CASE STUDY

FARO® Laser Scanner Data Instrumental In Near-Collision Case Involving Sprayer And Speeding Car

Challenge

In forensics, there is often a single opportunity to document and preserve all relevant evidence. Investigators must decide, usually at a very early stage of the investigation, what evidence is important and should be documented. In the case of a near-collision involving a large farm and field sprayer, an unanticipated issue of operator field-of-view became an important factor in understanding the circumstances of the incident. Thanks to thorough data collected using the FARO Laser Scanner, the investigator was able to answer questions critical to the case.

Solution

Mark S. Erickson, P.E., a forensic engineer and certified crash reconstructionist with Hayes + Associates, used a FARO^{3D} X 130 Laser Scanner to document the evidence. Verifying the sprayer operator's field-of-view became a key factor in determining whether the driver could have seen the speeding car in time to prevent the accident.

Photographs and overall dimensions of the sprayer.

Results

By scanning the sprayer and the roadway where both vehicles were traveling before the crash, the investigator was able to address field-of-view questions that were critical to the case. It would have been impossible if only standard, total station, survey data were available.

The use of laser scanning for investigating and understanding complex crash scenes can be the decisive factor in how a case is resolved, based on the detailed evidence that the scanner reveals. Veteran forensic engineer Mark S. Erickson, P.E., proved the cause of the crash after reconstructing the scene of a near-miss collision. The incident occurred on a two-lane road with a speed limit of 55 mph (88 kph) that involved a commercial farm sprayer traveling less than 20 mph (32 kph), and a car that was being driven approximately 72 mph (116 kph). The car attempted to pass the sprayer on the left, just after the sprayer began to make a left turn. The car swerved, struck an embankment and rolled, causing severe injuries to the driver.

Field-of-View Determination Critical to the Investigation

Mr. Erickson, a certified crash reconstructionist, was retained to reconstruct the incident. As part of his evidence documentation, Erickson used the FARO^{3D} X 130 Laser Scanner for the project. According to Erickson, a key issue was the sprayer operator's field-of-view to the rear of the sprayer before the car passed.

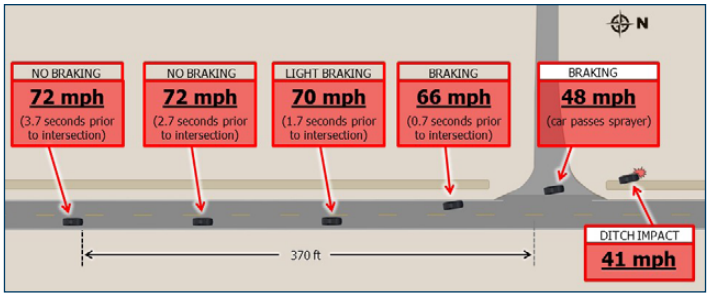
The specific question was how far the operator was able to see beyond the rear of the sprayer, as well as any "blind spots" that could have obscured the presence of a passing vehicle.

An important issue in the case was the configuration of the sprayer, which had a large chemical tank located behind the driver's cab, thus preventing a direct view through the rear window. The sprayer, to compensate for its limitation, had been fitted with three adjustable, exterior mirrors to provide the operator an extended field-of-view to the rear.

Mark S. Erickson, P.E., sets up the FARO 3D X 130 to scan the farm sprayer that was involved in an incident.

Erickson addressed the visibility and field-of-view question by using the FARO Laser Scanner to produce three-dimensional point clouds of both the sprayer and its driver's likely visibility of the roadway behind him. According to Erickson, the comprehensive evidence captured with the scans could not have been attained with a total station survey instrument, "Rather than attempting to anticipate every possible measurement that may be required for future analyses, I used the FARO Focus Laser Scanner to document the evidence in its entirety. The scanner is a safety measure that ensures I never miss an important measurement."

The driver of the car was sustained significant injury from the crash. The sprayer's driver was unharmed. Not long after the incident, the car disappeared. But before it went missing, data from the event data recorder in the car was downloaded, detailing the rotational rate of the tires. It was determined that the car had oversized tires, which caused the data recorder to underestimate the vehicle's actual speed. That is, Erickson concluded that the actual speed of the car was higher than what was displayed on the speedometer and reported by the data recorder, due to the vehicle's oversized tires.



The car was determined to be traveling at 72 mph (116 kph), nearly 20 mph (30 kph) over the speed limit, three seconds before reaching the sprayer.

Laser Scans Yielded Geometric Data for Science-Based Analysis

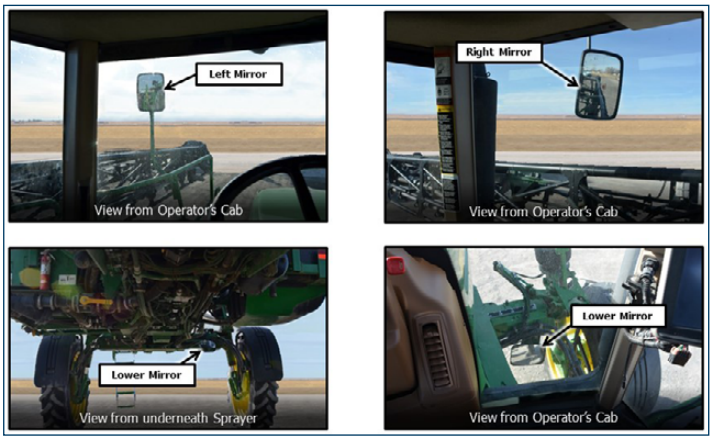
After the crash, the sprayer was transported to a parking lot so it was available for Erickson's investigation. Erickson photographed the sprayer and took four laser scans—one from the front, one scan on either side, and one from the sprayer's rear. These scans provided an accurate 3D model of the entire vehicle, which could be used to obtain critical measurements. Erickson said that the FARO Laser Scanner allows him to be thorough and collect millions of detailed points of information, any of which may become useful as the investigation progresses.

