Loss-Of-Control SUV Crash Results in Fatal Injuries to Ingersoll Man - A Review of Evidence at the Accident Site

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It was reported that at approximately 2030 hours on October 8, 2012, Leonard Bader, 45, of Ingersoll, Ontario was the driver of a westbound SUV on Road 88 In Zorra Township, Oxford County, Ontario. The vehicle "drifted into oncoming traffic" and was struck by an eastbound minivan. As a result of this impact Leonard Bader sustained fatal injuries.

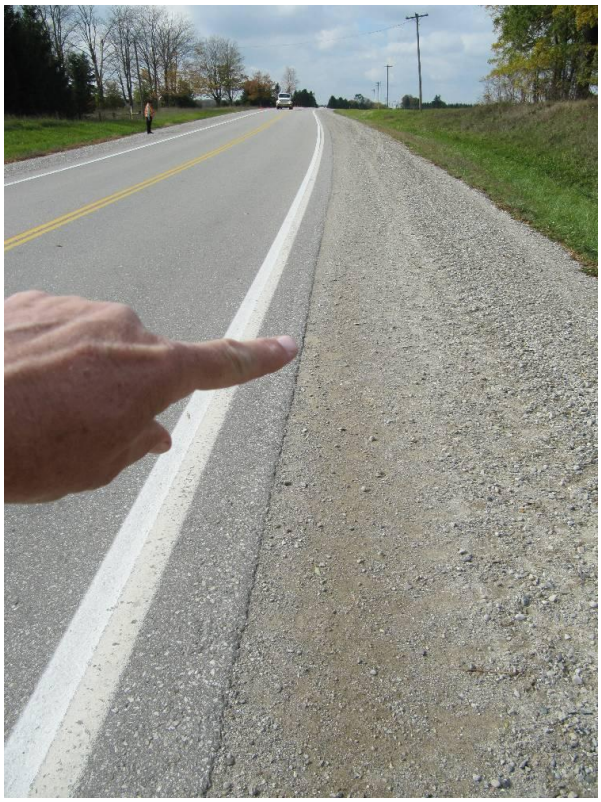
Gorski Consulting examined the collision site on the afternoon of October 9th. Below is a view looking west along Road 88. The impact occurred about 500 metres east of Oxford Rd 6. The west end of the bridge shown in this photo is located about 225 metres east of that area of impact. Thus the present photo is taken from approximately 300 metres east of that area of impact.

You can see in the background, past the bridge, that Road 88 curves to the left. In the vicinity of this left curve the Bader SUV's right wheels travelled onto the right (north) gravel shoulder and this is where the vehicle began to rotate out of control.

The photo below now takes us just west of the bridge which in now behind the camera. In the far distance there is a man standing on the south shoulder and we will see that same man in several of the following photos. The position of this man can be used to gain an appreciation of the distances shown between the various photos.

The top left photo on Page 3 shows the location where the SUV first travelled off the road surface and onto the north gravel shoulder. You can see the man standing on the south shoulder in the background and he is at the same position as he was in the previous photo. We noted that the vehicle first exited onto this north shoulder at a distance of approximately 142 metres east of the eventual area of impact. The top right photo shows an assistant pointing to the location of the tire mark on the north shoulder.

In the bottom left photo on Page 3 the finger is pointing to the tire mark as it is leaving the north shoulder and begins re-entering the road surface.



The bottom right photo on this page is looking westbound in the eastbound lane and it

indicates how the SUV crosses the roadway centre-line and travels onto the south gravel shoulder. The tire mark produced on that south shoulder has be out-lined by a series of small orange cones placed along its path.

The above-left photo shows a westbound view of the tire marks as the SUV travels across the eastbound lane and enters the south gravel shoulder. The above-right photo shows the diagonal striations that accompany the tire mark as it crosses the white edge lines at the south edge of the eastbound lane.

Our measurements indicate that the SUV was on the north shoulder between approximately 100 and 142 metres east of the area of impact and during this distance the vehicle began to rotate counter-clockwise. It then crossed the road and entered the south shoulder at about 56 metres east of the area of impact. While approaching the south shoulder the driver attempted to re-direct the vehicle back toward the road but

induced a clockwise rotation which brought the left rear tire back onto the road at about 19 metres east of the area of impact. The photo below shows the path of the left rear tire of the vehicle (outlined by the orange cones) on the south shoulder as the vehicle's clockwise rotation is in effect.

