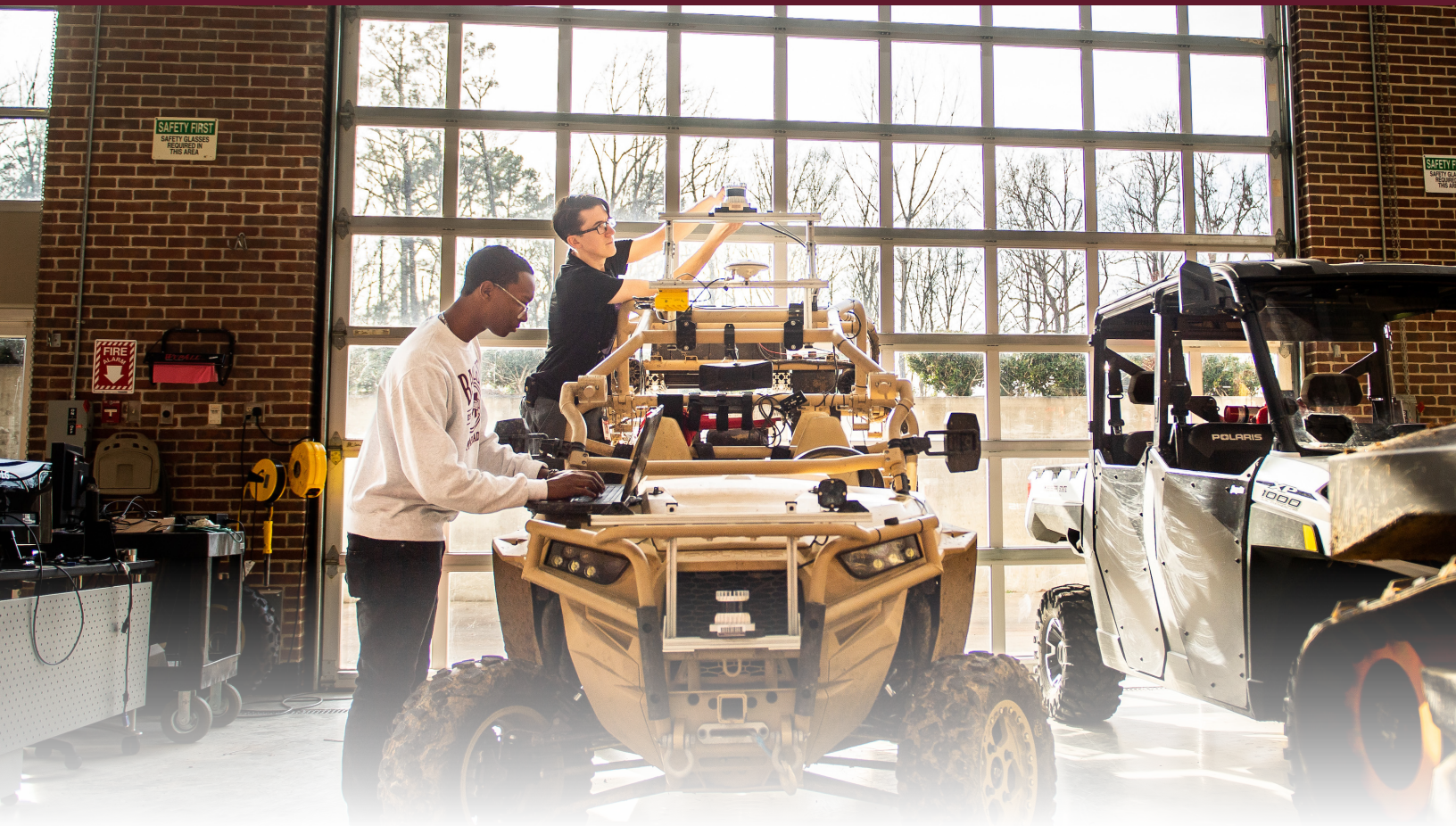




MISSISSIPPI STATE UNIVERSITY™
CENTER FOR ADVANCED
VEHICULAR SYSTEMS



DRIVING SOLUTIONS THROUGH INNOVATION IN AUTONOMY, ADVANCED MATERIALS, MANUFACTURING, MOBILITY, AND MODELING AND SIMULATION

ABOUT CAVS

Since its founding in 2002, MSU's Center for Advanced Vehicular Systems has been a key driver of economic activity in Mississippi and developed partnerships that support stakeholders in defense, private industry in government. **Originally established to support Mississippi's automotive manufacturing sector, CAVS has grown into an internationally recognized engineering research**

center with a wide range of impactful programs and partnerships.

