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Feature Article

Driver Training Needs Spawn New Business Opportunities

by Athanasia D. Baker

Training police officers to make risky maneuvers while behind the wheel can be expensive and potentially deadly. If the driving is done in a simulator, however, troopers can conduct high-speed chases and dangerous patrol missions without risking lives or vehicles.

In this context, the benefits of simulation-based training seem obvious. But it has only been in recent years that organizations such as police departments have been able to afford high-quality simulators. That technology used to be too expensive and the data too massive and complex for practical use. Today, even lower-end simulators, which are PC-based, offer the high-resolution graphics needed to make the training realistic enough for certain applications.



The city of San Antonio for example, has numbers that prove that simulators are a good deal. In June of 1999, San Antonio police officers were involved in 58 intersection accidents. During the same period in 2000, the number had dropped to 15. Officials attribute the lower number of accidents to the use of PatrolSim, a driving simulator. Until the addition of the simulator, all driving instruction was done in actual cars on courses or tracks. There was no way to practice driving in dangerous conditions without putting the driver or the vehicle in peril.

Driving simulators are becoming increasingly popular not only within police forces, but also in firefighter units and trucking companies.

The advent of smaller, faster computers has made driving simulation more realistic and cheaper, said Reg Welles, president of I-Sim Corporation based in Salt Lake City. The company makes simulators for commercial and military organizations. Driving simulators are an “emerging industry,” he said

in an interview. The industry so far has been dominated primarily by aviation. "If you look at how many airline pilots are in this country compared to how many drivers, you're talking millions [of] more drivers," said Welles. There are about 600 to 700 flight simulators in the United States for about 140,000 pilots. "So when you consider how many simulators are needed to handle millions of drivers, it's an ocean of opportunity.

"When we started, our systems were very expensive. We needed several computers to function in a parallel mode at the same time ... just to be able to handle the enormous amount of simulation equations." That drove the cost of the simulators to the millions of dollars.

"Basically, the technology is getting faster, cheaper and more comprehensive in performance. ... It's having embedded computer-based training; It's having embedded artificial intelligence that helps to guide the person using the simulator," said Welles. As customer requirements grow, systems can be upgraded fairly easily, he noted.

In the driving simulations, particularly, more attention is being paid to the physics behind the vehicle, said Welles. I-Sim, for example, works with the GoodYear Tire Company, in order to develop different tread designs and model the effects they have on vehicle performance. Welles believes that, too often, driving simulations are based on flight simulations or video games, and therefore are unsatisfactory for serious training.

"The customers are becoming more sophisticated. They are becoming more aware of what they really want in a simulator," Welles said. Law enforcement agencies are a case in point. The San Antonio Police Department acquired the PatrolSim in January 2000. Ernest Trevino, a department official explained, "We wanted our simulators a certain way. ... We videotaped the inside of one of our police cars. ... We wanted it to be real similar to that."

Because the simulators are capable of replicating a variety of tactical environments based on the vehicle, weather, traffic and road conditions, they are ideal for police training, said Trevino. And they are easy to use, he noted. "We're policemen. We're not computer experts or computer engineers. We can get on it, and we can do all kinds of things. It's pretty much user-friendly, point and click."

The contractor provides software updates and troubleshooting assistance over the phone.

I-Sim also has worked with military agencies to achieve a better understanding of "the complex natures of driving simulation and [has done] comparative analysis of various systems that were available," said Welles. The company has offered demonstrations for the Army, the Marine Corps and other Defense Department organizations on non-combat, support-vehicle training, such as reconnaissance platforms.

Welles said the goals of military and commercial customers "are converging.

... We're finding that what we are doing now with the commercial users, which are very sophisticated—law enforcement and trucking companies—is exactly what the military wants. But we are doing it with less expensive hardware.”

FAAC Inc., of Ann Arbor, Mich., received a contract to develop a simulator for the Marine Corps' new 8-ton truck, the Medium Tactical Vehicle Replacement (MTVR), which is built by OshKosh Truck Corporation, in Wisconsin. FAAC will produce 36 simulators, said Alan Jordan, president and chief executive of FAAC.

