMS**  
**Bagley College of Engineering at Mississippi State University**  
**FY07**  
**Fourth Quarter Report**  
**1 April to 30 June**

**EXECUTIVE SUMMARY**  
From Director, Rand M. German

I am pleased to report significant gains for CAVS on many fronts. Indeed we probably have moved from the “building” process into an established and “well-respected” interdisciplinary research, development and extension enterprise. During the fourth quarter of fiscal year 2007 (April – June), the Center for Advanced Vehicular Systems (CAVS) faculty and staff’s proposal activity included 9 awards totaling \$1,600,626.61. This gave a net award inflow of \$1,600,626.61 while CAVS had a net expenditure of \$3,070,782.36.

CAVS research participation for the quarter included:

- 15 faculty
- 31 research associates
- 11 postdoctoral fellows
- 46 graduate students
- 73 undergraduate students
- 9 academic departments represented

Highlights from the detailed listing given below include the following:

- 8 proposals, totaling \$551,673 were submitted for future funding
- CAVS staff submitted 25 articles for publication and 47 conference submissions
- During the same time CAVS was responsible for
  - 33 published articles
  - 70 presentations
  - 8 new patent disclosures

**I. Activities**

**A. Proposal Submissions by PI’s and Co-PI’s**

Felicelli, Sergio -	1
German, Rand -	1
Horstemeyer, Mark -	1
Reeves, Wes -	1
Sheely, Robert -	1
Walden, Clay -	3

## **B. Publication Submission**

- “A Tool for a Two-Level Dynamic Load Balancing Strategy in Scientific Applications,” R.L. Carino, I. Banicescu, *Scalable Computing: Practice and Experience*.
- “Atomistic Simulation of Activated Sintering of Tungsten by Additives,” J. Houze, S. Kim, S.J. Park, R.M. German, M.F. Horstemeyer, S.G. Kim, *Advances in Powder Metallurgy & Particulate Materials*.
- “Comparison of 2D and 3D Thermal Models of the LENS Process,” H. Yin, S. Felicelli, L. Wang, *Journal of Heat Transfer*.
- “Enhanced Surrogate Modeling via Optimum Ensemble of Metamodels,” E. Acar, M. Rais-Rohani, *Structural and Multidisciplinary Optimization*, June 2007.
- “Experimental and Numerical Study of the LENS Rapid Fabrication Process,” L. Wang, S. Felicelli, J. Craig, *Metallurgical and Materials Transitions*.
- “Extended Generalized Lambda Distribution for Fast and Accurate Reliability Analysis,” E. Acar, M. Rais-Rohani, C. Eamon, *Structural Safety*, June 2007.
- “Fatigue Crack Growth Mechanisms in High Pressure Die Cast Magnesium Based Alloys,” H. El Kadiri, M.F. Horstemeyer, P.T. Wang, B. Jordan, Y. Xue, *Metallurgical and Materials Transactions A*.
- “Grain Size Measurement and Modeling for Nano-Structured Tungsten Carbide,” S.J. Park, K. Cowan, J.L. Johnson, R.M. German, *International Journal of Refractory Metals & Hard Materials*, 2007.
- “Hybrid Boundary Element Method for Two-Dimensional Linear Elastic Fracture Analysis,” A. Yohannes, T.E. Lacy, Y. Hwang, *AIAA Journal*.
- “Master Decomposition Curve for Binders in PIM Processing,” G. Aggarwal, S.J. Park, I. Smid, R.M. German, *Metallurgical and Materials Transactions A*, 2007.
- “Melting Tungsten Nanoparticles: A Molecular Dynamics Study,” A. Moitra, S. Kim, J. Houze, B. Jelinek, S.J. Park, R.M. German, M.F. Horstemeyer, S.G. Kim, *European Physical Journal B*.
- “Micromechanical Simulation of Cyclic Plasticity at Inclusion Particles with Overloads,” Y. Xue, A. Wright, K. Solanki, M.F. Horstemeyer, *AIAA Journal*, May 2007.
- “Mobility of Dislocations in Mg and Mg/Al Alloys by Molecular Dynamic Simulations,” S. Groh, B. Jelinek, J. Houze, S.G. Kim, M.F. Horstemeyer, *Computational Materials Science*.
- “Multiscale Structures and Mechanical Behavior of the *Terrapene Carolina* (Box Turtle) Shell,” H. Rhee, Y. Hwang, M.F. Horstemeyer, L. Liyanage, W.M. Gullledge, III, *Journal of Structural Biology*, April 2007.
- “Phase Transformations in Low Alloy Steel Laser Deposits,” H. El Kadiri, L. Wang, M.F. Horstemeyer, R. Yassar, Y. Shahbazian, S. Felicelli, P.T. Wang, *Materials Science and Engineering A*, May 2007.
- “Pitting Corrosion Study in an AE 44 Magnesium Alloy,” R.B. Alvarez, M.F. Horstemeyer, M.Q. Chandler, N. Williams, P. Wang, A. Ruiz, *TMS A*.
- “Ranking Billions of Web Pages using Diodes,” R. Kaul, Y. Yun, S.G. Kim, *Communications of the ACM*.
- “Reliability Analysis using Dimension Reduction and Extended Generalized Lambda Distribution,” E. Acar, M. Rais-Rohani, C. Eamon, *Journal of Structural Safety*, June 2007.
- “Reliability-Based Crashworthiness Optimization of Automotive Structures,” M. Rais-Rohani, K. Solanki, E. Acar, C. Eamon, *ASME Journal of Mechanical Design*, June 2007.

- “Reliability-Based Structural Optimization using a Multiscale Material Model,” K. Solanki, E. Acar, M. Rais-Rohani, C. Eamon, M.F. Horstemeyer, *Computer Methods in Applied Mechanics and Engineering*, May 2007.
- “Sensitivity Analysis by the Adjoint Variable Method for Optimization of the Die Compaction Process in Particulate Materials Processing,” S.H. Chung, Y.S. Kwon, S.J. Park, R.M. German, *ASME J. Engineering Materials Technology*, 2007.
- “Structure of III-Sb(001) Surfaces Under Extreme Sb-rich Conditions,” J. Houze, S. Kim, S.G. Kim, S.C. Erwin, L.J. Whitman, *Physical Review Letters*.
- “The Effect of Fe Atoms on the Adsorption of a W Atom on W(100) Surface,” J. Houze, S. Kim, S.J. Park, R.M. German, M.F. Horstemeyer, S.G. Kim, *Journal of Applied Physics*.
- “The Web as a Diode Circuit: Computing Topic specific Ranks,” R. Kaul, Y. Yun, S.G. Kim, *ACM Transactions on Internet Technology*.
- “When Sensitivity is a Function of Age and Time Spent in the Preclinical State in Periodic Cancer Screening,” D. Wu, R.L. Carino, X. Wu. *Journal of Modern Applied Statistical Methods*.

### **C. Conference Full Paper Submission**

- “Atomistic Simulation of Activated Sintering of Tungsten by Additives,” J. Houze, S. Kim, S.J. Park, R.M. German, M.F. Horstemeyer, S.G. Kim, PowderMet 2007, Denver, CO, May 2007.
- “Binder Optimization for the Production of Tungsten Feedstocks for PIM,” T. Puzz, A. Antonyraj, R.M. German, J. Oakes, S. Caldwell, PowderMet 2007, Denver, CO, May 13 – 16, 2007.
- “Constitutive Modeling of Compaction and Sintering for P/M Automotive Components,” Y. Hammi, L. Tucker, P.G. Allison, T.W. Stone, M.F. Horstemeyer, E.B. Marin, PowderMet 2007, Denver, CO, May 2007.
- “Densification and Grain Growth During the Sintering of Nanoscale SiC,” M. Bothara, S.J. Park, R.M. German, T.S. Sudarshan, R. Radhakrishnan, S.V. Atre, 2007 NSTI Nanotechnology Conference and Trade Show, Santa Clara, CA, May 20 – 24, 2007.
- “Design & Fabrication of Ceramic Microarrays Using Powder Injection Molding,” S.V. Atre, C. Wu, S.J. Park, K. Simmons, 2007 NSTI Nanotechnology Conference and Trade Show, Santa Clara, CA, May 20 – 24, 2007.
- “Determination of Microstructure Property Relations for Performance and Design Optimization of the P/M Process,” P.G. Allison, Y. Hammi, M.F. Horstemeyer, PowderMet 2007, Denver, CO, May 2007.
- “Development of the High Performance W-Cu Electrode,” Y.S. Kwon, S.T. Chung, S. Lee, J.W. Noh, S.J. Park, R.M. German, PowderMet 2007, Denver, CO, May 13 – 16, 2007.
- “Investigating a Dynamic Loop Scheduling with Reinforcement Learning Approach to Load Balancing in Scientific Applications,” M. Rashid, I. Banicescu, The Sixteenth International Conference on Parallel Architectures and Compilation Techniques (PACT) Brasov, Romania, September 15 – 19, 2007.
- “Linking Homogenization and Densification in Tungsten Heavy Alloys,” G. Sethi, S.J. Park, J.L. Johnson, R.M. German, PowderMet 2007, Denver, CO, May 13 – 16, 2007.
- “Master Decomposition Curve of Nanoparticulate-Filled Polymer,” O.P. Valmika Nathan, S.V. Atre, S.J. Park, J. Simonsen, PowderMet 2007, Denver, CO, May 13 – 16, 2007.

