3D Laser Scanning and Animation for Analysis of Officer Involved Shooting Events - A PSI Case Study.

On August 24th, 2008, CHP Officers Walling and Coffman were led on a hi-speed pursuit in the outskirts of Stockton by Joey Pinasco. The pursuit ended on a little-used dirt road when Pinasco lost control of his Chevy pickup and swerved into a drainage ditch. After giving verbal commands to "Stop! Show me your Hands!" Officer Coffman positioned himself near the front of the Chevy and officer Walling approached the Chevy and knocked on the window. At this time Pinasco pressed the accelerator and began spinning his tires and heading towards officer Coffman, causing both officers to discharge their firearms, killing Mr. Pinasco. Mr. Pinasco's family sued the state for violation of Mr. Pinasco's civil rights and negligent homicide.

Craig Fries of Precision Simulations Inc. (PSI) was retained by Sacramento-based supervising Deputy Attorneys General Peter Meshot and Alberto Gonzalez to assist with analyzing the large amount of physical evidence in order to facilitate visualizing the event for both themselves and the jury via 3D Computer Animation of the event.

Mr. Fries' firm, PSI, approached the challenge using a three-step process:

## 3D Laser Scanning Preserves ALL the Physical Evidence

Imagine a tool that could effectively capture the entire scene, including all fixed objects, vehicles and physical evidence, and bring it into your expert's lab for in-depth analysis. 3D Laser Scanning is a revolutionary scene and evidence mapping system that automatically takes millions of precision 3D measurements, effectively preserving the 3D scene in exacting detail for later use in analysis and 3D modeling.
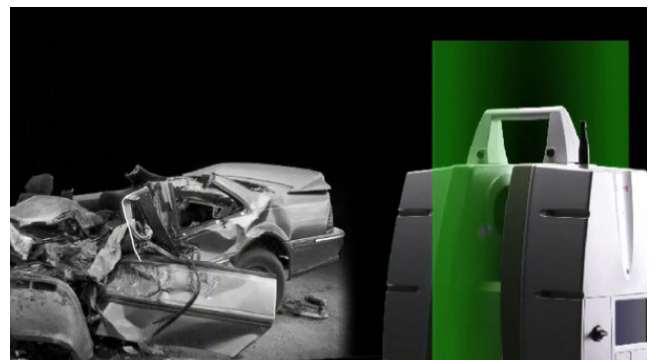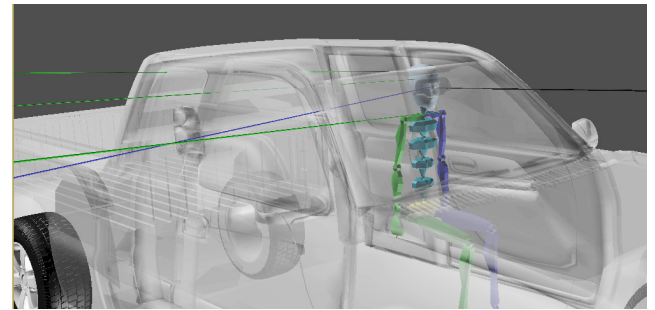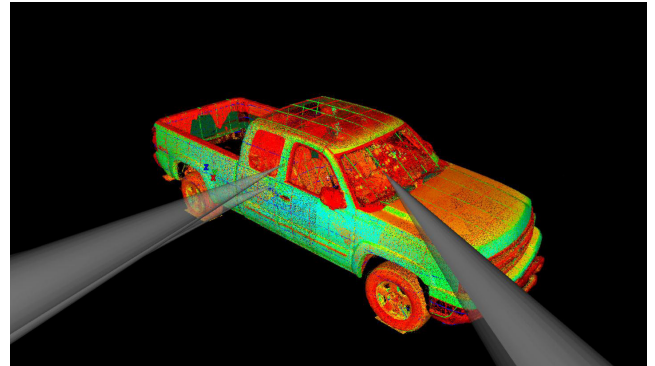
Unusual to this case is that 3D laser scanning was used by _both_ the CHP and PSI to document critical aspects of the evidence – the CHP first used laser scanning to document the "hot" scene to preserve it exactly as they found it, then PSI laser scanned the Chevy pickup after the Department of Justice firearms examiner had inserted trajectory rods into the bullet perforations found in the Chevy pickup. The precise 3D models created from this data formed the basis for the 3D Working Model used in the detailed analysis to accurately reconstruct the entire event.
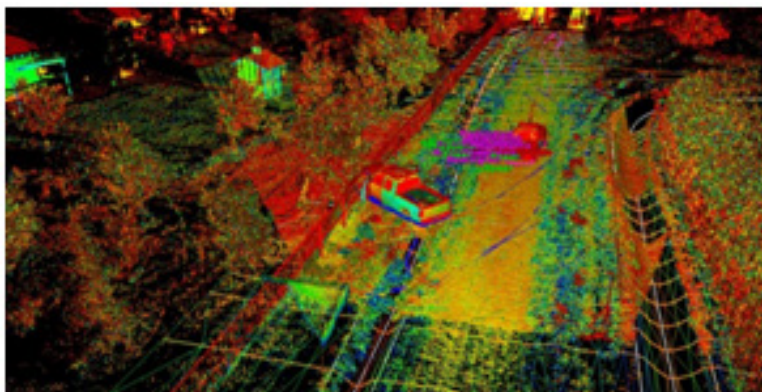
Laser Scan Data:
22 Million Data Points of Incident Scene and
ALL evidence
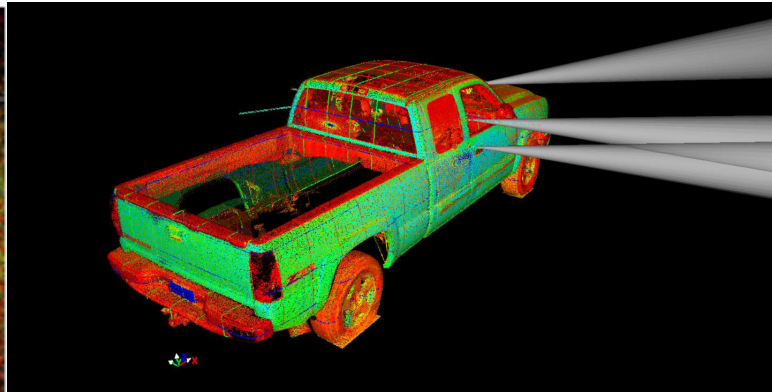
Laser Scan Data:
*Mr. Pinasco's Chevy with Ballistic*
Trajectories mapped
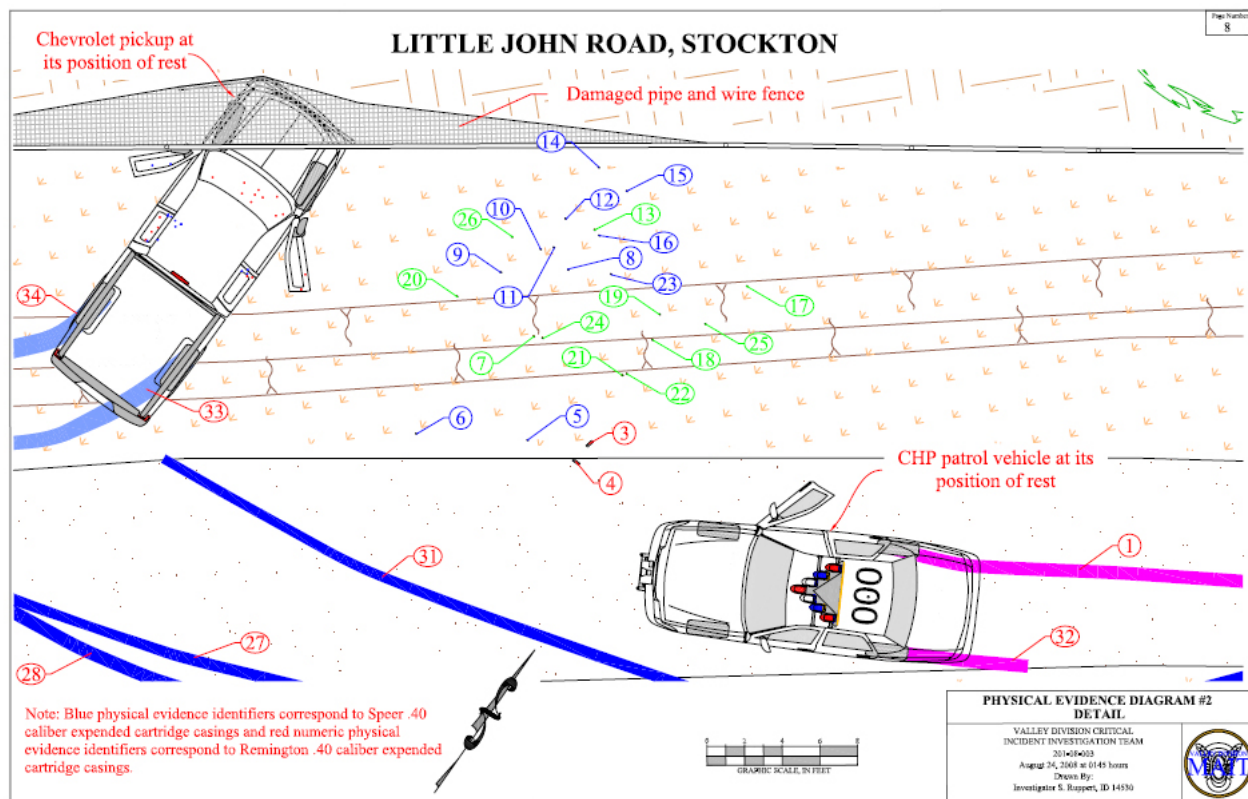
Diagram of Evidence documented at scene via 3D Laser Scanning