You may note that our vehicle is parked on the south shoulder in the background and the area of impact is closer to the camera than that parked vehicle. The photo at the top of Page 6 brings us further westward along that south shoulder and the orange cones indicate how the left rear tire re-enters the roadway. At this point you might also observe a dark tire mark approximately in the middle of the eastbound lane that was caused by the left front tire of the SUV. This demonstrates that the SUV is progressively rotating into a sideways slide, leading with it left side as it re--enters the roadway.

The photo at the bottom left of Page 6 shows the left rear tire mark while the photo at the bottom right shows the left front tire mark as they both travel toward the area of impact in the centre of the road.

It is sometimes possible to examine the angle of the striations in a yaw mark and establish what steering and braking actions were performed by the driver. This is the theory presented by some researchers ("Determining Vehicle Steering and Braking from Yaw Mark Striations", Beauchamp et. al, SAE Paper #2009-01-0092). The analysis and hypotheses are somewhat complicated but some rudimentary facts indicate that striations in a yaw mark that are perpendicular to the length of a tire mark caused by a rear tire indicate that there is no braking applied by the driver.

We can look at the angle of the striations of the tire mark produced by the left rear tire of the SUV, shown in the bottom right photo on Page 6. The striations near the bottom of the photo are definitely not perpendicular to the length of the mark and, as we look further in the background, those striations appear to become almost parallel to the length of the mark. That interpretation becomes quite obvious when we take a close look at that tire mark near the area of impact, as shown in the large photo on Page 8. Clearly, the striations in the tire mark appear to run parallel to the length of the tire mark.

If the theory held true then, if we examined the tire mark caused by the left front tire then it too would show evidence of the striations running parallel to the length of that tire mark. We can see the characteristics of that left front tire mark on Page 9 through 11. These three photos follow the left front tire mark as it approaches the area of impact. Clearly, the striations are already at a substantial angle in the photo on Page 9 and they become essentially parallel to the length of the tire mark in the photo on Page 11. Since the tire marks caused by both of the left side tires show the same pattern it would suggest that Mr. Bader was applying his brakes as his vehicle was on the wrong side of the road and that the brake application was probably near maximum just before impact.

Unfortunately at the location where the vehicle first began to rotate, while on the north gravel shoulder, there is no opportunity to examine any striations because these would not reveal themselves in the gravel. It was noticed however that the north gravel shoulder was relatively soft and indicative of some recent re-grading. A soft gravel condition would make it more likely that a driver might lose control of a vehicle. However, one must also consider that this vehicle left the roadway at about 142 metres from impact and during this 142 metres it was decelerating. That deceleration was certainly substantial on approach to impact. So the speed of the vehicle is an issue.

The photo below is a view, looking east, from just west of the area of impact and it is possible to see the two dark tire marks caused by the two left side tires of the SUV as it slid sideways. It is also possible to see the curve of the road in the background which was shown from the opposite direction in the earlier photos.

The evidence in the above photo is quite typical of what you might expect at the area of impact of two vehicles approaching each other from opposite directions. There will be gouges created in the pavement where one of the vehicles, or both, make contact with the pavement. One gouge is quite visible and it is located at the end of the tire mark caused by the left front tire of the SUV. This gouge is visible in the bottom left corner of the above photo.

Its characteristics are more visible in the closer view of the gouge shown on Page 13. Note how the angle of the tire mark changes as the impact occurs and then, as further deformation occurs at the left front wheel, the gouge is likely caused by the rim of the left front wheel.

It is not surprising that there are a number of fluid stains in the area of impact as it is quite common for these fluids to burst from the engine compartment of each vehicle. Dark fluid stains are often caused by oil. White stains are caused by battery acid. The fluid stains at the area of impact are often characterized by explosive "spraying" of the fluid. As vehicles leave the area of impact there will be a trail of fluid showing the vehicle's path. At the final rest position of a vehicle the stain will form a puddle as the escaping fluid has time to drain away in one location.

The process of interpreting the meaning of fluid stains comes with variable success because one must realize that emergency personnel such as police, paramedics and towing operators will move through the evidence and destroy and alter it. Sometimes the deciphering of these actions is successful and sometimes it is not.

One unique characteristic of this collision is that we have not found any evidence relating to the pre-crash position of the so-called eastbound minivan. This is unusual in that, in almost all cases, there is at least a short tire mark or scrape that can be used to position the vehicle.

