

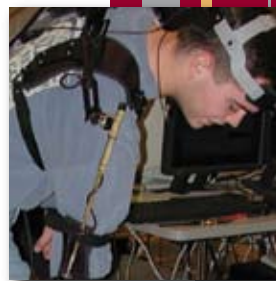
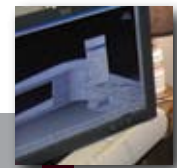
Mississippi State UNIVERSITY



CENTER FOR ADVANCED VEHICULAR SYSTEMS

MISSISSIPPI STATE UNIVERSITY

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HPC²



MISSION

The mission of CAVS is to develop the people, concepts and knowledge for future transportation and manufacturing needs. This includes research and development (R&D) efforts that support manufacturing, design, innovations, and cost reductions related to the production of future automotive vehicles. These vehicles will have superior quality, advanced features, lower production costs, and shorter development times. At the same time, broad manufacturing and design gains arise from CAVS via leveraging from its underlying technologies. Thus, the CAVS mission includes engineering extension, education, and workforce training for industry.

STRATEGY FOR ECONOMIC IMPACT

needs and priorities, opportunities for CAVS to provide added value, and opportunities to build on the state's investment by securing external funding related to broadening the reach of technologies.

The CAVS Extension Center in Canton provides direct engineering support for Nissan and its major suppliers; engineering extension work for Mississippi's manufacturers; workforce development, education, and training; and business systems and information technologies.

CAVS technologies are not limited to the automotive industry but are broadly applicable to all industrial sectors. CAVS research, development, and extension support the university and state goal of increased competitiveness and more jobs for Mississippians. By developing superior computational and information technologies the center aims to provide the state with a strong competitive advantage over its neighbors.

One measure of CAVS' economic success is the number of engineers hired in Mississippi. A more relevant measure is the number of nonprofessional new hires by industrial companies. Historically, employment sectors with more limited technical skills are more sensitive to global competition.

Therefore, it is the desire of CAVS to increase the number of nonprofessional hired to directly strengthen Mississippi's economic potential.



APPLYING RESEARCH TO STRATEGIC NEEDS

CAVS is organized into several major research areas: Computational Manufacturing and Design, Human and Systems Engineering, and Alternative Power.

The Computational Manufacturing and Design (CMD) thrust's mission is to reduce product development time and increase product performance life in a virtual transportation system. CMD aims to optimize physical design, manufacturing,



and life cycle of lightweight vehicles (e.g. made of aluminum, titanium, and magnesium) by developing and using multi-scale modeling, simulation, and validation tools. The thrust is focusing on multi-scale modeling of several manufacturing methods, including hydroforming, stamping, powder metallurgy, and machining; crashworthiness simulations for Dodge, Nissan, Ford and Chrysler vehicles; and developing computational codes based on atomic and chemical structures with the goal of producing lighter but stronger components.

The Human Systems and Engineering (HSE) thrust's focus is on enhancing the human performance in product and process design, and the user's experience in the automotive industry. This requires research in areas such as ergonomics, production system modeling, advanced electronic learning technologies, integrated design systems, electronic systems, and communication technologies. The thrust is subdivided into concentrated research groups including: Human Factors and Ergonomics, Advanced Learning Technologies, Cooperative Computing, Intelligent Electronic Systems and Product Lifecycle Management.

The Alternative Power (AP) thrust focuses on advanced power train technologies to achieve higher fuel efficiencies using renewable energy while maintaining a cleaner environment. CAVS research in bio-diesel hybrid and fuel cell power trains includes the shared technologies of electric motor propulsion, power electronic switching, and electronic control systems. Modeling and simulation efforts support the design of fuel cell and hybrid systems and their integration into the vehicle. Related efforts within the center involve development of dual-use electric power.



CAVS EXTENSION

The CAVS Extension Center in Canton focuses on providing direct support to Mississippi's automotive manufacturers, Tier-1 suppliers, and other Mississippi manufacturers, as well as assisting with improvements in productivity, manufacturing quality, profitability and product safety. Exciting new technologies being developed at MSU in Multi-Scale Virtual Design and Manufacturing (MVDM) are applied to enhance and improve companies' product engineering and design. MVDM can enable manufacturers to optimize materials, mechanics, and manufacturing processes.

Additionally, the real world experiences of CAVS Extension managers and engineers, along with developments at MSU in numerical modeling and simulations of production systems and transportation and logistics operations, combine to assist Mississippi companies in improving individual plant operations and employing effective supply chain management concepts.

SIGNIFICANT ACCOMPLISHMENTS FOR FY2005

Research and Development

- Developed Computational Training System and established collaboration with community colleges regarding workforce development and training
- Demonstrated full vehicle crashworthiness optimization within 36-hour cycle
- Acquired Human Motion Capture Systems and integrated them with ergonomics analysis software system



- Completed automotive research project for alternative vehicle control
- Finished designing and building fuel cell test-beds
- Developed curriculum for advanced computation tools to help propagate these skills throughout the state
- Developed and released to the Naval Research lab the simulation environment for on-board fire and smoke propagation model.

Extension

- Performed significant industrial outreach supporting the growth of the state's automotive industry by completing 31 partnership projects impacting 24 manufacturers in Mississippi
- Featured training in best practices such as Six Sigma methodology for quality improvement
- Entered partnership with Homeland Security and the American Trucking Association's Highway Watch Project, which addresses national safety and security through securing the nation's transportation infrastructure
- Secured state-of-the-art robotics welding, testing, and measuring equipment enabling Mississippi companies to compete globally.



CONTACTS

For more information about the research conducted at CAVS and how it can help your company become more competitive, please see our website: <http://www.cavs.msstate.edu>. To schedule tours, please contact Bob Kirkland.

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STUDENTS & FACULTY

Number of undergraduate students: 43
Number of graduate (MS) students: 33
Number of graduate (Ph.D.) students: 15
Number of academic faculty: 25
Number of research professionals: 37
Number of post doctoral researchers: 5

CAVS faculty and students represent 11 different departments, including aerospace engineering, civil engineering, electrical and computer engineering, industrial engineering, and mechanical engineering.

- CAVS researchers have submitted a total of 45 proposals, totaling \$46.7 million. These proposals were submitted by 17 PIs to 20 agencies and institutions.
- CAVS has received 26 awards for a total of \$7.3 million.
- Of the awards that CAVS received, 42 percent came from federal sources and 58 percent came from non-federal sources (data are for FY2005 only)



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