- “Mechanical and Physical Properties of Titanium and Silicon Carbide Containing Mixed Powder Sintered Aluminium,” F. Findik, K. Thompson, A. Antonyraj, S.J. Park, R.M. German, PowderMet 2007, Denver, CO, May 13 – 16, 2007.
- “Micromechanical Simulation of Cyclic Plasticity at Inclusion Particles with Pre-Over Straining,” Y. Xue, A. Wright, K. Solanki, M.F. Horstemeyer, Proceedings of the 48<sup>th</sup> AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, AIAA-2007-2341, April 2007.
- “Micromechanical Simulation on Hygro-Mechanical Properties of Woodfiber-Reinforced Plastic Composites,” K. Wang, Y. Xue, H. Zhang, M.F. Horstemeyer, 9<sup>th</sup> International Conference on Wood & Biofiber Plastic Composites, Madison, WI, May 21 – 23, 2007.
- “Microstructure of Tungsten Copper and Model to Predict Thermal Conductivity,” S.J. Park, J. Johnson, R. Yassar, Y.S. Kwon, R.M. German, R.B. Dinwiddie, W.D. Porter, PowderMet 2007, Denver, CO, May 13 – 16, 2007.
- “Multiscale Structures and Mechanical Behavior of Biological Composite Materials for Armor Design Applications,” H. Rhee, M.F. Horstemeyer, Y. Hwang, US-KOREA Conference 2007, Washington D.C., August 2007.
- “Nanoscale SiC Sintered Structures for Power Electronics Packaging and Advanced Microsystems,” M. Bothara, S. Atre, S.J. Park, R.M. German, Ceramic Interconnect and Ceramic Microsystems Technologies (CICMT 2007), Denver, CO, April 23 – 26, 2007.
- “Novel Methodology to Quantify Tool Wear in Powder Metallurgy,” J.K. Thompson, S.J. Park, R.M. German, F. Findik, A. Antonyraj, PowderMet 2007, Denver, CO, May 13 – 16, 2007.
- “Numerical Investigations of Mixing for Powder Injection Molding Feedstock,” T.G. Kang, S.J. Park, S.V. Atre, R.M. German, PowderMet 2007, Denver, CO, May 13 – 16, 2007.
- “Powder Infused Materials and their Possible Applications,” T. Puz, A. Antonyraj, R.M. German, J. Oakes, S. Caldwell, PowderMet 2007, Denver, CO, May 13 – 16, 2007.
- “Powder Injection Molded Ceramic Microsystems,” S.V. Atre, S.J. Park, R.M. German, Ceramic Interconnect and Ceramic Microsystems Technologies (CICMT 2007), Denver, CO, April 23 – 26, 2007.
- “Reliability of Mechanistic Multistage Fatigue Model for Damage and Life Estimations,” Y. Xue, K. Solanki, G. Steele, M.F. Horstemeyer, Proceedings of the 48<sup>th</sup> AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, AIAA-2007-1982, April 2007.
- “Reliability-Based Structural Optimization using a Multiscale Material Model,” K. Solanki, E. Acar, M. Rais-Rohani, C. Eamon, M.F. Horstemeyer, Proceedings of 48<sup>th</sup> AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Waikiki, HI, April 23 – 26, 2007.
- “Simulation of Binder-Powder Separation in Powder Injection Molding,” S. Kim, S.J. Park, S.V. Atre, R.M. German, PowderMet 2007, Denver, CO, May 13 – 16, 2007. “Statistical Tensile Properties of Kenaf Fibers and Composites,” Y. Xue, Y. Due, S. Elder, D. Shane, M.F. Horstemeyer, J. Zhang, 9<sup>th</sup> International Conference on Wood & Biofiber Plastic Composites, Madison, WI, May 21 – 23, 2007.
- “Study of Liquid-Phase Sintered, Nanosized Silicon Carbide Fabricated in a Plasma Pressure Compaction System,” M. Bothara, S.V. Atre, S.J. Park, R.M. German, T.S. Sudarshan, R. Radhakrishnan, PowderMet 2007, Denver, CO, May 13 – 16, 2007.

- “The Case for Functional Security Requirements: Deriving a Framework for Functional Security Requirements Engineering,” B. Robbins, *Proceedings of the 2007 International Conference on Software Engineering Research and Practice*, Las Vegas, NV: CSREA Press, 2007.
- “Thermal Expansion and Viscoelastic Properties of Sintered Porous Compact,” A. Antonyraj, S.J. Park, R.M. German, PowderMet 2007, Denver, CO, May 13 – 16, 2007.
- “Thermal Modeling and Experimental Validation in the LENS Process,” L. Wang, S. Felicelli, J. Craig, *Solid Freeform Fabrication Symposium*, Houston, TX, August 6 – 8, 2007.

#### **D. Conference Abstract Submission**

- “An Investigation of Thermal Behavior and Molten Pool Shape During the LENS™ Process,” L. Wang, S.D. Felicelli, J.E. Craig, P.T. Wang, M.F. Horstemeyer, Laser Assisted Net Shape Engineering 5 (LANE'07), Erlangen, Germany, September 25 – 28, 2007.
- “A Physically Motivated Uncertainty-Based Higher Order Plasticity and Damage Model,” K. Solanki, M.F. Horstemeyer, MCMAT2007-30120, ASME Applied Mechanics and Materials Conference, University of Texas at Austin, June 3 – 7, 2007.
- “Corrosion Pitting in an AE 44 Magnesium Alloy,” R.B. Alvarez, M.F. Horstemeyer, A. Ruiz, NACE Corrosion 2008 Conference and Expo, New Orleans, LA, March 16 – 20, 2008.
- “Cross-Validation of an Infrared Motion Capture System and an Electromechanical Motion Capture Device,” M. Thomas, J. McGinley, D. Carruth, C. Blackledge, *Proceedings of the Society of Automotive Engineers Digital 2007 Human Modeling Conference*, Seattle, WA, 2007.
- “Internal State Variable Modeling of Structure-Property Relationships in Deformed Microstructures,” M.F. Horstemeyer, K. Solanki, The Minerals, Metals, and Materials Society, 2007 TMS Annual Meeting & Exhibition, Orlando, FL, February 25 – March 1, 2007.
- “Leveraging CATIA V5 and Virttools for Environment Simulation,” D. Carruth, N. Littell, *COE 2007 Annual PLM Conference & TechniFair*, Las Vegas, NV, 2007.
- “Micromechanical Simulation of Cyclic Plasticity at Inclusion Particles with Pre-Over Straining,” Y. Xue, K. Solanki, A. Wright, M.F. Horstemeyer, AIAA, April 23 – 26, 2007.
- “Microstructural-Property Characterization of a Dodge Neon Passenger Car,” I. Carrasquel, M.F. Horstemeyer, K. Solanki, C. Burton, MS&T '07 (Materials Science & Technology 2007 Conference and Exhibition), Detroit, MI, September 16 – 20, 2007.
- “Mississippi State's Formula SAE Car Body Design, Analysis, and Construction,” B. Witbeck, *Catia Operator's Exchange*, Las Vegas, NV, 2007.
- “Multiscale Modeling in Powder Metallurgy: Atomistic, Discrete Element, and Finite Element Simulations,” S.J. Park, S.G. Kim, M.F. Horstemeyer, R.M. German, UKC (US – Korea Conference) 2007, Washington, DC, August 9 – 12, 2007.
- “Multiscale Structures and Mechanical Behavior of Biological Composite Materials for Armor Design Applications,” H. Rhee, M.F. Horstemeyer, Y. Hwang, US-KOREA Conference 2007, Washington, DC, August 9 – 12, 2007.
- “Probabilistic Product-Process Design Optimization of Automotive Structures using Multiscale Material Models,” E. Acar, K. Solanki, M. Rais-Rohani, M.F. Horstemeyer, The 14th Asia Pacific Automotive Engineering Conference, August 5 – 8, 2007.
- “Reliability-Based Structural Optimization using a Multiscale Material Model,” K. Solanki, E. Acar, M. Rais-Rohani, C. Eamon, M.F. Horstemeyer, AIAA, HI, April 23 – 26, 2007.