CAVS is a member of the MSU High Performance Computing Collaboratory, which oversees one of the country's most powerful academic supercomputing sites. In addition to the main CAVS facility in MSU's Thad Cochran Research, Technology

and Economic Development Park, CAVS-Extension in Canton provides direct support to Mississippi manufacturers and the Institutes for Systems Engineering Research in Vicksburg is co-located with the U.S. Army Engineer Research and Development Center. **CAVS-Extension has generated more than \$7 billion in economic impact since 2006.**

WWW.CAVS.MSSTATE.EDU

TAKING CARE OF WHAT MATTERS

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■ 662.325.5431



RESEARCH EXPERTISE

AUTONOMOUS VEHICLES

Off-road, industrial, and heavy-duty vehicle automation are among the last frontiers of autonomous mobility, and CAVS is combining our unique capabilities to be a leader in these fields. With top-rated high-performance computing capabilities and a 50-acre off-road proving ground, CAVS is able to validate advanced modeling and simulation developments in real-world situations.

CAVS also has full-suite capability for autonomous system development, including sensor research, artificial intelligence and vehicle robotization.



ADDITIVE MANUFACTURING

CAVS researchers are pioneering new materials and production methods in additive manufacturing, helping partners in industry and defense enhance the quality of manufactured parts and reduce production time. The additive manufacturing team's work is enhanced through MSU's high performance computing resources and artificial intelligence for data-driven modeling.

COMPUTATIONAL MECHANICS

In addition to hands-on material capabilities, CAVS' researchers have the ability to model a range of materials, including metals, polymers, bio-materials and cementitious materials. CAVS' design and optimization abilities allow our researchers to evaluate the materials while involved in a variety of tests, including fatigue and fracture, crashworthiness, corrosion and heat treatment, then to adjust the materials in order to reach prime material optimization.

COMPUTATIONAL FLUID DYNAMICS

CAVS is solving real world problems through dedicated research and development of advanced computational modeling, simulation, and design of physical systems. These models and simulations allow researchers to yield detailed insights without costly or impractical physical tests. MSU researchers are using computational fluid dynamics to advance fields such as aerospace, energy, and health.

NEXT GENERATION STEELS & STEEL PROCESSING

Current CAVS research focuses on developing various grades of steel alloys, including structural steels and automotive advanced high strength steels, as well as modeling efforts to understand and predict properties and performance. The highlight of the steel research laboratory at CAVS is a well-equipped steel manufacturing facility. This facility allows for the production of custom alloys to mimic commercial production on a smaller scale, bridging the gap between laboratory material production and industrial facilities.

CAPABILITIES

HIGH PERFORMANCE COMPUTING

CAVS research is accelerated by one of the country's most powerful academic supercomputing centers. High performance computing resources at MSU include the Orion system, which has a peak performance of nearly 5.5 petaFLOPS and has ranked as high as No. 60 in the Top500.org's global supercomputer rankings.

VEHICLE & SYSTEMS ENGINEERING

As a leader in advanced vehicle and systems engineering, CAVS has a growing range of in-house capabilities designed to advance efforts in powertrain engineering and engine development. A robust fleet of experimental vehicles outfitted with advanced sensors allows researchers to understand complex, off-road environments. CAVS researchers take that understanding and develop and test computer algorithms that will enable vehicles to make real-time, intelligent decisions about how to navigate in the complex, unstructured world that lies off the main roads.

MATERIALS EXPERIMENTATION

With extensive effort dedicated to materials science and research, CAVS' capabilities include comprehensive facilities for materials manufacturing, materials characterization and mechanical testing. In-house capabilities to build, break down, and examine material properties allows CAVS researchers the ability to be hands-on throughout the entire materials cycle, with the ability to adjust and optimize components as needed.

PROVING GROUND

The CAVS Proving Ground is a center-wide resource for development and testing of vehicular technology, including advanced materials, uncrewed aerial systems, automated vehicles, and mobility characterization. Comprised of 55 acres of rugged off-road courses, the proving ground features various terrains including rocks, tall grass, wooded trails, and lowlands.

SOFTWARE AND CODES

CAVS researchers have developed several open-source or licensed software programs, including the MSU Autonomous Vehicle Simulator, which enables the simulation of off-road, autonomous ground vehicles. The LocI-CHEM code, developed at MSU, is a foundational computational fluid dynamics software used by NASA and DoD for launch vehicle, propulsion, and missile systems analysis.