Petrolia Line Fatal Collision with Tree

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On Thursday, October 25, 2012, at approximately 0545 hours an eastbound Chevrolet car was travelling on Petrolia Line just west of the intersection with Inwood Road, east of Sarnia, Ontario, Canada. The vehicle was reportedly occupied by the lone, 47-year-old female driver. For reasons unknown the vehicle veered onto the south gravel shoulder where it rotated counter-clockwise, crossed back to the north roadside and then struck a tree. At the time of writing the driver has not been identified. The following discussion and photos are taken from an examination of the accident site on the afternoon of October 25th, or about 10 hours after the occurrence.

The photo below is taken from several hundred meters west of the tree impact and we are looking westbound on Petrolia Line. Thus the Chevrolet would be approaching toward the camera.

Note that the highway is straight and level. You can see the backside of warning sign on the left side of this view and that is the same sign that is shown the next photo below,

which is a view looking eastbound on Petrolia Line but now looking toward the area of the tree impact in the far distance.

If you look in the far distance, on the left side of the road, you may be able to detect our black car which is positioned near the tree impact. Throughout this distance you can see that the road surface is straight and level. There are lines of tar in the pavement where work crews have filled an cracks that could lead to deterioration of the road. So the road has been properly maintained. Having walked on the surface we can also indicate that there were no areas of unusual sagging, depression or upheaval. There was also no significant edge drop off.

The typical scenario is that vehicles travelling at highway speeds usually encounter problems several hundred metres prior their eventual collision and rest position. So the above photo is a good point to evaluate what might have caused the driver to lose control of her vehicle. One option is that some type of animal could have entered the roadway and the driver attempted to avoid it.

Another option is that she might have been involved in a passing motion and had to perform an abrupt action that she was not prepared for. We will see shortly that the passing zone for eastbound traffic came to an end in the area where the vehicle travelled onto the south shoulder. In many instances it is not possible to know, simply

from examining an accident site, why a collision occurred - often some possibilities emerge.

The photo below now takes us several hundred metres eastward to the area just west of where we detected some fresh tire marks on the right (south) roadside. We placed to orange cones on the right shoulder, near the asphalt edge, to demonstrate where the vehicle came onto the shoulder and then where it returned back onto the road surface before finally departing toward the north roadside.

Although there are many tire marks visible on the right shoulder, the tell-tale signs of a fresh, loss-of-control, set of tire marks on a gravel shoulder are not difficult to detect. In this case, part of those tire marks have already been demolished by vehicles travelling onto the shoulder but the marks are still capable of being seen.

The evidence in those tire marks on the shoulder indicates a divergence in the two marks and this indicates that the vehicle is rotating, typically counter-clockwise. With respect to the length of the road, the vehicle entered the right (south) shoulder about 102 metres west of where it eventually struck the tree. It travelled on that gravel shoulder for about 45 metres before it came back onto the road surface, at which point it was already at a substantial angle fully out of control.

In the 102 metres of evidence that was deposited along the vehicle's path there was evidence that the vehicle was decelerating, primarily by virtue of its tires sliding across the pavement and grass. One might consider some rates of deceleration (0.2 to 0.4 g) that might give us some ballpark number of the speed that could have been lost during that 102 metres. The speed loss could be something in the range of 72 to 102 km/h. But the struck tree was actually positioned about 19 metres north of the north road edge therefore the actual distance that the vehicle travelled was at a substantial diagonal to the road and therefore the actual travel distance was longer than the 102 metres measured along the road. So overall, we have a substantial speed loss even before the vehicle struck the tree.

The photo below shows a north-easterly view from the point at the east end of the tire mark as it leaves the south gravel shoulder and the vehicle begins to travel back across the road toward the north roadside. If you look closely at the road surface you should be able to detect the black, curved yaw marks indicating that the vehicle is rotating counter-clockwise. You might also be able to detect a large evergreen tree to the left, and east of our parked car and this is the tree that was struck by the vehicle.

A painted line is often the best location to see the characteristics of a tire mark and the photo on the following page shows a close-up view of one of the yaw marks as it

crossed the yellow centre-line of the road. The angle of the striations in the mark suggest that little or no braking was taking place at this location.

As we cross to the north side of the road we can see in the photo below how the tire marks cross the north shoulder and then travel toward the noted evergreen in the background. For clarity we have placed a line of small orange cones on what we believe to be the left rear tire mark, although we have not studied the evidence in any detail to confirm this.

The various merging and diverging of the tire marks needs proper study to confirm that the tire marks are matched to their proper tires. This would be easier for police or those who were able to see which portion of the vehicle came in contact with the tree. In official investigations we would plot the tire marks on a scale diagram of the site and, using a scale diagram of the representative vehicles we would match the tires to the various tire marks to ensure that our interpretation was correct. As this is not an official investigation we would not perform such studies.

One can generally observe that the extent of rotation is greater in this collision than what we would typically expect. Part of this may be due to the longer distance travelled away from the road and the greater opportunity for the vehicle to proceed with that rotation.

The two photos on the following page take us eastward along the tire marks on the north roadside and toward the noted evergreen tree where the impact occurred.

As we approach the tree in the two photos below we can see that the four tire marks from the subject vehicle are clearly outlined in the grass.

In the two photos below we turn around and view the tire marks from just east of the impacted tree.

It is unfortunate that events unfolded such that the vehicle's impact with the tree was relatively central and that all of the vehicle's remaining speed was lost from the impact. This central impact is evidenced by the fact that the vehicle came to rest at the base of the tree. Had there been some offset from this central impact the vehicle might have rotated, carried on past the tree and this could have resulted in a less severe impact. Often tree impacts result in very localized areas of deep penetration and when that penetration is to the "greenhouse" area of the occupant compartment it is difficult to develop a reliable safety device that can consistently protect that occupant in all cases. But it has been observed that, with non-central impact, and where the occupant's direction of motion is away from the direction of force, injury can be remarkably lessened.

As a point of clarification, what we stated above (occupant motion not in line with direction of force) is not a misstatement of Newton's Third Law (i.e. forces are equal and opposite). It is just that the existence of rigid bodies of certain lengths and widths, accompanied by rotation, and taking into account the seated position of the occupant, means that real life is more complicated than what the simple law may appear to state.

Gorski Consulting
London, Ontario, Canada