PORTABLE CRASH SCENE MAPPING TOOLS PROVE QUICK, ACCURATE, ECONOMICAL

By BOB GALVIN

As rush hour traffic moves into high gear one evening along a freeway on Portland, Oregon's west side, a passenger car attempts merging at high speed to pass an approaching delivery truck. The attempt fails and the truck's driver slams on his brakes and swerves suddenly, causing the truck to overturn and block two of the highway's lanes. Soon, state patrol traffic officers are on the scene using a total station to map data points of the expansive scene and create a diagram. The freeway has been shut down, and frustrated motorists face a long wait. Unarguably, a total station can be used to map the crash scene's data points with impressive accuracy, but is the road closure for three hours and the risk of secondary vehicle accidents worth it in such instances? Some states are saying no, and even seeking out alternative technology.

One-officer Operation

New portable technology is changing how crash scenes are investigated. Laser systems, for example, prove faster and more accurate than hand measurements using tapes or a measuring wheel. Less equipment, now more compact, can be brought to the crash scene quicker. And the fact that equipment is more portable than ever usually means just one officer can map and diagram a scene. The equipment also is more affordable, so more units can be purchased. But how, you may ask, can the important job of mapping data at a crash scene, then creating a diagram from this data be done with *portable* equipment. Most successfully is the answer. For example, just ask Sgt. John Naccarato of the Clackamas County, Oregon Sheriff's Department, who decided two years ago that the process for measuring and documenting crash scenes somehow had to be streamlined. "I used 25-foot tape measures for crash investigations and collecting data," Naccarato recalls. "It was really time consuming. There was a hazard to traffic, and it took a couple of guys to do it just to get the measurements (for a two-car crash). You had to write down calculations on paper while cars are driving over your tape measures," the sergeant said. "I started thinking there had to be a better way." From this experience, Naccarato experimented with some technology tools that ended up transforming his investigations of accident scenes into a one-man operation.

Sgt. Naccarato consulted with The CAD Zone, Inc., Beaverton, Oregon, from whom he had previously purchased a special drawing program for accident scenes, called The Crash Zone. It so happened that The CAD Zone was offering a new product, called Pocket Zone, a data collection program that lets you use a Pocket PC to collect and record all 3D point and line data at crash scenes. Sgt. Naccarato decided to get creative. He traded his PDA for a friend's HP iPAQ handheld PC which is compatible with the Pocket Zone software. Next, the sergeant obtained a grant from the Oregon Department of Transportation for $3,500 to purchase an LTI Laser Model 200 from Laser Technology, Inc., which captures slope and elevation measurements (even in 3D). Finally, he purchased a cable that connects the data collector to the laser, plus a mono-pod on which to mount his laser. The results? Sgt. Naccarato claims he can measure simple one or two-car accidents or even an eight-car collision. Sounds good, but how accurate is this whole solution? The sergeant's system proves highly accurate for nearly every crash diagram. In fact, one of the most significant benefits of Pocket Zone is that it automatically saves every point that the user shoots, and can capture mapping data from nearly any brand of total station. The data gathered is saved to a proprietary .pzd file within Pocket Zone. This .pzd file contains encrypted raw data and the scene coordinate diagram which can only be viewed in CAD Zone software programs, like The Crash Zone. The .pzd files can be viewed but not altered to maintain data

integrity, and any work is saved to a separate .czd (CAD Zone Drawing) file. Pocket Zone also allows data to be exported into AutoCAD, .dwg and .dxf file formats.

The Crash Zone can read the 3-dimensional coordinates for each point recorded in Pocket Zone and displays it in both 2D and 3D views so that symbols, text, dimensions, and final details can be added. Once these items are added, a detailed program can be printed out that is ready to present in court. Pocket Zone is compatible not only with The Crash Zone, but also supports AutoCAD, .dwg and .dxf file formats.

One more compelling aspect of Sgt. Naccarato's portable crash scene mapping equipment is that it all fits snugly inside a compartment on his motorcycle. Therefore, the sergeant no longer has to wait for another office to arrive at a crash scene with a total station. Instead, he can carry everything he needs to map the scene. The overriding benefit of this compact technology is that it yields tremendous time savings and shortened road closures.

Sgt. John Naccarato, Clackamas County, Oregon Sheriff's Department, maps a crash scene using a Laser Technology, Inc. Impulse laser measuring system mounted on a monopod. The Pocket Zone data collection/diagramming software from The CAD Zone, Inc., loaded on an HP iPAQ Pocket PC, and connected directly to the laser, plots the data points on the PC's screen as they are shot in real time. This compact equipment yields substantial time savings, and ensures that the officer leaves the scene with extremely detailed and accurate crash scene data.

Data Collectors Help Fuel Trend

As staffing and budgets for police departments and state patrols are continually squeezed, alternative means for mapping crash scenes, like the portable solution just discussed, undoubtedly will be pursued. The Society of Accident Reconstructionists (SOAR), based in Wheat Ridge, Colorado, is all for it. "We need to take advantage of technology that will improve our investigations and the accuracy of them, and diminish the time required to create those results," said SOAR Chairman Arnold Wheat. One reason for Wheat's advocacy of portable mapping equipment is that data collectors themselves have become more tailored for single-officer crash investigating.

Colorado based Laser Technology, Inc., a leading data collector provider, for example, offers various instrumentation packages or "kits" that bundle its mapping devices with other components. One such kit combines an LTI UltraLyte 200 Mapping Laser, either the Crash Zone or Vista diagramming software, heavy-duty monopod, data collector plate, transport bag and all necessary cables. In Colorado, notes SOAR'S Wheat, the state patrol has converted to using LTI

lasers since they are less expensive than traditional total stations. “The number of officers needed to operate each laser goes from two to one,” Wheat said. “With the lower cost, they (the state patrol) can afford to equip more officers throughout the state with this equipment.”