- “Reliability of Mechanistic Multistage Fatigue Model for Damage and Life Estimations,” Y. Xue, K. Solanki, G. Steele, M.F. Horstemeyer, AIAA, April 23 – 26, 2007.
- “Simulation and Testing of a Carbon Composite Wing Assembly of an Ultralight Airplane,” R. Sullivan, Y. Hwang, M. Rais-Rohani, T. Lacy, P. Wiwattananon, J. Simsiriwong, 22nd Annual Technical Conference of American Society for Composites, Seattle, WA, September 17 – 19, 2007.
- “Statistical Micromechanical Evaluations of Hygro-Mechanical Properties of Short Fiber-Reinforced Composites,” Y. Xue, K. Wang, H. Zhang, M.F. Horstemeyer, MRS Annual Meeting, November 2007.
- “The Design and Development of a Through-the-Road Parallel Diesel Electric Hybrid,” D. Oglesby, G.M. Molen, K. Crawford, K. Walp, C. Whitt, 2007 IEEE Vehicle Power and Propulsion Conference, Arlington, TX, September 9 – 12, 2007.
- “Thermal Modeling and Experimental Validation in the LENS™ Process,” L. Wang, S.D. Felicelli, J.E. Craig, P.T. Wang, M.F. Horstemeyer, Proceedings of The Eighteenth Solid Freeform Fabrication Symposium, Austin, TX, August 6 – 8, 2007.
- “Uncertainty-Based Internal State Variable Modeling of Structure-Property Relationships in Deformed Microstructures,” K. Solanki, M.F. Horstemeyer, The 5th International Conference on Materials Processing Defects, Cornell Center for Materials Conference, July 2007.

***E. Patents (disclosures or applications)***

- “Algorithm for Converting Flowchart Diagrams into SCORM Activity Trees,” A. Bullwinkle, D. Brown, J. Cain, S. Calhoun, D. Hamilton, K. McCarter, T. Miskelly, 07-0501-309.
- “Atomistic Sintering Simulation Software,” S.G. Kim, S. Kim, M. Horstemeyer, R. German, S.J. Park, 07-0131-274.
- “Desktop Peer-to-Peer Learning Management System,” M. Bennett, J. Cain, S. Calhoun, 07-0510-313.
- “Method and System for Graphically and Visually Depicting Adaptive Learning Sequences,” S. Calhoun, A. Bullwinkle, J. Cain, D. Brown, 07-0508-310.
- “Monocular Display Augmented Digitizing,” N. Littell, 06-0608-228.
- “Peer-to-Peer Learning Management System,” S. Calhoun, M. Bennett, J. Cain, 07-0510-313.
- “Software for and Engine Speed Controller with Total System Integration for On-Board Vehicle Power Applications,” M. Molen, A. Card, 07-0404-298.
- “Structured Sequence Notation,” A. Bullwinkle, D. Brown, J. Cain, S. Calhoun, 07-0508-310.

***F. Proposal Submission***

*(Note: Only proposals submitted through Sponsored Programs Administration were counted.)*

- “SAVIOR Vehicle Modification and Sensor Installation,” W. Reeves, General Atomics.
- “Simulation and Characterization of Biologically Inspired Materials,” M.F. Horstemeyer, Battelle.

- “Modeling of Oxide Bifilms in Aluminum Castings,” S. Felicelli, National Science Foundation.
- “Workshop for Scientific Issues on Medical Applications of Micro/Nano Powder Injection Molding-Molding, Sintering, Modeling, and Commercial Applications,” R. German, National Science Foundation.
- “Taxonomy Based Assessment Methodology: Pilot Case Studies of MS Manufacturers Impacted by Hurricane Katrina,” C. Walden, Mississippi Technology Alliance.
- “Phase II Process Improvement Support at Faurecia in Cleveland, MS,” C. Walden, Faurecia.
- “Phase II Process Improvement Support at Faurecia in Cleveland, MS.” C. Walden, South Delta Planning & Development District.
- “Planning Study to develop a strategy and recommendations for a path forward for the development of a “Best Available Technology” solution to comply with an EPA 'Clean Water Act' Regulation that requires the design of cooling intake structures that reduce and minimize adverse environmental impact related to killing fish and other aquatic organisms,” R. Sheely, Atlas Manufacturing Co., Inc.

## **II. Outcomes**

### **A. Publications**

- “An Analysis of the Powder Injection Molding Industry Global Market,” R.G. Cornwall, R.M. German, *PIM Compilation IV: Applications and Management Issues*, Metal Powder Industries Federation, Princeton, NJ, 2007 (on CD).
- “Bi-Metal Injection Molding of Tough/Wear-Resistant Components,” J.L. Johnson, L.K. Tan, R. Bollina, P. Suri, R.M. German, *PIM Compilation III: Secondary Processing and Material Properties*, Metal Powder Industries Federation, Princeton, NJ, 2007 (on CD).
- “Binder Selection for PIM of Water Atomized 316L,” N. Myers, R.M. German, *The Science of Stainless Steels Produced by Powder Metallurgy and Metal Injection Molding*, C. Lall (ed.), Metal Powder Industries Federation, Princeton, NJ, 2007, pp. 289-294.
- “CAE-Based Process Design of PIM for Microfluidic Device Components,” R. Urval, C. Wu, S. V. Atre, S.J. Park, R.M. German, *Powder Injection Molding International*, 2007, vol. 1, pp. 53-58.
- “Center for Advanced Vehicular Systems,” R.M. German, R. Kirkland, *Advanced Materials and Processes*, 2007, vol. 165, no. 4, pp. 37-39.
- “Damage and Stress State Influence on the Bauschinger Effect in Aluminum Alloys,” J.B. Jordon, M.F. Horstemeyer, K. Solanki, Y. Xue, *Mechanics of Material*, vol. 39, October, 2007, pp. 920-931.
- “Densification and Grain Growth During the Sintering of Nanoscale SiC,” M. Bothara, S.V. Atre, S.J. Park, R.M. German, T.S. Sudarshan, R. Radhakrishnan, *Technical Proceedings of the 2007 NSTI Nanotechnology Conference and Trade Show* (NanoTach2007/Cleantech2007), Nano Science and Technology Institute (NSTI), Vol. 4, pp. 494-497, May 20-24, 2007, Santa Clara, CA, USA.
- “Design & Fabrication of Ceramic Microarrays Using Powder Injection Molding,” C. Wu, S.V. Atre, D. Whychell, S.J. Park, R.M. German, *Technical Proceedings of the 2007 NSTI Nanotechnology Conference and Trade Show* (NanoTach2007/Cleantech2007), Nano Science and Technology Institute (NSTI), Vol. 3, pp. 379-382, Santa Clara, CA, May 20

– 24, 2007.

