Speed Racers

Study will monitor driver behavior to determine the role of speed in crashes.

By Jane M. Sanders

The National Highway Traffic Safety Administration, which is funding the Drive Atlanta study, conducts crash tests on vehicles. This test, involving Georgia Tech researchers, tested the MACBOX data recorder system.

PHOTO COURTESY OF NHTSA

Conquering metro Atlanta's highways is like winning the Daytona 500 to many drivers. To cross the finish line, you've got to drive hard, drive fast and put in a lot of hours.

With so many drivers taking this approach, crashes are bound to happen, and some of them are deadly. More than 1,500 people a year die in crashes in Georgia, and more than 135,000 are injured. The concern is greatest perhaps in metro Atlanta counties, which exceed the national average crash rate of 5 percent a year among all registered vehicles. In fact, the crash rate is almost 10 percent in Fulton County, the heart of the metro area. Previous studies have shown that Atlantans drive harder, faster and longer than motorists in four other representative U.S. cities, including Los Angeles.

So Atlanta is the natural test bed for an unparalleled, comprehensive study of driver behavior and environment, and the role of speed in crashes. The Georgia Institute of Technology's Drive Atlanta study, which began in the spring of 2000, got into full swing recently when technicians began installation of data collection and telecommunications equipment in the cars of 1,100 metro drivers randomly recruited by researchers. Researchers expect that equipment installation in participating vehicles will be completed by this spring. In exchange for their participation, drivers have been assured of the privacy of data collected from their vehicles, and given the benefits of a vehicle theft-tracking system and automated 911 notification in the event of a crash.

"Ultimately, we hope the data we collect can help make the whole system — the driver, vehicle and the road — safer and more efficient," says Jennifer Ogle, lead investigator and a research scientist in the School of Civil and Environmental Engineering. "We don't know exactly what findings will result from this study, but we hope to learn about all three pieces of the system. The sheer size of the data set allows for nearly limitless analysis possibilities."

The role of speed in crashes is the primary focus of the study. Researchers led by Ogle and Associate Professors Karen Dixon and Randall Guensler, both of the Georgia Tech School of Civil and Environmental Engineering, and Simon Washington, an associate professor of civil engineering at the University of Arizona, hope to answer several questions. Does speeding lead to crashes? Are regular speeders more likely to crash? Do speeders have a higher risk of crashing only under certain conditions?

"We know very little about pre-crash speeds," Ogle says. "Almost all of what we know relies on driver and witness reports or crash reconstruction activities. Each of these sources is subject to errors. Our equipment will actually measure and record speed for us."

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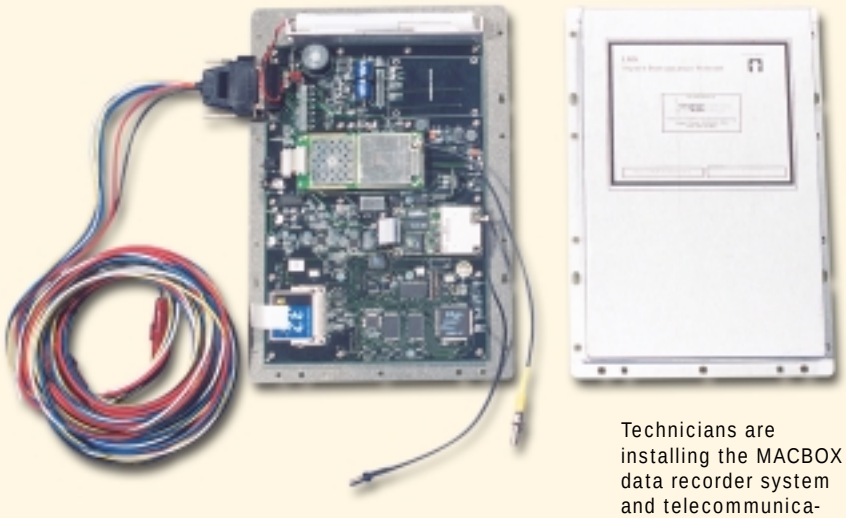

Technicians are installing the MACBOX data recorder system and telecommunications equipment in the cars of 1,100 metro drivers randomly recruited by researchers.

But researchers also want to learn more about travel patterns — how, when and where people drive. This information will be useful to both Ogle's research team and to SMARTRAQ (Strategies for Metropolitan Atlanta's Regional Transportation and Air Quality), an ongoing Georgia Tech-led study to determine what types of land use and transportation investment policies have the best chance to reduce auto dependence.

"For years, we have collected information from the roadway and the vehicle," Ogle says. "Now, we will also be able to gain information on driver behavior. This information will allow transportation officials to target their countermeasure programs. Countermeasures can come in the form of safety enhancements for the vehicle or the roadway environment, such as the roadside grading, signage, airbags, seatbelts or the setting of appropriate speed limits. This research may also lead to better driver training programs for younger and older drivers."