Entire Traffic Motor Squad Goes Portable

Frustrated because most of his traffic officers were using different crash scene drawing programs, Officer George Maglaras of the San Diego, California Police Dept. decided to also adopt portable mapping equipment for crash scene investigations. The sergeant adopted the same solution as that used by Oregon’s Sgt. Naccarato, except that he prefers using a TDS Recon rugged handheld computer on which to operate The Pocket Zone drawing software. Officeer Maglaras likes the TDS Recon computer mainly because it’s ruggedized, has a 15-hour battery and is watertight. “I realized the TDS Recon would be the way to go for police work since we work in the rain and heat, and because motorcycles create a lot of vibration.” The portable crash mapping solution has reduced the number of officers needed for a collision scene from three down to one, said Officer Maglaras, who notes that previously two officers held a tape measure while another officer wrote down all measurements. Today, with the portable equipment, time needed for measuring a collision scene also has lessened--from three hours to one. To pay for the equipment, Officer Maglaras obtained a $411,000 grant in October 2004 from the California Office of Traffic Safety. The funding enabled the San Diego Police Department to purchase 50 LTI lasers, 50 TDS Recon handheld computers, and the same number of CAD Zone’s Crash Zone and Pocket Zone software.

One P.D. Uses Several Portable Options

Still another champion of reducing manpower while making crash scene investigations a portable process is Police Officer Jeffrey DeBolt of the Beaverton, Oregon Police Department’s Traffic Safety Team. DeBolt, who also is accredited by the Accreditation Commission for Traffic Accident Reconstruction (ACTAR), considered cost as the main impetus for adopting a portable crash scene mapping option. Officer DeBolt observed Sgt. Naccarato’s equipment and decided that his traffic safety team needed a similar solution, but with some slight changes. DeBolt decided to buy LTI’s Mapstar Angle Encoder, which allows high-precision reflectorless distance measuring with a narrow-beam visible laser, to use with his LTI Model 200 Laser. “I get true elevation (with the angle encoder),” explains DeBolt, “because the inclinometer in the laser measures the slope. So, you get the true slopes of the grading, roadway, and ditches to where you can just connect lines in the diagram off the points that are taken, then just hit the 3D generator in Crash Zone and create a 3-dimensional diagram.” DeBolt also uses a total station with a prism as part of his department’s arsenal of crash scene mapping equipment. When CAD Zone introduced The Pocket Zone, Debolt said he and his traffic safety team began looking at different types of data collectors to use with the laser for mapping crash scenes. With funding that the police department had provided, DeBolt adopted a measuring kit identical to Sgt. Naccarato’s, plus he bought the angle encoder. “With shrinking budgets, manpower and resources, for one person to be able to shoot crash scenes and measure them alone with this kind of equipment is invaluable,” DeBolt said. The officer acknowledges that the LTI Angle Encoder adds another piece of hardware to his portable solution, making it more appropriate for carrying in a police cruiser than on a motorcycle.

Officer Jeff DeBolt, a member of the Beaverton, Oregon Police Department's Traffic Safety Team, demonstrates how to measure a crash scene with an LTI Mapstar Angle Encoder, one of the latest offerings in portable crash scene technology tools. DeBolt uses the angle encoder with an LTI laser, Pocket Zone data collector from The CAD Zone, Inc., and a Panasonic Pocket PC. The angle encoder is used to shoot to points within a long crash scene. The equipment takes only five minutes to assemble, and can capture data points and create a diagram in under one hour.

Total Stations Still Valuable, Needed

DeBolt admits that his portable solution is not perfect for all crash scenes. “Probably seventy-five percent of all scenes we can map with the LTI (laser),” DeBolt said. “It’s just that those larger, complex nighttime crash scenes (many of them a result of DUI incidents) where you get so far out you just can’t see, a total station will track a prism out to further points that you can see with the LTI System.”

Photogrammetry Catching On

Still another emerging, portable method for mapping crash scenes is “Close-Range Photogrammetry.” With this technology, a digital camera is used to quickly capture the necessary scene details and evidence. Photogrammetry involves extrapolating 3D measurements from the 2D digital camera images acquired from various angles at the scene. Next, the images are loaded into special software, which processes the data points captured and creates a 3D model. Finally, the 3D photogrammetry modeled points and lines are converted into a 3D diagram using a CAD (computer-aided design) drawing program.

The software typically has built-in 3D symbols and libraries of drawing elements such as cars, trucks, people. All of these elements are fully sizable.

As with the other equipment discussed in this article, photogrammetry requires only one person to map the scene, using a digital camera, and then create a detailed diagram using the special software for creating a 3D model.

The benefits of portable equipment to map crash scenes small or large are clear: huge time savings, one officer taking measurements instead of two or three, and reliable data collection and diagramming--right at the scene. Yet, Chairman Wheat of the Society of Accident Reconstructionists, cites an even bigger role evolving with this trend. By capturing crash scene data more quickly, using the various portable equipment solutions discussed here, law enforcement agencies can better determine why the accidents are happening and what countermeasures could be implemented to reduce their frequency.

But there's another reason Wheat feels police agencies and state patrols must strongly consider adopting portable crash scene measurement options--- the potential for more secondary accidents occurring during long road closures. Simply put, law enforcement agencies may be leaving themselves exposed to possible litigation by not using technology to capture crash scene data accurately and more quickly so that road closures are kept to a minimum. "If I were a police agency, I would be worried about incident management at highway crash locations," SOAR's chairman said.

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