- “Design Guide for Powder Injection Molding - Simplified Rules,” R.M. German, *PIM Compilation IV: Applications and Management Issues*, Metal Powder Industries Federation, Princeton, NJ, 2007 (on CD).
- “Design Regression for Identification of Optimal Components for Metal Powder Injection Molding,” R.M. German, *Proceedings Powder Metallurgy World Congress*, Korean Powder Metallurgy Institute, Busan, Korea, 2006, pp. 121-122.
- “Effect of Carbide Addition on Sintering of M2 Tool Steel,” H. Zhang, D.F. Heaney, R.M. German, *PIM Compilation III: Secondary Processing and Material Properties*, Metal Powder Industries Federation, Princeton, NJ, 2007 (on CD).
- “Effect of Die Compaction Pressure on Densification Behavior of Molybdenum Powders,” P. Garg, S.J. Park, R.M. German, *International Journal of Refractory Metals and Hard Materials*, 2007, vol. 25, pp. 16-24.
- “Exploring Powder Injection Molding of Niobium,” G. Aggarwal, I. Smid, R.M. German, *PIM Compilation III: Secondary Processing and Material Properties*, Metal Powder Industries Federation, Princeton, NJ, 2007 (on CD).
- “Mapping Particle Size Distributions into Predictions of Properties for Powder Metal Compacts,” R.M. German, *Proceedings Powder Metallurgy World Congress*, Korean Powder Metallurgy Institute, Busan, Korea, 2006, pp. 704-705.
- “Master Curves Based on Time Integration of Thermal Work in Particulate Materials,” S.J. Park, R.M. German, *Int. J. Materials and Structural Integrity*, Vol. 1, Nos. 1/2/3, pp. 128-147, 2007.
- “Master Decomposition Curve for Binders Used in Powder Injection Molding,” G. Aggarwal, S. J. Park, I. Smid, R.M. German, *Metallurgical and Materials Transactions*, 2007, vol. 38A, pp. 606-614.
- “Mechanical Properties and Corrosion Resistance of MIM Ni-Base Superalloys,” J.L. Johnson, L.K. Tan, P. Suri, R.M. German, *PIM Compilation III: Secondary Processing and Material Properties*, Metal Powder Industries Federation, Princeton, NJ, 2007 (on CD).
- “Metal and Ceramic Injection Molding - Technical Status and Future Challenges,” R.M. German, S.K. Ferchak, *PIM Compilation IV: Applications and Management Issues*, Metal Powder Industries Federation, Princeton, NJ, 2007 (on CD).
- “Metal and Ceramic Injection Molding - Technical Status and Future Challenges,” R.M. German, S.K. Ferchak, *The Science of Stainless Steels produced by Powder Metallurgy and Metal Injection Molding*, C. Lall (ed.), Metal Powder Industries Federation, Princeton, NJ, 2007, pp. 278-288.
- “Metal Injection Molding of High Conductivity Copper Heat Sinks,” J.L. Johnson, P. Suri, D.C. Schoiack, R. Baijal, R.M. German, L.K. Tan, *PIM Compilation III: Secondary Processing and Material Properties*, Metal Powder Industries Federation, Princeton, NJ, 2007 (on CD).
- “Nanoscale SiC Sintered Structures for Advanced Microsystems and Power Electronics Packaging,” M. Bothara, S.V. Atre, S.J. Park, R.M. German, T.S. Sudarshan, R. Radhakrishnan, O. Ostroverkhova, *Proceedings of 2007 IMAPS/ACerS 3rd International Conference and Exhibition on Ceramic Interconnect and Ceramic Microsystems Technologies (CICMT 2007)*, Co-Published by International Microelectronics and Packaging Society (IMAPS) and The American Ceramic Society (ACerS), pp. 373-380, Dencer, CO, April 23 – 26, 2007.

- “Numerical Estimates of the Compressive Strength of Impact-Damaged Sandwich Composites,” Y. Hwang, T.E. Lacy, *Journal of Composite Materials*, Vol. 41, No. 3, pp. 367-388, 2007.
- “Powders, Binders and Feedstocks for Powder Injection Molding,” R.M. German, *Powder Injection Molding International*, 2007, vol. 1, pp. 34-39.
- “Powder Injection Molded Ceramic Microsystems,” C. Wu, S.V. Atre, D. Whychell, S.J.Park, R.M. German, *Proceedings of 2007 IMAPS/ACerS 3rd International Conference and Exhibition on Ceramic Interconnect and Ceramic Microsystems Technologies (CICMT 2007)*, Co-Published by International Microelectronics and Packaging Society (IMAPS) and The American Ceramic Society (ACerS), pp. 22-28, Denver, CO, April 23 – 26, 2007.
- “Powder Injection Molding of Bi-Metal Components,” L.K. Tan, R. Baumgartner, R.M. German, *PIM Compilation IV: Applications and Management Issues*, Metal Powder Industries Federation, Princeton, NJ, 2007 (on CD).
- “Powder Processing,” R.M. German, *Materials Processing Handbook*, J.R. Groza, J.F. Shackelford, E.J. Lavernia, M.T. Powers (eds.), Taylor and Francis CRC Press, Boca Raton, FL, 2007, pp. 25.1-25.23.
- “Process Simulation of Powder Injection Molding. I. Identification of Significant Parameters during The Mold Filling Phase,” S.V. Atre, S.J. Park, R. Zauner, R.M. German, *Powder Metallurgy*, Vol. 50, No. 1, pp. 76-85, 2007.
- “Production Cost Sensitivity Analysis for Metal Powder Injection Molding,” R.M. German, D. Blaine, *PIM Compilation IV: Applications and Management Issues*, Metal Powder Industries Federation, Princeton, NJ, 2007 (on CD).
- “Reliability-Based Aircraft Structural Design Pays, Even with Limited Statistical Data,” E. Acar, R.T. Haftka, *Journal of Aircraft*, Vol. 44, No. 3, May-June 2007, pp. 812-823.
- “Sintering Simulation of PIM Stainless Steel,” D.C. Blaine, R.M. German, *The Science of Stainless Steels Produced by Powder Metallurgy and Metal Injection Molding*, C. Lall (ed.), Metal Powder Industries Federation, Princeton, NJ, 2007, pp. 333-344.
- “The Impact of Economic Batch Size on the Cost of Powder Injection Molded (PIM) Products,” R.M. German, *PIM Compilation IV: Applications and Management Issues*, Metal Powder Industries Federation, Princeton, NJ, 2007 (on CD).
- “Thermal Conductivity Evaluation of PIM Powders to Evaluate Predensification Sintering Phenomena,” C.E. Schlaefer, R.M. German, *PIM Compilation III: Secondary Processing and Material Properties*, Metal Powder Industries Federation, Princeton, NJ, 2007 (on CD).
- “Toz Metalurjisi ve Parçacıklı Malzeme İşlemleri,” R.M. German, Çeviri Editörleri: Süleyman Saritaş, Mehmet Türker, Nuri Durlu, Birinci Basım: Temmuz 2007 Ankara, © Her hakkı saklıdır 2007 Türk Toz Metalurjisi Derneği.

## **B. Presentations**

- “A Physically Motivated Uncertainty-Based Higher Order Plastically and Damage Model,” K. Solanki, M.F. Horstemeyer, Plasticity Conference, Alaska, June 2 – 6, 2007.
- “Atomistic Simulation of Activated Sintering of Tungsten by Additives,” J. Houze, S. Kim, S.J. Park, R.M. German, M.F. Horstemeyer, S.G. Kim, *PowderMet 2007*, Denver, CO, May 2007.

- “Atomistic Simulation for Activation Sintering Mechanism of Tungsten by Additives,” A. Moitra, S. Kim, S.G. Kim, S.J. Park, R.M. German, PowderMet 2007, Denver, CO, May 13 – 16, 2007.
- “Binder Optimization for the Production of Tungsten Feedstock in PIM,” T. Puz, R.M. German, J.J. Oakes, 2007 International Conference on Powder Metallurgy and Particulate Materials, Metal Powder Industries Federation, Denver, CO, May 14, 2007.
- “CAVS Extension’s Support of Mississippi Manufacturers,” C. Walden, Mississippi State University’s Economic Development Forum, Wise Center, Mississippi State, MS, May 17 – 18, 2007.
- “Constitutive Modeling of Compaction and Sintering for P/M Automotive Components,” Y. Hammi, L. Tucker, P.G. Allison, T.W. Stone, M.F. Horstemeyer, E.B. Marin, PowderMet 2007 Conference, Denver, CO, May 12 – 16, 2007.
- “Data Repository for Ad-Hoc Collaborations Horizontally Integrated with Transformation Services,” T.A. Haupt, A.K. Kalyanasundaram, G. Singh, I. Zhuk, 2007 World Congress in Computer Science, Computer Engineering & Applied Computing, Las Vegas, NV, June 2007.
- “Densification and Grain Growth During the Sintering of Nanoscale SiC,” M. Bothara, S.J. Park, R.M. German, T.S. Sudarshan, R. Radhakrishnan, S.V. Atre, 2007 NSTI Nanotechnology Conference and Trade Show, Santa Clara, CA, May 20 – 24, 2007.
- “Design & Fabrication of Ceramic Microarrays Using Powder Injection Molding,” S.V. Atre, C. Wu, S.J. Park, K. Simmons, 2007 NSTI Nanotechnology Conference and Trade Show, Santa Clara, CA, May 20 – 24, 2007.
- “Determination of Microstructure Property Relations for Performance and Design Optimization of the P/M Process,” P.G. Allison, Y. Hammi, M.F. Horstemeyer, PowderMet 2007 Conference, Denver, CO, May 12 – 16, 2007.
- “Development and Potential of Titanium Powder Injection Moulding,” R.M. German, invited keynote presentation, Metal Injection Moulding Workshop, PM Asia 2007 International Conference, Elsevier Metal Powder Report, Shanghai, China, April 3, 2007.
- “Development of the High Performance W-Cu Electrode,” Y.S. Kwon, S.T. Chung, S. Lee, J.W. Noh, S.J. Park, R.M. German, PowderMet 2007, Denver, CO, May 13 – 16, 2007.
- “Effect of Particle Shape and Fiber Length on Viscosity of Metal Composite Mixes,” F. Ahmad, R.M. German, 2007 International Conference on Powder Metallurgy and Particulate Materials, Metal Powder Industries Federation, Denver, CO, May 13, 2007.
- “Energy Management meeting Energy Plan Review,” V. Branch, Canton, MS, May 23, 2007.
- “Faurecia Layout Analysis May 7, 2007,” T.Hill, C.Walden, R. Sheely, Cleveland MS.
- “Flexural Moduli of Vapor-Grown Carbon Nanofiber/Wood Flour/Polypropylene Composites,” C.U. Pittman, Jr, J.L. Shi, J. Zhang, H. Toghiani, Y. Xue, 9<sup>th</sup> International Conference on Wood & Biofiber Plastic Composites, Madison, WI, May 21 – 23, 2007.
- “Gravitational Effects on Hardness in Liquid Phase Sintering,” L.G. Campbell, R.M. German, 2007 International Conference on Powder Metallurgy and Particulate Materials, Metal Powder Industries Federation, Denver, CO, May 16, 2007.
- “Gravitational Effects on Microstructures in Liquid Phase Sintering,” L.G. Campbell, R.M. German, 2007 International Conference on Powder Metallurgy and Particulate Materials, Metal Powder Industries Federation, Denver, CO, May 16, 2007.
- “Industry Education Partnership (IEP) Workshop,” R. Sheely, tour and CAVS Extension overview, June 20, 2007.

