

## FIELD NOTES

### Forensic Survey: Accident Reconstruction

In the wake of an accident, experts are employed to aid in the reconstruction of the events that led to it. These experts provide vital functions ranging from the identification of contributing factors to presentations in a court of law. Accurate documentation of the "crash environment" is vital for these experts.

To determine the most probable scenario leading to the accident, physical elements such as skid marks, road settings, potholes and shoulder conditions are analysed. Guard rails and utility poles are also included in the assessment. Weather and lighting conditions (which can contribute to an accident) also need to be included in the assessment, but these conditions can hinder traditional data collection methods.

Lidar technology is currently being deployed by police organizations and surveyors alike for a variety of applications, including accident reconstruction. Since an accident can happen at any time, rain, snow and darkness can limit traditional data collection methods such as photogrammetry. Lidar scanning units that are rated to operate in inclement weather as well as independent of ambient lighting are ideally suited for quick, accurate and efficient on-site data collection in virtually any circumstance.

With the advent of ground-based lidar scanners as an acceptable form of fast and accurate 3D data collection, the Toronto Police Force is investigating the possibility of using lidar technology to assist them in accident scene reconstruction. On September 1, 2002 at 20:00 Northway-Photomap Inc., a Toronto-based survey company employing Optech's ILRIS-3D laser scanner, was contacted by Toronto Police to assist them in an accident scene investigation. A crash had occurred at a busy intersection involving a single car and a traffic signal pole. A three-dimensional



*Top: Crash scene evidence, featuring five scans merged into a single point cloud dataset. Two bottom images: Digital images of the accident site taken with ILRIS-3D. Images courtesy of Northway-Photomap Inc.*



digital image of the scene was required in the least amount of time possible.

Both the police and Northway-Photomap felt the survey could be conducted more efficiently using ILRIS-3D. As such, ILRIS-3D was used to collect survey points of the scene for reconstruction and forensic analysis.

*Requirements and results on reverse*

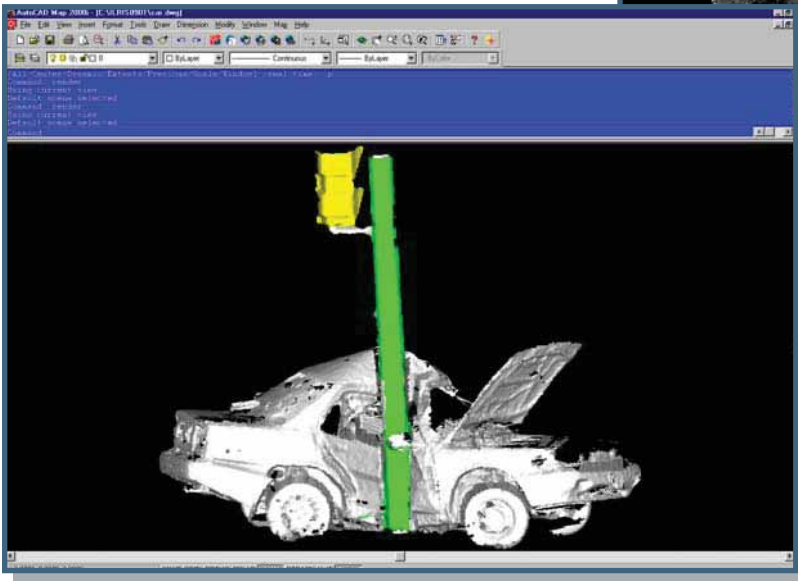
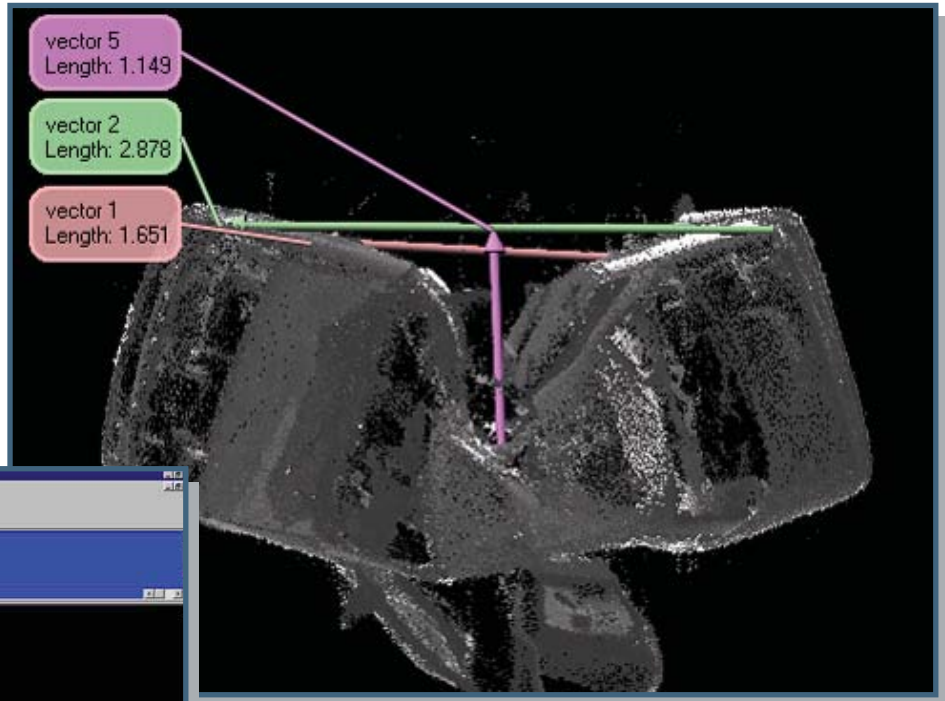


## Crash Scene Requirements & Results

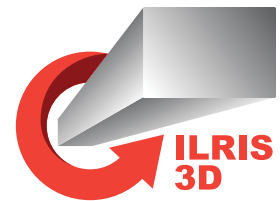
When Northway-Photomap arrived on scene the objective was to collect as much data as required as quickly as possible, in order to re-open the roadway. Unlike photogrammetry, ILRIS-3D is an active sensor and the time of day and low light level was not a factor. The scene was scanned and data captured to sub-centimetre accuracies from distances out to 250 metres. Multiple scans were taken and joined to create a "virtual reality" crash site. Owing to ILRIS-3D's long-range capabilities, a substantial amount of collateral data was also collected including neighbouring trees, poles and curbs, all of which can prove vital in forensic review.

In the post-processing software, the data was analysed with attention paid to the skid marks and point of impact. Through vector placement and other measurement techniques, the dynamics of the collision were determined. An AutoCAD model was then generated and given to police technical staff for evaluation and documentation for court presentations.

The total on-site time required for this exercise was approximately 1 hour, allowing for the rapid re-opening of the intersection. Five scans were taken, consisting of 3,506,402 points, and later aligned and merged in post-processing software. All data was viewed on-site to ensure full coverage, and all possible angles and potential evidence were included. Further processing of the data is ongoing by the Toronto Police technical staff for presentations in a court of law.



Above: Complete merged data set of the crash scene showing the dynamics of the collision through vector placement.  
Left: An AutoCAD model was generated for evaluation and documentation for court presentations.



**ILRIS-3D delivered higher quality, quantitative evidence  
with reduced roadway inconvenience.**



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