The simulators will be shipped to Fort Leonard Wood, Mo., and Camp Johnson, N.C., before the actual trucks arrive, so the instructors will be ready to train the troops, Jordan said in an interview. Like with other simulators, the goal for the MTVR trainer is “to stay faithful to the vehicle,” he said. FAAC is using cabs from the real trucks as the basis for the driving station, Jordan said. “Everything the driver will have available to him in the vehicle will be available to him in the simulator. [There is a] mix of motion-based simulator, full six degree of freedom motion-based on a pedestal, and a motion seat that FAAC has developed to provide the feel for on- and off-road.”

The system, he added, “has full wrap-around graphics ... so they have all the normal sight lines for driving.” The simulator will not only display exterior driving conditions, but also will provide a realistic environment of the interior of the vehicle, he said.

“The Marines want to be able to use the simulators throughout the entire level of training, starting with beginning drivers ... all the way to a tactical driver, who is in severe off-road conditions and inclement weather and blackout conditions,” said Jordan. “They are looking to cover the full breadth of training.”

Jordan agrees that military customers are reaping the benefits from advancements in commercial simulators.

“We started off the driving simulation business in the late 1980s, early 90s, as an adjunct to our other military business, and looking to get into a non-military field to offset the declining defense revenues,” he said. “And now it's come full circle, in that the military is a major customer of our driving simulation product.”

FAAC's simulation equipment is available on the GSA schedule, said Jordan. “So the government can purchase them like another commodity, because we are selling essentially the same thing to both the commercial and the government customers.”

The biggest difference he sees between commercial and military simulation requirements is the need to simulate much harsher off-road conditions for military driver training. “That [off-road simulation] brings up different levels of fidelity in the vehicle model, particularly in the suspension system and

or fidelity in the vehicle model, particularly in the suspension system and such,” he explained.

“Certainly, the major problem in driving a vehicle is not so much driving, but decision making,” he said. That is why a realistic “traffic model” is critical to effective training. That traffic model, he said, “will react to you based on whatever you do, in both logical and illogical manners. We can vary [the model’s] behavior to be from law abiding, very courteous drivers all the way up to very aggressive drivers, cutting you off, running red lights and stop signs, not yielding right of ways, that type of stuff. We can vary the driving experience, as a function of the student’s level of capabilities and level of experience.”

Advanced Driving Simulator

One of the country’s most advanced driving simulators is the Department of Transportation’s National Advanced Driving Simulator (NADS) project which will be unveiled in December, according to program officials.

The NADS, which is located at the University of Iowa, will be used in research to improve highway safety through a better understanding of driver-centered human factors that come into play during the complex interaction of the driver, vehicle and highway environment. According to Lea Chen, professor of mechanical engineering at the University of Iowa and director of NADS, “The simulator can be used to study the causes and effects of driving safety in a safe and repeatable environment that cannot be accomplished otherwise.” With the NADS, driver behavior can be observed without endangering the driver or the vehicle, Chen said. Currently, the Transportation Department and the National Highway Traffic Safety Administration plan on using the simulator to study the effects of blood alcohol content on driving performance and the driver distractions due to the use of cellular phones and in-vehicle devices such as vehicle communication, navigation and control technology being developed as part of the Intelligent Transportation System. Simulations will be run to determine if the system will be more of a help or a hindrance to drivers.

Of particular interest is a study of driver crash avoidance behavior. The NADS can be used to recreate actual accident scenes and get a better understanding of the limitations of participants and the response limitations of the involved vehicles, according to the NADS web site. This project will also be used as a tool for conducting highway engineering and design research related to traffic safety. Researchers will be able to evaluate various designs for intersections, entrance and exit ramps, tunnel and bridge alignments, traffic control devices and highway signing.

The automotive industry will find a use for NADS as a development tool, said Chen. “The simulator can also provide an additional dimension to the product design and development process, that is the driver-in-the-loop assessments during the product development, serving as a virtual proving ground.”

The Transportation Department provided the majority of the funding for NADS and, thus, will have priority rights to two-thirds of usage time. However, Chen adds, anyone wishing to use the simulator can submit a statement of experimental requirements for an institutional/university review. The usage fee is \$1,000 per hour, and time is limited to 1,750 hours for one year.