Drive Atlanta is primarily funded by a $1.9 million contract with the National Highway Traffic Safety Administration (NHTSA) and a $1.2 million in-kind grant from Safety Intelligence Systems Inc. The private company is providing the development costs, prototyping and testing for the MACBOX™, an event data recorder, which will operate — transparently to the driver — in all the study vehicles for the next two years.

The MACBOX will record high-resolution data for each vehicle trip and download that information to the researchers' secure server weekly. Data will include trip length, trip duration, route choice and second-by-second speed and acceleration.

Researchers will supplement MACBOX data with information on the freeway and major highway driving environments. The Atlanta Traffic Management Center will contribute data on prevailing traffic conditions, and researchers will gather weather data from the National Oceanic and Atmospheric Administration. They will combine all of these data within a geographic information system using the Georgia Department of Transportation roadway characteristics file and network as the basis for analyses.

Meanwhile, researchers will also be collecting data — both from the MACBOX and at the scene — when a study vehicle is involved in a crash. Based on statistical probabilities, they estimate that at least 100 crashes will occur during the study period.

When a crash occurs, the MACBOX will record all of the vehicle deceleration data and simultaneously transmit a Mayday message to the Fulton County Public Safety Access Point, or 911 center, the central emergency agency for all vehicles involved in the

Fatal Crash Statistics for Georgia

These 2000 statistics from the National Highway Traffic Safety Administration's Fatality Analysis Reporting System are the latest available.

- ❑ 1,541 people died in motor vehicle crashes.
- ❑ 63 percent of these deaths did not involve alcohol-related fatal crashes.
- ❑ 93 percent of these deaths did not involve drivers ages 16 or 17.
- ❑ The fatality rate was highest for the contributing factor of failure to keep in the proper lane or run off the road — 13.5 per 100,000 licensed drivers compared with 2.5 for failure to obey traffic stop sign or signal.
- ❑ Alcohol and illegal or unsafe speed were the next highest contributing factors at rates of 9.8 and 5.9 per 100,000 licensed drivers, respectively.
- ❑ 71 percent of drivers in fatal crashes were male.
- ❑ Almost one in 10 drivers in fatal crashes did not have a valid driver's license.
- ❑ The fatality rate per 100 million vehicle miles traveled in rural Georgia was 1.8, compared with a fatality rate of 1.1 in the five primary metropolitan Atlanta counties. The rate in suburban Atlanta counties was 1.6.
- ❑ More than one in four fatalities occurred in crashes involving a pick-up truck.
- ❑ More than one in seven fatalities occurred in crashes involving a sports utility vehicle.
- ❑ Proper child safety seat use by fatally injured motor vehicle occupants up to age 4 increased from 23.3 percent in 1999 to 25.0 percent in 2000.
- ❑ 18-year-old drivers had the highest fatality rate.
- ❑ Pedestrian fatalities accounted for 11 percent of all motor vehicle fatalities — the highest number of those occurring at night.

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Technicians installed the MACBOX data recorder system in the vehicle of Georgia Tech Associate Professor Karen Dixon, who is part of the research team for Drive Atlanta. The equipment was tested in Dixon's vehicle.

study. Researchers are making plans on how to handle crashes that may occur outside the metro area, Ogle adds.

Fulton County 911 officials will open a cellular telephone line into the vehicle using the onboard speakerphone system to verify that a crash has occurred and determine its potential severity. Global positioning system signals transmitted to 911 officials from the vehicle will reveal the crash location. Meanwhile, algorithms embedded in the MACBOX software will automatically analyze crash data, such as impact velocity and severity, and inform 911 personnel about the probability of injuries or casualties associated with the wreck. Then after quickly looking at these data and attempting to contact the driver, they will dispatch rescue workers and police to the scene.

The in-vehicle equipment will automatically notify the on-call Georgia Tech research team, which will deploy and investigate the crash in coordination with police departments. All six faculty members and six graduate students involved in the study underwent crash reconstruction and investigation training, including on-the-job practice with a metro area police department. Researchers will analyze the MACBOX data and crash scene information to determine the role of speed in the crash.

"Crash reconstruction is essentially more an art than a science," says Safety Intelligence Systems' Ricardo Martinez, a former NHTSA administrator and now an adjunct professor of civil engineering at Georgia Tech. "We look at the archaeology of the crash, witness reports and expert opinion to decide the 'facts.' With cars becoming more sophisticated like computers, we can actually measure what happens in a crash. So with the MACBOX, we can go from Flintstonian to Jetsonian."

Based on a pilot study she did in 1997 in Texas, Ogle believes Drive Atlanta will be successful in terms of data collection technology and data analysis. Ogle will issue periodic reports to NHTSA throughout the study and a final report in the summer of 2004.

"There is a lack of comprehensive information on crashes," Ogle says. "With ABS brakes, skid marks are not as detectable.... But crash analysis is changing. The more information we have, the better off we are."

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Researcher Jennifer Ogle, right, meets with personnel at the Fulton County Public Safety Access Point, or 911 center in Atlanta. When a crash occurs involving a Drive Atlanta study vehicle, the MACBOX will record all of the vehicle deceleration data and simultaneously transmit a Mayday message to the 911 center, the central emergency agency for all vehicles involved in the study.

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