Let us step back westward and examine what the eastbound driver of the minivan might have been able to see in the few seconds of approach toward the impact. The photo at the top of Page 15 shows an eastbound view , looking along Road 88, from several hundred metres west of the area of impact. You might be able to detect the position of our parked vehicle on the south (right) shoulder of the road in the distant background. The 500 metres of this road leading eastward from the intersection with Oxford County Road 6 is straight and relatively level. It is not until the last 100 or so metres prior to the impact the road begins a slight curve to the left.

The gradual nature of that curve is exemplified in the bottom photo of Page 15 which brings us further eastward and closer to the area of impact. One can judge the closer distance by noting how our parked car has come much closer into view.

The photo at the top of Page 16 is almost adjacent to the parked position of our car and now you might begin to distinguish those tire marks and stains in the middle of the road, in the background, where the two vehicles collided. Looking at the left (north) shoulder of the road, across from the parked position of our car, you might see some disturbance in the shoulder and this was caused by the towing personnel as they removed the SUV which came to rest in the north ditch. This disturbance is more clearly visible in the bottom photo of Page 16.

Determining the final rest position of the eastbound minivan is surprisingly less clear since the post-impact motion of a substantially damaged vehicle is normally outlined by a trail of physical evidence. While a trail of evidence exists leading from the area of impact it is not clear whether this trail was caused by towing personnel or if the minivan was pushed backwards by the impact.

The photo below is a view looking eastward from the south road edge and the area of impact is located approximately in the middle of the view. In the foreground you should see some stains and a trail of markings coming toward the camera and stopping near the south road edge. These markings were likely deposited by the minivan but it is not clear to us that they were created during the impact. This is so because there is a large area of fluid staining at the area of impact and such staining is typically caused at the final rest position of a vehicle that has sustained front end damage. It would also be atypical for the eastbound minivan to be pushed so far backwards as this would suggest that the speed of the SUV at impact was much greater than the speed of the minivan.

Not everything can be explained from simply looking at the results of an impact at an accident site. That is why, in an official investigation, we would strongly request that we be allowed to conduct thorough examinations of both vehicles.

Even without the opportunity to examine the vehicles, our continued exploration of accident sites had improved our observational skills. The ability to examine the vehicles typically results in a less-focused study of the debris at an accident site. By not having the opportunity to see those vehicles we must explore the debris and consider what information it might contain about the damage to the vehicles.

For example, earlier in this article we discussed the striations in the SUV's yaw mark and described research that suggested the driver of the SUV might have been braking at the time of impact. While that conclusion remains open, there is debris at the site that could help provide further information on that issue. The photo below shows a piece of wheel-well liner that came from one of the colliding vehicles. If you look closely at the bottom of that liner you should see an imprint of the sidewall and tread of a tire.

The photo at the top of Page 19 provides another view of that imprint. This evidence indicates that the tire was pushed sideways against this liner. There are distinct outlines of the individual tread blocks of the tire and you might even be able to read some of the labels from the tire. Such well-defined markings occur when a tire is not rotating, or rotating very slowly at the time of impact. A rotating tire would cause smudged, circular scuffs on the liner. So this evidence suggests that one of the vehicles' tires was not rotating at impact. But which vehicle?

Well, based on probability, the minivan might sustain front damage where the impact force would generally be from the front rearwards and this type of force would not cause its tire to be pressed against the wheel well. However we see clear evidence that the SUV was sliding sideways at the time of impact and we also saw a gouge at the end

of the tire mark caused by the left front tire that would suggest that this wheel sustained a substantial impact resulting in the wheel rim making contact with the ground. Such a force at the left front wheel would be expected to push the left front tire against its sidewall. So it is quite possible that this liner came from the left front tire of the SUV and that it supports the yaw mark evidence that the driver of the SUV might have been braking at the time of impact.

There is further evidence found in the debris at the site that indicates one of the vehicles was braking at the time of impact. In the photos on Pages 20 and 21 we can see a taillight bulb that we removed from a housing that was lying on the ground. Recall that the tungsten filaments of these bulbs will stretch when illuminated and this is a classical way of determining whether a brake, signal or headlight was on at the time of a crash. The current bulb contains two posts for each filament which is stretched across the post. You should see that there are two shorter posts which contain the thicker filament of the brake light and two taller posts that contain the thinner filament of a signal/ident light. By looking at the various views of the filaments you should come to the conclusion that both filaments exhibit "hot shock" deformation and therefore both were illuminated at the time of the crash. So, which vehicle did this filament come from. Again, we have to examine the probabilities.

The photo below shows the tail-light housing as it was found lying in the grass.