In addition to providing the highest level of measurement accuracy, the 3D Laser Scanner offers the expert a unique opportunity – to create a virtual accident or crime scene (3D Working Model) and use this model to perform exacting reconstruction analyses directly within the computer. The benefit of this approach lies in the computer's power to precisely control all the dynamic elements and visualize the results of different input assumptions. This allows the expert to test each assumption and hypothesis and continuously refine the reconstruction until the best match to the physical evidence is achieved. PSI pioneered the use of the 3D Working Model and used it extensively in this case in the following areas:

- Vehicle dynamics - Derived from yaw marks documented via laser scanning and analysis provided by defense expert Tom Shelton. PSI uniquely located the vehicle dynamics within the laser-documented incident scene to provide the basis for determining the officers' positions relative the moving vehicle.

- Officers shooting locations - Derived from spent cartridge casings and secondary live-fire tests of their specific firearms and ammunition. PSI correlated these positions to the known evidence locations within the 3D Working Model to derive accurate officer locations at the time their firearms were discharged.

- Timing of rounds fired - Derived from live-fire testing performed with each officer and matched directly to laser-assisted ballistic trajectory analysis on vehicle and plaintiff. PSI used this date to synchronize the officers discharged rounds with the location, speed and trajectory of the moving Chevy pickup.