- “Innovations in Sintering - New Processes for Challenging Materials,” R.M. German, invited keynote presentation, PM Asia 2007 International Conference, Elsevier Metal Powder Report, Shanghai, China, April 3, 2007.
- “INROADS – Jackson, *Leadership Training*,” V. Branch, INROADS Regional mentorship, Jackson, MS, June 16, 2007.
- “InSite Suite project meeting with McNeely Plastic Products,” J.S. Calhoun, Clinton MS, April 4, 2007.
- “InSite Studio presentation to Microsoft Education Products,” J.S. Calhoun, K. McCarter, M. Riddle, Redmond, WA (via GoToMeeting.com), April 5, 2007.
- “InSite Suite presentation to Earthzine, <http://www.earthzine.org/> (via GoToMeeting.com),” J.S. Calhoun, D. Brown, April 12, 2007.
- “InSite Studio presentation and follow-on discussion with NAVAIR (Naval Air Systems Command, Orlando, FL) and NGSS (Northrop Grumman Ship Systems, Pascagoula, MS) (via GoToMeeting.com),” D. Brown, K. McCarter, J.S. Calhoun, April 17, 2007.
- “InSite Studio presentation to Neonatal Development Care,” J. S. Calhoun, Hattiesburg, MS (via GoToMeeting.com), May 3, 2007.
- “InSite Studio presentation to Craig Miller & Barrett Koger – Wolter Skluwer Publishing,” J.S. Calhoun, The Netherlands, (via GoToMeeting.com), May 7, 2007.
- “InSite Studio presentation to Kansas USD 242,” J.S. Calhoun, Valley Center, KS (via GoToMeeting.com), May 9, 2007.
- “InSite Studio presentation to Science, Business, and Education, Inc.,” J.S. Calhoun, Veradale, WA, (via GoToMeeting.com), May 11, 2007.
- “InSite Suite booth exhibit at World’s Best Technology Conference,” J.S. Calhoun, K. McCarter, M. Riddle, Arlington, TX, May 16, 2007.
- “InSite Suite 2.0 Workshop at Pearl River Community College,” D. Brown, M. Riddle, Poplarville, MS, June 25, 2007.
- “InSite Suite 2.0 Workshop for IEP Teachers,” D. Brown, M. Riddle, CAVS, Starkville, MS, June 27, 2007.
- “Internal State Variable Modeling of Structure-Property Relationships in Deformed Microstructures,” M.F. Horstemeyer, K. Solanki, The Minerals, Metals, and Materials Society, 2007 TMS Annual Meeting & Exhibition, Orlando, FL, February 25 – March 1, 2007.
- “Law Enforcement Research Initiative, D. Carruth, *Mississippi Association of Chiefs of Police Summer Conference*, Biloxi, MS, 2007.
- “Linking Homogenization and Densification in Tungsten Heavy Alloys,” G. Sethi, S.J. Park, J.L. Johnson, R.M. German, PowderMet 2007, Denver, CO, May 13 – 16, 2007.
- “Master Decomposition Curve of Nanoparticulate-Filled Polymer,” O.P. Valmika Nathan, S.V. Atre, S.J. Park, J. Simonsen, PowderMet 2007, Denver, CO, May 13 – 16, 2007.
- “Master Sintering Curve Analysis of Liquid Phase Sintered, Nanoscale Silicon Carbide Fabricated in a Plasma Pressure Compaction System,” S.V. Atre, M. Bothara, S.J. Park, T. Sudershan, P. Radhakrisnan, R.M. German, 2007 International Conference on Powder Metallurgy and Particulate Materials, Metal Powder Industries Federation, Denver, CO, May 14, 2007.
- “Mechanical and Physical Properties of Noval Scandium Containing Mixed Powder Sintered Aluminum,” F. Findik, K. Thompson, A. Antonyraj, S.J. Park, R.M. German, PowderMet 2007, Denver, CO, May 13 – 16, 2007.

- “Micromechanical Simulation of Cyclic Plasticity at Inclusion Particles with Pre-Over Straining,” Y. Xue, A. Wright, K. Solanki, M.F. Horstemeyer, D.L. McDowell, 48<sup>th</sup> AAIA Structural Dynamics and Materials Conference, Waikiki, HI, April 23 – 26, 2007.
- “Micromechanical Simulation on Hygro-Mechanical Properties of Woodfiber-Reinforced Plastic Composites,” K. Wang, Y. Xue, H. Zhang, M.F. Horstemeyer, 9<sup>th</sup> International Conference on Wood & Biofiber Plastic Composites, Madison, WI, May 21 – 23, 2007.
- “Microstructural-Property Characterization of a Dodge Neon Passenger Car,” I. Carrasquel, M.F. Horstemeyer, K. Solanki, C. Burton, Escape Conference, GSA (Graduate Student Association) Symposium, MSU, March 30, 2007.
- “Model-Based Decision Making Through Simulation-Optimization Decision-Support Systems (DSS),” T. Hill, A. Greenwood, Flexsimposium, Park City, UT, May 15, 2007.
- “Modeling of Microstructure Evolution during LENS<sup>TM</sup> Deposition,” L. Wang, H. El Kadiri, S.D. Felicelli, P.T. Wang, M.F. Horstemeyer, SPIE International Defense and Security Symposium, Modeling and Simulation for Military Operations II, Orlando, FL, April 9 – 13, 2007.
- “MRAP Manufacturing Process Plan for West Point Facility,” G. Dennis, to John Brennan, Director of Manufacturing Engineering and Chris Schneider, Director of Product Introduction for International Truck & Engine, June 4 – 5, 2007.
- “MRAP Manufacturing Process Plan for West Point Facility,” G. Dennis, to Colonel Gallagher, Commander Huntsville Region of the Defense Contract Management Agency, West Point, MS, June 28, 2007.
- “Multiscale Modeling – Corvette Engine Cradle,” D. Oglesby, Visiting High School Teachers, CAVS, June 27, 2007.
- “Nanoscale SiC Sintered Structures for Power Electronics Packaging and Advanced Microsystems,” M. Bothara, S.V. Atre, S.J. Park, R.M. German, Ceramic Interconnect and Ceramic Microsystems Technologies (CICMT 2007), Denver, CO, April 23 – 26, 2007.
- “Novel Methodology to Quantify Tool Wear in Powder Metallurgy,” J.K. Thompson, S.J. Park, R.M. German, F. Findik, A. Antonyraj, PowderMet 2007, Denver, CO, May 13 – 16, 2007.
- “Numerical Investigations of Mixing for Powder Injection Molding Feedstock,” T.G. Kang, S.J. Park, S.V. Atre, R.M. German, PowderMet 2007, Denver, CO, May 13 – 16, 2007.
- “Optimal Choice of Knockdown Factors from Structural Tests,” E. Acar, J. An, R.T. Haftka, N.H. Kim, P.G. Ifju, T.F. Johnson, 48th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Waikiki, HI, April 2007.
- “Overview of CAVS Extension,” C. Walden, R. Sheely, Industry Education Partnership a program offering of the Center for Math, Science, and Technology, hosted at CAVS Extension, June 13, 2007.
- “Overview of Metamodeling- and Reliability-Based Optimization” E. Acar, CAVS CMD Meeting, Mississippi State University, MS, May 2007.
- “Overview of Powder Metallurgy,” R.M. German, NSF Teachers Workshop at CAVS, June 27, 2007.
- “Powder Infused Putty Materials and Their Possible Applications,” T.E. Puz, A. Antonyraj, M.T. Tucker, R.M. German, J.J. Oakes, S.J. Caldwell, Weird PM: Next Generation Materials, processes and Applications, 2007 International Conference on Powder Metallurgy and Particulate Materials, Metal Powder Industries Federation, Denver, CO, May 15, 2007.

