CASE STUDY

Reconstructing the Scene: Software Solutions Transform Courtroom 3D Presentations

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Every day around the world, tens of thousands of incidents occur involving cars, buses, trucks, motorcycles, bicycles, and pedestrians. From winding two-lane country roads, to cul-de-sac-strewn suburban streets, to high-speed highways, the tens of millions of miles of roadway asphalt can be deadly.

In fact, according to the ***Association for Safe International Road Travel*** (ASIRT), 1.35 million people die annually from road incidents. While the emotional pain and suffering is incalculable for their loved ones and for those who negligently contribute to someone's injury or death, the economic, medical, and societal costs can be measured: road crashes are estimated to have a cost to the world economy of $1.8 trillion.

When a crash occurs, often someone (or something) is at fault. A driver may not have seen a bicyclist; a truck driver didn't brake fast enough or didn't account for strong crosswinds. There could be unforeseen mechanical failures. And poor weather conditions, be it ice, rain, and snow – or an unwelcomed combination of all three – can wreak havoc on road safety. Sometimes all it takes is a perfect summer day with a low morning or evening sun and a few seemingly minor negligent actions that can lead to tragedy. Often it is in these scenarios that lawsuits are filed. Some of those lawsuits, about ***5 percent***, end up in court.

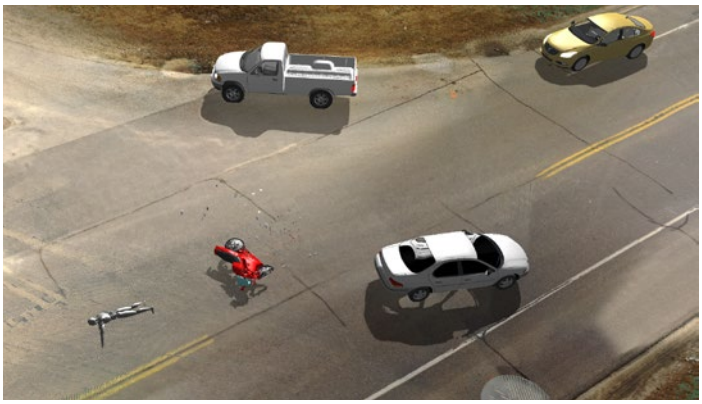


Figure 1: 3D re-creations like this depicting a motorcyclist losing control are becoming essential visual aids for courtroom presentations.

'Better Call Carl' – Crash Reconstruction Expert

And when they do, it is the job of crash reconstruction experts to help jurors understand what took place. Unlike the crash investigators who first employed total stations to measure individual points, modern reconstructionists rely on high-tech laser measurement equipment and advanced computer software to virtually re-create the events that took place leading up to and following the crash.

So lifelike and accurate have these digital recreations become, that they are essential visual tools for defense and prosecution attorneys, each arguing their case. It is not surprising then, that such compelling presentations are also having a powerful impact on swaying jury verdicts.

> ***Jurors better absorb trial information if that data is presented in a visual manner - Especially via 3D reconstructions.***

Carl Lakowicz is a crash reconstructionist whose job is to help show jurors the whole picture through the 3D visualizations he creates. He does so not with fanciful storytelling, but with strict adherence to fact. As an active crash reconstructionist for nearly 40 years, following his career as a police officer with the city of Concord, New Hampshire, Lakowicz has had a front-row seat as both 3D software and hardware technology has advanced. And as the lead forensic animator for New Hampshire-based ***Northpoint Collision Consultants***, he has reconstructed hundreds of cases. And for years now, his team has relied on FARO Technologies, Inc. crash reconstruction software and laser imaging technology.

"3D technology did not exist when I began my career," Lakowicz explained. "Back then, we used a ruler, a flexible curve, a thumb, and measuring tape. Over the years, I have watched this technology skyrocket, and I'm a huge proponent of using it anywhere it makes sense."

In 2019 Northpoint upgraded their digital forensic tools to include FARO Zone 3D software and a FARO Focus 3D Laser Scanner. As a combined "scene-to-desk" solution, FARO products help Northpoint decrease time spent in the field, increase personnel safety, and shorten the company's re-creation turnaround time. From a business standpoint, this translates to more clients and faster referrals, but it also means capturing fully accurate 3D crash scene documentation that stands up in court.

Road Incidents Happen: A Tragedy in Trajectories

Another example where Northpoint used its FARO software and laser scanner was after a tragic crash involving a motorized bicycle and landscaping truck on a two-lane highway that occurred. According to dashcam footage from a nearby marked police car, it appeared that the bicycle (with a two-cylinder combustion engine) was moving faster than a standard bike as it passed a T-intersection. As the biker approached the intersection, the landscaping truck struck the bicycle as the truck made a left turn. The impact occurred on the truck's right rear corner and the bicyclist was thrown, unfortunately sustaining a fatal head injury.

