

Spotlight on Success

Bioengineering research on human spinal mechanics has led to development of products that improve seating posture and reduce human head and neck injuries. A head and neck support (HANS) system developed at MSU received considerable attention, including mention in a *New York Times* editorial, after racecar driver Dale Earnhardt's tragic accident in 2001. Major racing organizations have now mandated HANS use to reduce the head motions and neck tensions that injure racers in crashes.

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Outcomes for Michigan's Future

MSU: Moving People and Goods around the State Quickly and Efficiently

In Brief:

Transportation plays a critical role in supporting the development of Michigan. Today, as in the past, transportation shapes the movement of society and significantly dictates the patterns of society's growth and much of the pace of our daily lives. Through research, teaching, and collaboration with government and industry, **Michigan State University is addressing the broad spectrum of issues that challenge the state to maintain ready access between its citizens and the world community.**

MSU has considerable proven capability in

- **Interdisciplinary research** among criminal justice, business, law, natural science, and engineering disciplines
- **Research in collaboration with Michigan industry**
- **Refining and updating practices** in collaboration with Michigan government and industry
- Development of **new and improved technologies** to
 - Provide and improve **international, interstate, and intrastate transport security**
 - Reduce **transportation-related costs**
 - **Educate various constituencies about transportation issues**
 - Support creation of **transportation-related jobs for today and tomorrow**
 - Increase **transportation-related safety**

Situation:

Among the ripple effects of the 9/11 attacks were delays in truck traffic on both sides of the U.S.-Canadian border. In addition to creating exceptional levels of pollutants, **the disruption in the transport of people, goods, and services in an age of just-in-time inventories had a devastating impact on many Michigan businesses.**

The **efficient use of energy** has long been a serious societal problem that will get more acute in the coming years. Transportation is one of the major users of energy and creators of environmental pollutants.

MSU Capacity:

- MSU researchers from engineering, business, criminal justice, and law are developing a novel comprehensive ITS that integrates biometric identification, dedicated short-range communication, and wireless communication — satellite systems, microwave, and radar — into an effective, efficient **tool for maintaining security while speeding up border transactions.**
- MSU business scholars team with security experts from the School of Criminal Justice to study supply chain security and **develop measures to increase security and enhance supply chain logistics and efficiencies.**
- Sponsored research at MSU is investigating ways to **improve the performance of hybrid vehicle engines**, combinations of internal combustion engines and electric motors integrated with control systems, which will lead to their broader acceptance by consumers as costs drop.
- The National Center for Pavement Preservation (NCPP) at MSU advances and promotes **sound road surface preservation practices** through education, research management, outreach, and technical hands-on assistance.

The infrastructure needed to move people and goods is a major state expense. **Pavement preservation is a cost-effective set of practices that extend pavement life and improve safety and motorist satisfaction while saving public tax dollars.**

In over 70 percent of crashes drivers are drunk, sleepy, talking on a phone, eating, putting on makeup, or simply not paying attention to the roadway. **Intelligent Transportation Systems (ITS) can make transportation safer for travelers.**

- MSU research supports the State Police's Safe Community program, an effort to build **community coalitions to promote traffic safety.**
- In work funded by NASA and in collaboration with TJ Technologies of Ann Arbor, MSU is working to produce the **next generation of extended-life, high-capacity batteries** for use on the next Mars Rover and eventually in applications on earth. The effort is made possible by a new nanoplatelet form of graphite, discovered at MSU, which has exceptional properties as a replacement for current materials used in batteries. The nanographite performs as well as carbon nanotubes but can be produced at 1/500 of the cost.
- The MSU Automotive Research Experiment Station (ARES) involves students in **multidisciplinary research of the kind done within the automobile industry.** ARES researchers apply fundamental scientific principles to develop optimal automotive systems.

Successes:

- An MSU-developed **online assessment tool for identifying traffic safety assets and deficits** has been used by more than 50 Michigan communities. Other results are workshops on older driver safety and Michigan's graduated licensing law, which has proved effective in reducing youth-driver injuries.
- Technology developed at MSU that produced a best-selling office chair has been incorporated into an **automobile seat** developed by Johnson Controls. It was displayed at the 2005 North American International Auto Show in Detroit.
- A Green Cell **starch-based protective packaging system** designed at MSU for Toyota's video entertainment system, windshield, and end cap has been used for over 12 months by Toyota Motor Sales, USA, without any system failure.

Outcomes for Michigan's Future:

- Success in developing and deploying ITS widely will **generate new high-tech jobs, produce graduates who are familiar with the new technology, and help in maintaining security against terrorism.**
- Equipping automobiles with the intelligence to detect vehicles that are straying out of the lane or off the road or coming too close to another vehicle and to issue a clear warning to the driver could **save many lives.** (Michigan has more than 40,000 traffic fatalities every year.)
- ITS offers the ability to **integrate safety with the needs of homeland security** by identifying people with criminal histories and detecting contraband at international border crossings. ITS can also be applied to the security of such civil infrastructures as the Mackinac Bridge, the Ambassador Bridge, and the Blue Water Bridge, which are used for trade exceeding \$300 billion annually.
- Research sponsored by the U.S. Department of Energy enables MSU to **investigate thermoelectric conversion to increase the efficiency of automobile power plants.** The idea is to convert heat energy that is now wasted into useful electrical energy.
- MSU research is **revising utility and pipeline installation guidelines and specifications** for the Michigan Department of Transportation. These guidelines will help to protect the road structure and improve public safety when contractors and utility companies apply for permits to bore under Michigan roads. The guidelines will serve as a policy guide for better use of road right-of-ways and improve safety of road embankments.