- “Powder Injection Molded Ceramic Microsystems,” S.V. Atre, S.J. Park, R.M. German, Ceramic Interconnect and Ceramic Microsystems Technologies (CICMT 2007), Denver, CO, April 23 – 26, 2007.
- “Radar Power Technology Annual Program Review,” G.M. Molen, J. Gafford, A. Card, T. Stewart, CAVS, April 26, 2007.
- “RBDO of Automotive Structures for Improved Crashworthiness,” M. Rais-Rohani, K. Solanki, E. Acar, C. Eamon, TMS 2007 Annual Meeting and Exhibition in Orlando, FL, February 25 – March 1, 2007.
- “Reliability-Based Structural Design Using Approximate Probability Distribution,” E. Acar, S. Kumar, R.J. Pippy, N.H. Kim, R.T. Haftka, 48th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Waikiki, HI, April 2007.
- “Reliability-Based Structural Optimization using a Multiscale Material Model,” K. Solanki, E. Acar, M. Rais-Rohani, C. Eamon, M.F. Horstemeyer, 48th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Waikiki, HI, April 2007.
- “Reliability of Mechanistic Multistage Fatigue Model for Damage and Life Estimations,” Y. Xue, K. Solanki, G. Steele, M.F. Horstemeyer, J. Newman, Jr., 9<sup>th</sup> AIAA Non-deterministic Approaches Conferences, Waikiki, HI, April 23 – 26, 2007.
- “Self-Similar Aspects of Particulate Materials Processing,” R.M. German, 2007 International Conference on Powder Metallurgy and Particulate Materials, Metal Powder Industries Federation, Denver, CO, May 16, 2007.
- “Simulation of Binder-Powder Separation in Powder Injection Molding,” S. Kim, S.J. Park, S.V. Atre, R.M. German, PowderMet 2007, Denver, CO, May 13 – 16, 2007.
- “S.T.E.P. 2008,” V. Branch, Mississippi Department of Education, Program changes for 2008, June 15, 2007.
- “S.T.E.P. Graduation 2007,” V. Branch, Nissan Training Center, Nissan sponsored ceremony, Canton, MS, May 8, 2007.
- “Statistical Tensile Properties of Kenaf Fibers and Composites,” Y. Xue, Y. Du, S. Elder, D. Shame, M.F. Horstemeyer, J. Zhang, 9<sup>th</sup> International Conference on Wood & Biofiber Plastic Composites, Madison, WI, May 21 – 23, 2007.
- “Study of Liquid-Phase Sintered, Nanosized Silicon Carbide Fabricated in a Plasma Pressure Compaction System,” M. Bothara, S.V. Atre, S.J. Park, R.M. German, T.S. Sudarshan, R. Radhakrishnan, PowderMet 2007, Denver, CO, May 13 – 16, 2007.
- “Thermal Expansion and Viscoelastic Properties of Sintered Porous Compact,” A. Antonyraj, S.J. Park, R.M. German, PowderMet 2007, Denver, CO, May 13 – 16, 2007.
- “Traffic Flow and Dock Analysis Final Presentation,” T. Hill, Griffin and International Truck and Engine, June 20, 2007,
- “Unidirectional Natural Fiber-Polyolefin Laminates: Thermal and Mechanical Properties,” S. Lee, S. Shi, Y. Xue, 61<sup>st</sup> International Convention, Forest Products Society, Knoxville, TN, June 10 – 13, 2007.

**C. Grant and Proposals**

***Submitted Proposals Awarded – Totaling \$1,600,626.61***

- “CNIC Public Safety Regional AT Plan,” D. Coltharp, Sentel Corporation, \$51,910.
- “Collaborative Proposal: Bridging and Coupling Particle Continuum Length-Scale Mechanics for Simulating Deformation and Flow Density,” Y. Hammi, National Science Foundation, \$53,129.
- “FSSIM: Task 1,2, and 3: Tools for Quantitative Analysis of the Simulation Results,” T. Haupt, NRL, \$50,000.
- “General Dynamics Robotics Systems,” M.F. Horstemeyer, General Dynamics Robotics Systems, \$400,438.
- “Performance Evaluation of Propane Injection for Diesel Engine (mobile application),” Z. Rowland, Hypercomp Engineering, \$75,000.
- “Phase II Process Improvement Support at Faurecia in Cleveland, MS,” C. Walden, Faurecia, \$17,500.
- “Phase II Process Improvement Support at Faurecia in Cleveland, MS,” C. Walden, South Delta Planning and Development District, \$17,500.
- “Run-Flat Modeling and Simulation Project,” Z. Rowland, Amcom Express, \$924,979.61.
- “Taxonomy Based Assessment Methodology: Pilot Case Studies of MS Manufacturers Impacted by Hurricane Katrina,” C. Walden, Mississippi Technology Alliance, \$10,170.

**D. Participation**

- A. McAlpin, hosted Robert F. Kennedy Jr., who visited the Challenge X vehicle, April 2007.
- A. McAlpin, visited Immanuel Christian Center for Education to present to two classes about Challenge X, May 2007.
- A. McAlpin, visited Ward-Stewart Elementary School and gave 7 presentations to 13 classes of students about Challenge X, approximately 350 students total, May 2007.
- B. Kirkland, escorted Joe Fanguy, Office of Tech Transfer, to meet with Lonnie Coffey, Consultant to TVA, in Knoxville, TN. The purpose of the meeting was to discuss the marketing aspects of the patent (Boiler Optimization for Fossil Fuel Plants). We established a recommended marketing strategy for the Office of Tech Transfer to follow, April 3, 2007.
- B. Kirkland, assisted the CMD Group with an Industrial Day in support of the newly proposed Safety Simulation Center to be funded as an Engineering Research Center by NSF. Solicited industrial partners in support of the proposed center, April 3 – 5, 2007.
- B. Kirkland, assisted with the exhibit for the Automotive R&D Alliance at the Automotive News Auto Manufacturing Conference in Nashville, TN. A public announcement was made to the Automotive Industry regarding the formation of the Alliance and its current members. CAVS has been the leading organization on behalf of the Office of Research at MSU in forming the alliance, May 15 – 18, 2007.
- B. Kirkland, assisted in transferring the funds for four NAC projects through the AMCOM Express Purchasing Contract. The transfer of funds was completed at the end of May, May 23, 2007.

- B. Kirkland, assisted and supported the MSU Challenge X Team in the competition events at GM's Proving Grounds in Milford, MI. The MSU team won first place in the final competition. This accomplishment has provided a tremendous amount of publicity for the team, CAVS and the University. The team won approximately \$33,000 in prize money which will go to support the program as it continues into the additional fourth year. The additional year was added to provide publicity for the universities and the program sponsors, May 30 – June 8, 2007.
- B. Kirkland, arranged and participated with Fred Williams, Director of the Center for Safety and Survivability within the Dept of the Navy to present CAVS/ MSU with a certificate of accomplishment. The certificate recognized CAVS' Computing Group for developing the first fully accredited and validated computer simulation model for Smoke and Fire Spread within ships. In addition, NRL funded the continued development of the model totaling \$129,393 for 2007. Additional funding is anticipated to follow, June 19, 2007.
- B. Kirkland, contacted Mr. Ron Ashburn, Executive Director for the Association for Iron and Steel Technologies (AIST). The foundation provides annual grants to universities that support advanced steelmaking technologies in an attempt to attract more students into the industry. The foundation is currently reviewing information provided by CAVS in order to make a decision in July, June 20, 2007.
- B. Kirkland, met with TeleSouth Communications in Jackson, MS to plan a live interview about CAVS and Challenge X on "Super Talk Radio." This interview will be broadcasted over the entire state of Mississippi and will be an effective way to inform the state of the accomplishments of the Challenge X Team as well as CAVS' activities, June 26, 2007.
- B. Kirkland, met with the Mississippi Development Authority (MDA) to discuss joint marketing efforts in order to more effectively promote the State to the automotive industry. CAVS and MDA will be working together more closely and jointly in the future. CAVS has been asked to participate in a trade delegation to Japan on October 14-19 to meet with various auto part suppliers. In addition, MDA donated \$5,000 for the continued support of the Challenge X Program at MSU, June 27, 2007.
- B. Kirkland, was asked to serve on the Mississippi Transportation Coalition in order to assist in the development of a statewide transportation plan. This coalition is being directed by Ms. Jan Larsen of Global Strategies Inc. for the state, June 29, 2007.
- C. Walden, T. Hill, VT Halter Project Kickoff, Pascagoula, MS, June 26, 2007.
- C. Walden, R. Sheely, T. Hill, Conducted pilot of Taxonomy Based Assessment Methodology, Diversified Technology Inc., Ridgeland, MS, May 15 – June 30, 2007
- C. Walden, L. Dalton, outreach visit to Tower Automotive, Meridian, MS, June 8, 2007
- C. Walden, Outreach visit to AZZ Calvert, Richland, MS, June 21, 2007
- C. Walden, R. Sheely, outreach visit to Gibson Steel, Meridian, MS, June 28, 2007.
- G. Dennis, invited to attend the June 4, 2007 celebration and introduction of IMG's MRAP vehicle - MAXXPRO™.
- G.M. Molen, P. Martin, visited with UQM, Technologies, Denver, CO, May 9 – 10, 2007.
- G.M. Molen, A. Card, visited with Diversified Technologies Inc., Jackson, MS, June 13, 2007.
- M. Rais-Rohani, gave presentation on research status under Task 4 of DOE at the 1<sup>st</sup> semi-annual meeting of DOE/SRCLID with Aaron Yocum.
- M. Rais-Rohani, met with Jim Ryan of MSC Software to discuss details related to cost share agreement under the DOE/SRCLID project and the integration of various MSC-developed software into engineering education at MSU.

