

STAGED LOW SPEED COLLISIONS

By Sam Kodsi, B. Eng., P. Eng.

Many Forensic Engineers/Accident Reconstruction Experts will shy away from defining a “Low Speed Collision.” The reason may be due to the subjective nature of the topic. Most, will however agree that Low Speed Collisions usually involve relatively minor damage and low speed change to the involved vehicles. Staged Low Speed Collisions also entail intentional contact/impact between vehicles, other stationary objects and/or “inflicted” damage with foreign items in order to submit illegitimate claims.

Over the past year or two, there has been not only an increase in claims arising from all types Low Speed Collisions, but also a dramatic rise in claims from Staged Low Speed Collisions. The Accident Benefits claim, including the witness statements, may contain some inconsistencies, however, that alone may not be grounds to deny the claim. The task of defending against illegitimate Low Speed Collision / Accident Benefits claims involves the contribution of the:

- Auto Physical Damage Appraiser,
- Accident Benefits Adjuster,
- Special Investigation Specialist,
- Accident Reconstruction Engineer, and possibly
- Medical Professional
- Legal Professional

An Accident Reconstruction based on the physical evidence may prove to be an invaluable tool here. It becomes of the utmost importance to thoroughly document the damage details of vehicles involved in Low Speed Collisions in order to identify if:

- The vehicles could have come into contact
- The collision could have occurred as reported, even if contact did occur
- The speed changes and accelerations experienced by the occupants could have been above injury tolerances

Types of Low Speed Collisions include:

- Inline (Front/Rear end) Collisions
- Lateral (Side) Collisions
- Angular Collisions (A combination of an inline and a side Collisions)
- Sideswipe Collisions
- Other

DOCUMENTATION

Vehicle side damage is usually apparent since sheet metal deforms easily in side, angular and sideswipe impacts. Scratches, scrapes, scuffs and paint transfers are also usually apparent in impacts to vehicle sides. On the other hand, vehicle front or rear damage may not be apparent, since bumpers are designed to protect the vehicle and not the occupants during Low Speed Collisions. Bumpers are usually constructed of energy “absorbing” components such as isolators, foam core, plastic honeycomb and/or metal reinforcing bars. Bumpers may thus contain hidden damage that must be documented, which may even require disassembly. Passenger vehicles are in fact required by Canadian Motor Vehicle Safety Standard (CMVSS) 215 to undergo front and rear barrier impacts tests at 8 km/h and remain drivable. Light trucks, SUVs and minivans are exempt from CMVSS 215 and can thus sustain more damage in the above tests. Wheels and pillars are also resistant to deformation. It is important to keep in mind that what is NOT damaged is just as important to document as what IS damaged.

Vehicle damage tolerances vary significantly according to:

- Year, Make and Model of Vehicle
- Location (in all dimensions) of Point of Impact on vehicle
- Direction of Force

Damage photographs should be taken as soon as possible following the collision. The photographs (about 8 or so) should cover the whole vehicle from the angles illustrated in figure 1, any prior damage, before “zooming-in” on the contact area(s) and details of the damage related to the collision in question. Note that the entire vehicle width or length or both should be visible in every photograph taken per Figure 1. For inline collisions, photographs of the underside of the bumper and its supports should also be taken. The use of a measuring stick/tape for scale is also beneficial.

An Accident Reconstruction Engineer also conducts damage examinations and documentation by:

- a) Disassembly of components as required to reveal hidden damage
- b) Description notes and diagrams
- c) Measurements in terms of location on the vehicle: length, width, height and depth