- Synchronization of vehicle position and officer actions - Derived from ballistic analysis and human performance data provided by defense expert Jared Zwicky. PSI used the Working Model to assist the expert in refining when the shooting occurred and when it stopped, relative to the plaintiffs location.
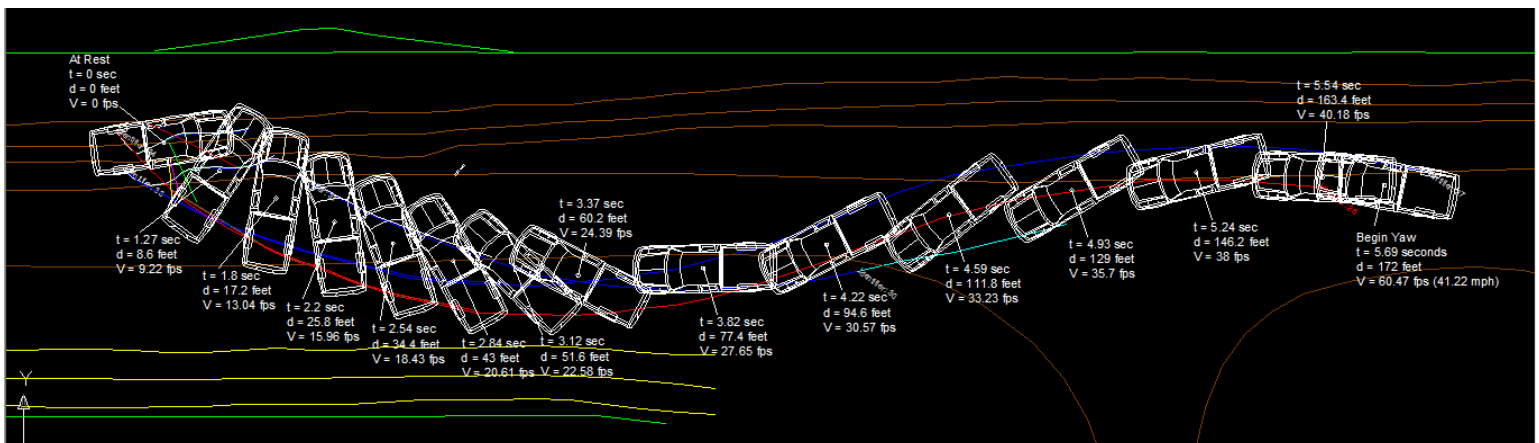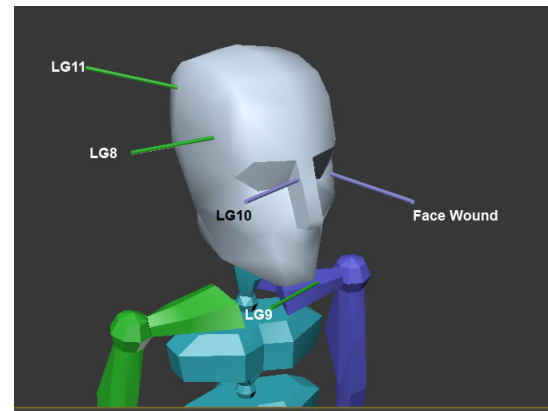

Vehicle Kinematics Data Developed by Defense Expert Tom Shelton

Conclusion
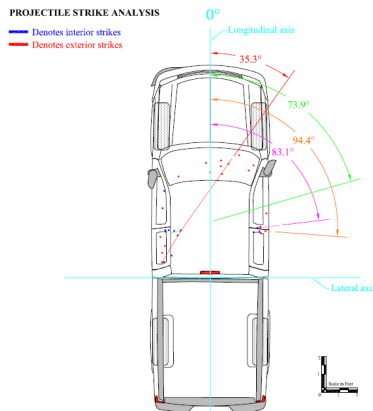
Bullet trajectories documented by Department of Justice

3D Model of Driver Wound Trajectories developed by PSI

3D Animation "Turns Jurors Into Witnesses"

Once the analysis was completed and checked to ensure it maintained fidelity to All known physical parameters, the results were visualized using state of the art 3D forensic animation. PSI's forensic field crew recreated the initial positions of both the Chevy pickup and the CHP patrol car, under similar celestial lighting conditions as the evening of the incident, and captured Hi-definition video footage of the scene. This footage served as the background for the final animation, providing the most accurate visual match possible to the conditions of the event. To further enhance the realism of the animation, the audio of a Chevy pickup revving its engine and spinning ties on dirt was recorded off-site and added to the animation. The officer's commands to Pinasco prior to the event were also recorded using voice actors and overlaid at the proper time into the animation. The jury viewed the animated reconstruction during Mr. Fries' testimony and later cleared the officers of all Civil Rights Violations.