These images are frames in the animation Lakowicz created using FARO Zone 3D. The left image shows the point of impact and the right shows the final rest position of the bicycle, as determined by the measurement data and the photogrammetry analysis of the scene.

When Northpoint joined the investigation some four months after the crash, the truck driver's statement was that the crash was unavoidable. But after taking detailed 3D scans of the crash scene combined with footage from the police dashcam, it was determined that the truck driver did not stop prior to making the turn as he claimed and that the crash was, in fact, avoidable.

In any forensic investigation point of impact is key, Lakowicz explains, as is the speed of the moving vehicles. In this case, the 3D scans determined that the biker's estimated speed was 13 mph, while the truck was turning at 14 mph. Moreover, the biker likely expected the truck to stop.

Details Matter: 3D Realism and a Whole Lot More

In another incident at a signaled intersection, Lakowicz used 3D scans to bring a crash scene to life. A motorcyclist had lost control as he made a left turn and drove over an unseen sand pile in the middle of his lane. The biker skidded off the road and crashed into a guardrail.

When Northpoint was called in, the company quickly coordinated 28 individual setups to capture all the scene data, which included aerial shots from 300 feet. The scans were processed and registered into a point cloud, and the data used to accurately re-create the crash.

The key to determining fault and presenting the courtroom documentation needed to sway a jury, was determining the biker's acceleration rate. With FARO Zone 3D software, Lakowicz was able to measure precisely from the moment the traffic light turned green until the guardrail stopped the biker's momentum. The software was also used to determine the lean angle, or the degree to which the motorcyclist leans toward one side to complete a turn. Once the forensics of the scene were determined, Lakowicz used the software to visualize the finer details – details that help bring a sense of realism to in court presentations. For example, they correctly colorized a vehicle that was found to be blocking the biker's line of sight, a hard-to-match taupe, mushroom-like color. They also digitally re-created the pile of sand – even though the sand had long been removed from the highway.

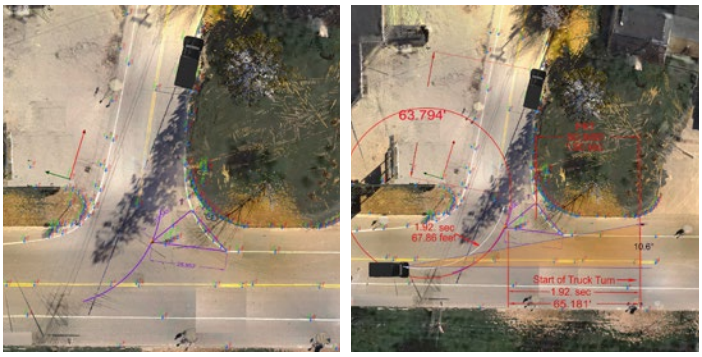
These are the kinds of vital elements that can enhance the realism of courtroom presentations, allowing jurors to "re-live" the scene as it unfolded. But as Lakowicz points out, this isn't about re-creating Hollywood theatrics. It's about "truth through science."

The Road Not Taken – Too Fast

As long as there are roads to be traveled and humans behind the wheel, crashes will happen. Despite ongoing advances in safety protocols and the advent of driverless cars, the laws of physics will always win. The speed of impact, the trajectory of the moving objects, the weather conditions, line of site, and reaction times, are the ever-shifting details of disaster.

Bringing the reality of those tragedies to courtroom life is never easy. But providing jurors with an unmatched 3D virtual re-creation is the best way to ensure that justice will be served.

The in-vehicle camera of responding police officer recorded the final rest position of the bicycle. Photogrammetry was used to obtain measurements from this frame so the point of impact could be accurately located in the FARO Zone 3D reconstruction of the scene.



Investigating officers measured the scene using a total station and Lakowicz imported those 3D points into his FARO Zone reconstruction. The points used to determine the moment of impact are also shown here in purple.

FARO Zone 3D Software Features & Advanced 3D Animation Effects

- Load high-resolution drone and satellite images
- Place multiple virtual surveys in a single drawing
- Customize and place 704 placards in any diagram or animation
- Attach bullet trajectory objects to posable bodies
- Add light blooms and lighting presets for dramatic effect
- Turn a point cloud into a virtual training session
- Show spinning and locked wheels, and trailer articulation
- Add shadows, account for light sources and can even fire and smoke
- Select aerial maps from Google®, Bing®, or Pictometry® to overlay scanned scenes, including terrain
- Display bodies in motion
- Adjust camera position, change the playback speed or adjust the vehicle's yaw, pitch, or roll

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