- M. Rais-Rohani, held discussions with representatives from The Boeing Company and Alpha STAR Corporation in search of cost share agreement for the DOE/SRCLID project as well as research collaboration.
- M. Rais-Rohani, reviewed and ranked a collection of papers for the annual BCOE best research paper award.
- M. Rais-Rohani, and all other members of DOE Task 4 took a trip to Canton, MS to give a presentation on research conducted under simulation based design optimization, to tour the stamping operation at Nissan, and to have a meeting and discussion with the stamping engineers from Nissan and Tower Automotive.
- M. Rais-Rohani, and members of DOE Task 4 took a trip to the Tower Automotive stamping facility in Meridian to learn more about the stamping process of automotive frame structures.
- M. Rais-Rohani, invited Dr. Frank Abdi of Alpha STAR and Dr. Bob Farahmand of Boeing to come to MSU to give seminars and hold meetings with ASE, ME, and CAVS professors/researchers, June 18, 2007.
- M. Rais-Rohani, J. Ryan of MSC software, organized an MSC/NASTRAN-PATRAN training course to be conducted at CAVS during the week of July 30 – August 3, 2007.
- N. Littell, A. McAlpin, R. German, J. McGinley, hosted The Center for Science, Mathematics & Technology, conducted teacher workshop funded through the National Science Foundation, June 2007.
- S.G. Kim, discussions with industry representatives in search of cost share agreement on DOE/SRCLID project, including POSCO, Inc., SAC Co., and Hyundai Motor Co.
- S.G. Kim, obtained the in-kind donation of \$57,600 over two years from SAC, Co.
- S.G. Kim, secured official agreement from POSCO, Inc. for in-kind donation of \$187,200 over two years.
- S.G. Kim, had many discussions with industry representatives in search of cost share agreement on DOE/SRCLID project, including POSCO, Inc., SAC Co., and Hyundai Motor Co.
- S.J. Park, arranged Dr. Sundar Atre (Oregon State University) to visit CAVS from March 28 – April 2, 2007 (presentation, proposal, and papers).
- S.J. Park, arranged Drs. Ho-Yong Lee and An-Ho Lee (Korea Railroad Research Institute, Korea) to visit CAVS on May 3, 2007 (collaboration).
- S.J. Park, arranged Dr. Hideshi Miura (Kyushu University, Japan) to visit CAVS from May 10 – 13, 2007 (presentation, collaboration).
- S.J. Park, participation in PowderMet 2007, Denver, CO, from May 13 – 17, 2007; 4 talks, meeting with University of Texas, Pan America (Prof. Sukyoung Ahn), Oregon State University (Prof. Sundar Atre), CetaTech (Dr. Young-Sam Kwon), Stryker (Mr. Don Finney), Alldyne (Dr. John Johnson), Chemet (Mr. Jeff King), Firth Sterling (Dr. Prakash Mirchandani), and IAP (Dr. Bhanu Chelluri).

- S.J. Park, trip to Korea, with Profs. Mark Horstemeyer and Seongjai Kim, 4 talks and 2 translations, meeting with Myung-Ji University (Prof. Steven Lee), Hanyang University (Prof. Jae-Sung Lee, Director of Academy-Industry-Government Institute Cluster), Bestner Inc. (Dr. Tae-Sik Yoon, CEO), Hyundai Motor Co (Dr. Mun-Sik Kwon, Vice President), SungKyunKwan University (Prof. Myung-Won Suh), Korea University, (Prof. Eunil Lee), Yunsei University (Prof. Kye-Hyun Chung), CetaTech Inc. (Dr. Young-Sam Kwon, CEO), GyungSang National University (Prof. Woong-Ryul Hwang), Sung-Sil University (Prof. Won-Mo Kim), POSTECH (Profs. Tai-Hyun Kwon, Woon-Bong Hwang, Yong-Hun Kwon, Byung-Joo Lee), POSCO (Dr. Jae-Gon Lee), Handong Global University (Dr. Young-Gil Kim, President), KITECH (Dr. Chul-Jin Hwang), and Joong-Ang University (Prof. Dong-Sung Lee), May 27 – June 6, 2007.
- S.J. Park, invited to visit Oregon State University by Prof. Sundar Atre, to guide two students (Master Sintering Curves, Master Decomposition Curves, PIMsolver, and PMSolver), to write paper and proposal, and to meet Prof. Shiwoo Lee, June 14 – 17, 2007.
- T.E. Lacy, Y. Hwang, K. Solanki - Trip to NTCNA. Project Autoglass, project final review meeting. Nissan Technical Center of North America, Detroit, MI, March 21, 2007.
- T. Hill, attended Flexsim Advanced Training, Ogden, UT, May 16 – 17, 2007.
- T. Hill, R. Sheely, C. Walden, Intermediate Faurecia Layout Analysis Model Review Presentation, Cleveland, MS, April 12, 2007.
- T. Hill, R. Sheely, C. Walden, Final Faurecia Layout Analysis Model Review Presentation, Cleveland, MS, May 7, 2007.
- V. Branch, attended Madison Career & Tech Banquet, Madison County, May 3, 2007.
- V. Branch, participated in AGC Corporate, Tier 1 survey, April 26, 2007.
- V. Branch, participated in Mississippi Department of Education, Robotics Competition 2008, April 26, 2007.

### ***E. Recognition***

- A. McAlpin, received first place for Challenge X Overall Outstanding Outreach program, as well as Best Media/PR program, June 2007.
- L. Wang, NSF Fellowship (2007): Summer Institute on Foundational Interrogation Modalities and Novel Applications Forged at the Intersection of Micro/Nanotechnology and Medicine at UCLA, July 16 – 19, 2007.
- N. Littell, appointed to be Track Executive for COE University, June 2007.
- P.M. Gullett, 2007 Bagley College of Engineering, Faculty Research Award.
- R. Sheely, L. Simmons, T. Hill, completed the Institutional Review Board (IRB) training for “experimentation with human subjects” and received certification, April 24, 2007.
- R. Sheely, appointed chair of the newly formed Development Committee of SEAB, a standing committee that will work with the College of Business and Industry (COBI) Development Officer and Dean to assist in fund raising and related projects. Presented the committee’s plans to date with the new incoming Dean of COBI, Lynne Richardson, May 15, 2007.
- V. Branch, received letter of recognition from Canton School District, S.T.E.P., May 2007.
- V. Branch, received letter of recognition from the MS Department of Education, S.T.E.P., May 2007.
- V. Branch, received letter of recognition from Leake County Schools, S.T.E.P., May 2007.