The probability is low that it came from the minivan because we would expect the major damage on that vehicle to be located at the front end. It is more likely that the housing came from the left rear of the SUV because that vehicle was sliding sideways and leading with its left side as it approached the impact.

Generally, filaments do not stretch like this unless they are located close to the area of impact. So we would expect that there was substantial contact to the left rear corner of the SUV. But if we already determined that there must have been major contact to the left front wheel then that suggests that there was a broad area of damage across the left side of the SUV. We say this because a typical SUV might be about 5 metres long depending on its actual size, and the rearward distance from the front bumper to the front wheel hub would likely be somewhere in the range of 1 metre. Thus direct damage would need to occur over a width of about 4 metres of the left side of the SUV. But if the minivan is likely less than 2 metres wide then we need to explain how 4 metres of damage could exist along the SUV when the van is only 2 metres wide.

One possibility is that there was a form of sideswiping action occurring such that the left side of the SUV slid along the front end of the minivan. This possibility is reasonable since the SUV did not stop at the area of impact but carried on into the north ditch.

Another possibility is that the minivan driver steered sharply to left in an attempt to avoid the SUV which would be coming onto the road from the south shoulder. This is also a reasonable possibility because the gouge from the left-front wheel rim of the SUV was found in the westbound lane and this would mean that the minivan had to cross the centre-line of the road before impact.

It may be possible to analyze this further without the convenience of knowing what the damage looks like on the vehicles but this would take considerably more time and we are not prepared to invest that time for this case where we are only discussing the evidence from an educational perspective. An official investigation would involve our actual examination of the vehicles or we would have access to the police investigation materials and their on-site photos.

We want to conclude our discussion of this incident by considering what might have caused the SUV driver to travel off the road surface and therefore what factors caused this collision to occur.

Having examined a large number of previous similar incidents we would point the obvious finger at the speed of the SUV and perhaps a little lack of attention. Judging by the length of the vehicle's travel on the shoulders, coupled with the likely severity of the impact, and then the distance that the SUV travelled to final rest, indicates to us that an official analysis would likely reveal a high speed on the part of the SUV driver. But there is no specific information to say that the driver was inattentive and this is what caused the vehicle to travel onto the north shoulder. Our recent articles about the testing we have been performing on the seven S-curves on Adelaide Street will indicate that the curve at the present site was not challenging and should have resulted in relatively mild lateral acceleration of the vehicle, even at speeds well above the posted speed limit. So the actual speed of the vehicle cannot be fully blamed on the vehicle leaving the road surface. So what else could possibly be another factor?

Well, we did a search of the roadsides in the area where the vehicle travelled onto the north shoulder and we came across a discovery in the gravel shoulder as shown in the photos on Page 23. The final photo on Page 24 provides a close up of one of the many fresh imprints in the gravel shoulder.

As you might suspect these imprints are hoof prints caused by deer and they are quite fresh. We had arrived at this accident site at about 1140 hours on October 9th and the collision reportedly occurred at about 2030 hours on the evening of October 8th. So approximately 15 hours had passed since the accident. Since police reconstructionists were likely present because this was a fatal accident they would undoubtably wait until the sunrise of the morning of October 9th so they could get a good look at all the evidence in daylight. Thus they would likely have not opened the road to the public very much earlier than our arrival. Thus the opportunity for deer to be walking along the shoulder in the 15 hours after the collision is not great.

So there is a reasonable likelihood that these hoof prints might have been present sometime before the accident, or they might even have been created at the time of the accident

There might not have been any evidence of an impact with a deer but it is also possible that the driver of the SUV, Leonard Bader, saw the deer on the shoulder, or even on the road surface, and attempted to avoid them by steering onto the north shoulder. We cannot know if any of this occurred. Certainly police would have additional evidence that could support a different conclusion.

In the photo on Page 26 we show the view that a deer might have made if it had been standing on the south side of the road, near the line of trees and looking toward the east from which the SUV emerged. That view is well blocked by the trees such that the bridge is not even visible from this location. If we consider that the SUV was travelling very quickly it would be a considerable distance away to the east when a deer might decide to venture toward the road. So there is some reason to consider this possibility as a factor.

Obviously we have no evidence to say that a deer was involved in causing Leonard Bader to lose control of his vehicle. But this discussion is a way of making the point that collisions can be caused by many factors, and many times by a number of factors that come together to form a uniquely threatening situation. Yet the effect of some of these factors might never be revealed in any investigation.