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100-Car Naturalistic Driving Study Tracks Drivers for a Year

BLACKSBURG, Va., June 10, 2005 – With the primary purpose of collecting pre-crash naturalistic driving data, over 100 individuals volunteered to drive their own (or leased) vehicles with specialized instrumentation for 12 – 13 months in the Northern Virginia/metropolitan DC area. The 100-Car Naturalistic Driving Study was recently completed by the Virginia Tech Transportation Institute (VTTI) and sponsored by the National Highway Traffic Safety Administration (NHTSA), Virginia Tech, Virginia Department of Transportation (VDOT), and Virginia Transportation Research Council (VTRC).

The 100-Car Study was the first instrumented vehicle study undertaken with the primary purpose of collecting pre-crash naturalistic driving data. Drivers used these vehicles in their normal daily routines, were given no special instructions, no experimenter was present and the data collection instrumentation was unobtrusive.

Vehicle instrumentation gathered information through five channels of digital compressed video and many sensors that recorded vehicle state and kinematic information. Data collection resulted in approximately 2,000,000 vehicle miles of driving, over 42,000 hours of data with 241 primary and secondary driver participants.

The data collection effort for this study resulted in the following data set:

- 15 police-reported and 67 non-police reported crashes. Crashes were defined as any physical contact between the subject vehicle and another vehicle, pedestrian, or object, including low impact events, such as striking curbs and parking blocks.
- 761 near-crashes (situations requiring a rapid, severe evasive maneuver to avoid a crash).
- 8,295 incidents (situations requiring an evasive maneuver occurring at less magnitude than a near-crash).
- Nearly 80 percent of all crashes and 65 percent of all near-crashes involved driver

inattention, just prior (within 3 seconds) to the onset of the conflict.

- In addition, the study showed that total crash involvement may be over five times higher than police reported crashes.

From the data, an "event" database was created, similar to the classification structure of an epidemiological crash database, but with video and electronic driver and vehicle performance data appended to it. Since drivers rapidly disregarded the presence of vehicle instrumentation, the event database contains many extreme cases of driving behavior and performance, including, but not limited to, severe fatigue, impairment, judgment error, risk taking, willingness to engage in secondary tasks, aggressive driving and traffic violations.

Inattention to the forward roadway was found as the primary contributing factor in most crashes with 93 percent of the rear-end-striking crashes involved driver inattention. Driver inattention includes such things as drivers eating, writing, conversing with a passenger or looking away from the forward roadway at rear-view mirrors, objects in the vehicle or objects outside.

When drivers are in traffic, data indicated that drivers generally have sufficient awareness and ability to perform evasive maneuvers when responding to typical traffic conditions. Drivers have difficulty responding appropriately when other vehicles perform unexpected or unanticipated maneuvers, such as suddenly stopping or changing lanes.

The rate of inattention-related crashes and near-crashes decreased dramatically with age, with the rate being as much as four times higher for the 18- to 20-year-old drivers relative to some of the older driver groups (i.e., 35 years and older). Drivers younger than 18 years old were not tested.

The use of hand-held wireless devices was associated with the highest frequency of secondary task distraction-related events, and was among the highest frequencies for crashes.

Fatigue contributed to crashes at much higher rates than was previously thought. Fatigue was a contributing factor in 12 percent of all crashes and 10 percent of all near-crashes, while most current database estimates place fatigue-related crashes at approximately two to four percent of total crashes.

"This study and its results represent a new and unique approach to understanding driver behavior," says Gary R. Allen, director of the Virginia Transportation Research Council, a partnership of VDOT and the University of Virginia. "The research programs in Virginia and at Virginia Tech are leading the way to safer travel, and this study lays the foundation for a more

extensive awareness of addressing the human factors involved with driving." Dr. Allen is also VDOT's chief of technology, research & innovation.

Data from crashes and near-crashes may provide additional insight into effective defensive driving techniques, as well as insight into the effective design of crash countermeasures for these driving situations. Furthermore, the data provides much greater external validity relative to the larger context of driving than do empirical methods such as test tracks or simulators.

The 100-Car Study marks the first time that detailed information on a large number of crash and near-crash events has been collected and it fills a void in existing driving safety research methods. The 100-Car Study results are important because near-crashes occur 15 times more often than crashes and every near-crash event demonstrates a driver successfully performing an evasive maneuver.

"The goal is to save lives and this 100-Car Study is really a first step. Our data sources up to this point were pretty limited. If you don't have good information about why crashes occur and why fatalities occur, you can't really solve the problem," said VTTI Director Dr. Tom Dingus.