"You may not know that you need specific measurements until after the evidence is gone," Erickson said. The scanned data completely captures the scene so measurements can be retrieved at any time.

Erickson used the FARO 3D X 130 Laser Scanner to capture an accurate 3D model that could be used to digitally determine the sprayer's field-of-view to the rear.

The plaintiff in the case argued that the sprayer's driver had some responsibility for the crash. If he had looked in his rearview mirrors, he could have seen the approaching car and then decided not to turn. "This became an issue, and was why the scanner data became so important," Erickson said.

The laser scan data included the operator seat position, mirror locations (fore-aft and angular adjustment settings), the position and configuration of the sprayer boom arm, and other vehicle components that would have been visible in the mirrors. According to Erickson, the measurement data showed there was nothing the sprayer's operator could have done to prevent the car's crash. "He (the sprayer operator) could not have seen or known that the car was approaching at its given speed," Erickson explained.



The sprayer had been fitted with three exterior mirrors to ensure that there was good visibility to the rear

Point Clouds Revealed Essential Rear-View Sight Lines

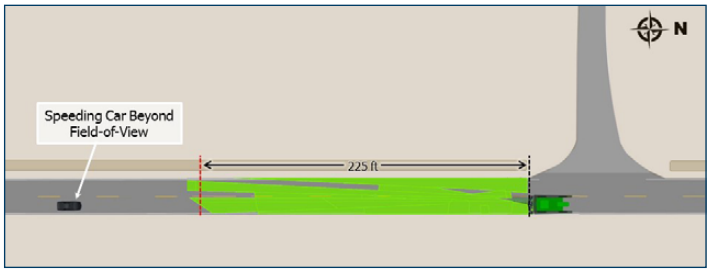
Once Erickson created a comprehensive point cloud model of the sprayer, he used CAD software to project the sprayer operator's sightlines (available with the sprayer's exterior mirrors) onto the roadway surface. This data allowed a precise field-of-view to be established.

The point clouds showed all of the areas that the sprayer's driver could have seen to his rear if he was using the equipment's mirrors. "Some areas might have been obstructed by the sprayer's large booms and chemical tank," Erickson explained. "The line of sight goes back about 225 feet, which is far enough that the car would have been visible if it was going the speed limit."

A 3D model of the sprayer, as captured with the FARO Laser Scanner, is digitally inserted into the scene of the crash to show the driver's field-of-view.

Case Settled Shortly After Scan Data Presented

This case turned on Erickson's analysis of the sight lines based on the data he captured with the FARO Laser Scanner. "The scanning was very valuable because it allowed us to show the entire scene plus the measurements," Erickson commented. "I could not have done the same analysis reliably without the laser scans. That's the power of the FARO scanner. The scans preserve the evidence forever."



After analyzing the scanned data, Erickson concluded that due to the excessive speed of the approaching car, the driver of the sprayer had no opportunity to see the vehicle before initiating the turn.

The plaintiff in this case hired a forensic expert to investigate the case for its side, but that investigator was unable to perform an analysis anywhere similar to Erickson's. Erickson said that he offered testimony about how he performed laser scanning on the sprayer to create a 3D model of its driver's line of sight relative to the car. According to Erickson, "The case settled shortly after."

Erickson attributes the successful outcome for his client to his ability to apply the FARO^{3D} X 130 Laser Scanner to the case. "It puts my client and me at a tremendous advantage to have completely accurate 3D data," Erickson said. "In forensic work, everything is based on evidence. I call it evidence-based reconstruction. The scanner will capture everything you need in the point cloud so you can get exact measurements between any two points in the scene."

The laser scanner's ability to document millions of evidence data points is a key attribute, but its usability is also important. Erickson appreciates that the FARO Laser Scanner is compact and lightweight, has an integrated camera, and is simple to set up and take down. "The FARO Focus is incredibly intuitive," Erickson noted. "Data collection is simple, fast and, in contrast to traditional survey equipment, only requires one person. The captured data can make a huge difference in how a case is resolved." Ultimately, this case was settled out of court.

Views of the point cloud of the sprayer, scanned with the FARO^{3D} X 130 Laser Scanner

Customer Background

Mark S. Erickson, P.E., is a forensic engineer with 15+ years of experience focused in the fields of crash reconstruction, impact biomechanics and product/premises liability. Mr. Erickson's research and publications have focused on vehicle dynamics (including active stability control systems), crash reconstruction and the dynamics of occupant response. He is a licensed Professional Engineer and accredited traffic accident reconstructionist.

Mr. Erickson is a certified "black box" Crash Data Retrieval (CDR) technician and CDR data analyst for both passenger cars (light vehicles) and heavy commercial trucks. Since 2014, Mr. Erickson has been using FARO Laser Scanning solutions for forensic evidence documentation. He is certified in both the operation of FARO Focus Laser Scanner and the processing and interpretation of scan point cloud data.

Additional information on Mr. Erickson's forensic work can be found online:
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