**F. Service**

- C. Eamon, served on the national ASCE-SEI Committee on Structural Safety, and on the national TRB Committees A2C03/AFF30, Concrete Bridges, and A2K05, Modeling Techniques.
- C. Eamon, completed a FEA consulting project for USGS at Stennis Space Center.
- C. Walden, R. Sheely, V. Branch, L. Simmons, attended multiple meetings with engineers and managers from AGC Automotive during late April 2007 to lend assistance in finding a solution to a bonding failure on glass window panels that they manufacture for Nissan vehicles.
- C. Walden, R. Sheely, T. Hill, J. Sellers, attended the S.T.E.P. Graduation Ceremony at the Nissan plant, Canton, MS, May 8, 2007.
- C. Walden, R. Sheely, L. Simmons, participated in a conference Call with AGC engineers along with Paul Wang and Estaban Marin at CAVS Research to discuss a possible FEA project relating to a new design for AGC's glass window panel. FEA project is projected to be included as a qualified FEA project in the CAVS Extension SBA Grant contract.
- G.M. Molen, held committee chair planning meeting for the 2008 IEEE International Power Modulator Conference (IPMC), June 20, 2007, then attended the IPMC ExCom meeting, June 21, 2007. These meetings were held in conjunction with the 2007 IEEE Pulsed Power & Plasma Science Conference and 34<sup>th</sup> Annual International Conference on Plasma Science, Albuquerque, NM, June 17 – 22, 2007.
- H. Rhee, served as a reviewer for a journal article in *Journal of Materials Science and Engineering A*.
- M. Rais-Rohani, served on the judging panel for the Jefferson Goblet Best Student Paper Award at the 48th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Waikiki, HI, April 23 – 26, 2007.
- M. Rais-Rohani, provided a peer review for the *AIAA Journal*.
- N. Littell, contracted by Aurora Flight Sciences to provide CATIA V5 training in Manassas VA, June 2007.
- N. Littell, hosted and mentored Nissan funded MSMS group during the first week of their visit, June 2007
- P.M. Gullett, Chair, Solid Mechanics Working Group.
- S.G. Kim, reviewer for:
- (a) Physical Review Letters
  - (b) Physical Review B
  - (c) Journal of Physics and Chemistry of Solids
  - (d) Journal of Alloys and Compounds
  - (e) NanoLetters
  - (f) Nanoscale Research Letters
  - (g) Surface Science
- R.L. Carino, created/refined the following software tools to support CMD researchers:
- DMGFIT – graphical interface for fitting the BCJ and damage models
  - EMMifit – graphical interface for fitting the EMMI model
  - DANNmodel – graphical interface to an artificial neural network model for dislocation
  - MSFconst – fitting tool for determining constants in the multistage fatigue model with constant loading
  - ImageAnalyzer GUI – graphical interface to a program for defects analysis of images

- R. Sheely, D. Norman, attended the Southern BioProducts and Renewable Energy Conference at Golden Moon Casino and Resort in Philadelphia, MS on May 16 – 18, 2007. Ken Peterson, CEO and Founder of 2 Management of Mississippi, LLC, the projected sponsor of the proposed “Biofuels” project was in attendance at the conference.
- R. Sheely, continuing PI responsibility for the \$509,804 portion of the SBA Grant that has been awarded to CAVS Extension. The project is under going major revisions to accommodate the reorganization of CAVS Extension into the Bagley College of Engineering.
- R. Sheely, attended the CIT.ms Board Meeting, Jackson, MS, April 27, 2007.
- R. Sheely, C. Walden, D. Norman, met with Tony Jeff and Sumesh Arora of the Mississippi Technology Alliance (MTA) to discuss MTA’s new \$4M R&D Fund and the MTA Strategic Biomass Initiative, May 8, 2007.
- R. Sheely, attended contract planning meeting with Ken Peterson, projected sponsor for the upcoming “Biofuels” project, at CAVS Extension, May 10, 2007.
- R. Sheely, attended the CIT.ms Membership Meeting, Pat Busby, President of DTI, was program speaker, Jackson, MS, May 24, 2007.
- R. Sheely, C. Walden, J. Sellers, attended the Award Ceremony for the MRAP vehicle at International Military and Government’s (IM&G) facility in West Point, MS, June 4, 2007. Governor Haley Barbour and Congressman Roger Wicker were among the speakers.
- R. Sheely, C. Walden, attended the Mississippi Automotive Manufacturer’s Association (MAMA) meeting, as the guest of John Turner, Director of Economic Development at Entergy Mississippi, Inc., Nissan facility, Canton, MS, June 7, 2007. Made request for MSU to join MAMA.
- R. Sheely, provided \$250 Hole Sponsorship for a fund raising Golf Tournament conducted by the Young Alumni Advisory Group (YAAG) of COBI at Deerfield Country Club Golf Course, Gluckstadt, MS, June 30, 2007.
- S. Groh, reviewed two articles for Modeling and Simulations in Materials Science and Engineering (MSME).
- S.G. Kim, consultant for Become, Inc., Mountain View, CA.
- S.J. Park, master degree defense committee for James Kyle Thompson, June 25, 2007.

***G. Other Activities***

- B. Kirkland, update of the lobby video was completed.
- B. Kirkland, initiated and continue to assist with the updating of marketing material for CAVS.
- B. Kirkland, gave 9 tours consisting of 79 visitors.
- B. Kirkland, approximately 29 media releases about CAVS and Challenge X for the 4th Quarter. These releases are the only ones that could be verified. CAVS was the feature article in the April issues of Automotive Industries and Advanced Material Processes. There were additional advertisements through the support of utility companies as well as the Automotive R&D Alliance.

### Challenge X Competition – Year 3

- 1<sup>st</sup> Place Overall
- 1<sup>st</sup> Place – King of the Hill
- 1<sup>st</sup> Place – Best Acceleration
- 1<sup>st</sup> Place – Best AVL DRIVE Quality
- 1<sup>st</sup> Place – Best On-Road Energy Use
- 1<sup>st</sup> Place – Best Static Consumer Acceptability
- 1<sup>st</sup> Place – Best Realization of XVDP
- 1<sup>st</sup> Place – Best Engineering and Fabrication Workmanship
- 1<sup>st</sup> Place – Outstanding Outreach
- 1<sup>st</sup> Place – Best Media Relations
- Outstanding Incoming Faculty Advisor – Marshall Molen
- D. Brown, InSite Server Training, posted on public InSite Server site and distributed with installations, created June 22, 2007.
- D. Norman, CAVS Extension training/workshops for approximately 315 people.
- D. Oglesby, K. Crawford, C. Whitt, K. Walp, M. Young, R. Lewis, S. Phillips, B. Christian, G. M. Molen, “The Mississippi State University’s Parallel Through-the-Road Diesel Electric Hybrid Equinox,” 2007 Challenge X Spring Technical Report, April 2007.
- D. Oglesby, interview with Bloomberg TV about MSU Challenge X, New York, June 12, 2007.
- D. Oglesby, C. Whitt, “Challenge X Progress Report #3,” May 3, 2007.
- D. Oglesby, participated in 2007 Challenge X Competition, GM Proving Grounds, Milford, MI, May 30 – June 8, 2007.
- E. Acar, “Tradeoff of Uncertainty Reduction Mechanisms for Reducing Weight of Composite Laminates,” CAVS Report, MSU.CAVS.CMD.2007-J0003, June 2007.
- L. Wang, S. Felicelli, P. Wang, M.F. Horstemeyer, “Thermal Modeling and Experimental Validation in the LENS™ Process,” CAVS Internal Report, MSU.CAVS.CMD.2007-R0021.
- M. Denton, gave tour to Dr. Warkentin's Database Class, April 2007.
- M. Riddle, InSite Studio Training, distributed on CD-ROM, created June 26, 2007.
- N. Littell, gave tour to Dr. Warkingtons BIS Class, April 2007.
- P. Martin, attended the International Conference on Compound Semi-Conductor Manufacturing Technology, Austin, TX, May 14 – 18, 2007.
- P. Martin, M. Mazzola, L. Cheng, final Report for Air Force Research Laboratory Contract F33615-01-D-2103 Delivery Orders #4 – 6 submitted on June 21, 2007. Delivery Order 4 – Silicon Carbide for Static Thermal Energy Converters, Delivery Order 5 – 600/1200 V, 20 A, 1 MHz Integrated Schottky Diode and Vertical SiC JFET Development, Delivery Order 6 – SiC High Voltage Converters, 600 – 1200 Volt, 25 Amp Integrated VJFET Prototyping and Qualification.
- P.M. Gullett, “High Rate Progress Report,” MSU.CAVS.CMD 2007-R00012 NAC.
- S.J. Park, invited proposal review of “dynamic modeling and analysis of the sintering of fine powders” from Australian Research Council, April 17, 2007.
- Y. Xue, gave 20-minute presentation on fatigue modeling at CAVS at Industrial Partnership meeting, April 4, 2007.
- Y. Xue, gave one hour-presentation at Pittman’s Chemistry discussion group on micromechanical simulation of short fiber composites, May 11, 2007.
- Y. Xue, reviewed papers for *International Journal of Fatigue, Composite B: Engineering, Material Letters*.
- Z. Rowland, gave tour to EADS, May 2007.