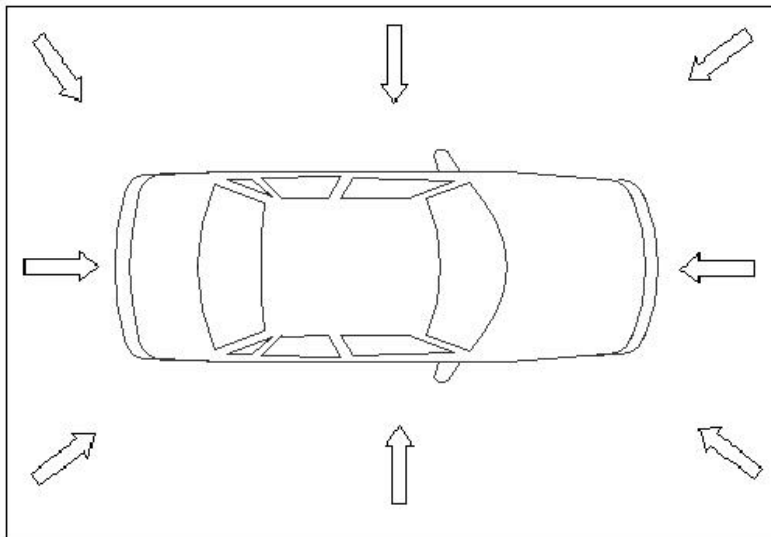


Figure 1: Vehicle Photograph Angles

DAMAGE/EVIDENCE TO WATCH FOR

- Several/separate points of impact/contact
- Sharp damage including small dents, short contact areas, etc., which may be consistent with an impact with a narrow object such as a pole
- Rough scratches or scrapes which may not be consistent with an impact with another vehicle (such as a rough masonry surface)
- Irregular damage profile/abrupt changes in damage magnitude. Note that in most Low Speed Collisions (between vehicles), the damage profiles are continuous with gradual deformation, usually telling of the direction of impact forces
- Non-existent or inconsistent color paint transfers
- Inconsistent damage locations with the reported sequence of events
- Inconsistent contact damage severities and/or heights
- General inconsistencies of other damage details

ANALYSIS

The Accident Reconstruction should establish:

- If the contact between the vehicles did (not) occur as reported via a comparison of the vehicle(s) damage details (locations, profiles, magnitudes and other specifics) or lack thereof
- If the damage could (not) have been sustained in a motor vehicle collision or if the damage was consistent with “inflicted” damage with foreign (non-vehicular) object(s)
- If the collision could (not) have occurred as reported via a comparison of the vehicles’ damage details with the reported sequence of events of collision
- If the collision did occur, the vehicle and occupants’ speed change/forces and hence collision severity from vehicles’ damage magnitudes
- If the speed change/forces assessed were above or below recommended injury tolerances
- If the speed change/forces are comparable to exemplar activities experienced by human test subjects

Inline (Front/Rear end) Collisions

The Accident Reconstructionist may analyze the damage locations around the perimeter of the vehicle, severities and contact heights consistency between the vehicles in staged inline collisions. This would be conducted while keeping in mind that a vehicle pitches clockwise (nose dives) under braking and vice versa under acceleration, which changes the front bumper height. The degree of pitch depends upon a number of variables, primarily the type of vehicle and the magnitude of deceleration. The Accident Reconstructionist may also analyze other damage specifics such as the direction of scratches.



Lateral (Side), Angular and Sideswipe Collisions

In staged side, angular or sideswipe collisions, the Accident Reconstructionist may analyze the damage locations, severities, heights and also the profile between the vehicles in order to establish the longitudinal collision direction. The damage on the side of a vehicle illustrates the direction of the collision; i.e. if the striking vehicle was moving forward/rearward with respect to the side of the struck vehicle.



Other Collisions

These incorporate a combination of any of the above collisions, or even other single vehicle maneuvers or impacts, and are very case dependant.

Staged angular/lateral intersection collisions have been noted to be recently on the rise. These may be modeled as a combination of frontal/side collisions. The reported collision scenario is usually as follows: One vehicle is traveling along a main road, when a second vehicle comes out from a side street and strikes the side of the first vehicle with one corner of its front end. A "closer" look sometimes reveals that the vehicles' damage is inconsistent with any contact between another vehicle or inconsistent with the stated sequence of events. If contact did occur between the vehicles, the second vehicle is often driven into the first one, while the first vehicle is stopped.

New Accident Reconstruction Tools

Sensing and Diagnostic Modules (SDMs) have been installed on some vehicles manufactured by General Motors since 1990. The module, which is the vehicle's front air bag "computer" has evolved and is now installed on almost every if not all GM vehicles. This is a mini "black box", if you will, which was a previously exclusive technology to the aviation industry. The module, which records certain crash data in some collisions (primarily containing a frontal component), can also assist qualified professionals in retrieving vital crash information (via a crash data retrieval system which consists of hardware and software) to supplement the collision analysis. The data may be downloaded via the vehicle's OBD (On-Board Diagnostic) connector, without removing the SDM module. Alternately, this potentially crucial piece of evidence, the module may be removed and taken to download the data later. Depending upon the year and model of vehicle, the module may contain all or some of this information:

- Brake status and Throttle position up to 5 seconds before impact
- Vehicle forward and Engine speeds up to 5 seconds before impact
- Air bag warning lamp, driver's seat belt buckle and right front passenger suppression switch status
- Number of ignition cycles at the time of the incident and at the time of the investigation
- Other relevant times and longitudinal speed changes in relation to near deployment or deployment

The above-mentioned information may be used to assess safety restraint systems usage and function and collision severity (in terms of Impact Speed Change). This data may also be compared with the reported sequence of events in assessing if the collision occurred as reported. For example, to identify:

- If the driver was braking or accelerating to the point of impact
- The vehicle speed prior to and at Impact
- If the driver was wearing his/her seat belt

It is anticipated that other manufacturers, including Ford, will follow in adding SDMs in their vehicles soon. Vehicles are becoming and will continue to become more technologically advanced. SDMs will evolve themselves to record more data (in terms of variables and range/frequency), possibly including other critical information in the "making or breaking" of a case. It becomes of utmost importance to seize that silver box after a collision, even if the air bags did not deploy, before it is altered or damaged.

Low Speed Collision Testing, Collision Severity and Occupants' Response

It is important to note that there is substantial research into vehicle dynamics and bumper behavior in low speed collisions and their effects on the occupants. This research is conducted by national transportation safety authorities, insurance agencies and institutes, automotive crash testing facilities and private engineering firms. There are extensive references published by the Society of Automotive Engineers (SAE) and other sources on Low Speed Collisions. Even though the experimental crash tests are conducted primarily to study the vehicle dynamics and occupant kinematics/response during Low Speed Collisions, the initial crash test parameters and resulting data regarding the post test conditions of the vehicles can be used as a "benchmark" when comparing the outcome of known types of crash tests to vehicle damage resulting from reported Low Speed Collisions in assessing if they were staged.

The vehicle damage can thus also assist in the speed change assessment and hence the severity of the impact. This speed change can then be compared with recommended injury tolerances. This is conducted by performing vehicle dynamics and occupant kinematics and speed change analyses. In other words, comparing the accident vehicle damage to crash tests conducted on exemplar vehicles in order to assess the likely speed changes, accelerations and forces experienced by the vehicle and its effect on the occupants' movements. The speed change is then compared with recommended tolerances of speed changes or forces for injury (obtained mostly from a database of human response in experimental crash tests). The forces likely experienced during the collision can then be contrasted with activities, in which similar forces are sustained, such as amusement park rides.

One of the greatest and most dangerous myths about Low Speed Collisions, even by some accident reconstruction "experts" is that low vehicle damage magnitude and repair costs are indicative that occupant injuries would not be "reasonably expected". As discussed earlier, vehicle damage thresholds vary highly and thus the speed change analysis must be conducted in order to quantify the collision severity.

What to Look for in a Forensic Engineer/Accident Reconstruction Expert in Low Speed Collisions

- Educated (beyond correspondence courses or classes a few hours, days or weeks in duration), licensed (by a regulating body, not “certified” after examinations of limited scope), trained and specializes in Accident Reconstruction as a profession
- Experienced and competent in **Low Speed Collision** analysis
- Has been involved in Scientific Low Speed Crash Testing, utilizes proper sources for testing, reference and research
- A court accepted expert in **Low Speed Collision Reconstruction**
- Assesses collision specifics and severity primarily from vehicle damage (not just witness statements, collision scene, vehicle motion or computer Accident Reconstruction programs)
- Assesses occupant kinematics, accelerations and compares forces to similar activities
- Provides objective opinions based on the physical evidence, even if he/she “believes” that the claim may not be legitimate
- Does not exceed boundaries of expertise

CONCLUSIONS

Even though there has been a dramatic increase in the number of claims resulting from Staged Low Speed Collisions, the consistency of the collision damage with the reported sequence of events and collision severity can be assessed. An Accident Reconstruction Engineer can assess if the contact between the vehicles could have occurred or if the collision could have occurred as reported. The Accident Reconstruction Engineer can also quantify the collision in terms of speed change and compare these results to recommended injury tolerances and exemplar activities. It is important keep in mind that legitimate low speed collisions do occur and occupants may very well sustain soft tissue symptoms from collisions in which relatively low speed changes are experienced. This is why the selection of the appropriate expert in Low Speed Collision analysis is crucial. To quantify any of the above, **the physical damage sustained by the vehicle(s) must be thoroughly documented.**