

Photographing Vehicles For Litigation

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PREFACE

"One picture is worth a thousand words."
Confucius

In the course of writing two previous books dealing with accident investigation, one of the most frequent questions asked me was, "Why didn't you go into more detail?"

The answer is that each of the topics covered in those books could be the subject of a book by itself. The limitation of space is a realistic restraint on deciding which topics you elaborate on and which you give cursory treatment.

I honestly feel that photographing vehicles for the courtroom (either civil or criminal) is a topic worthy of separate treatment. Thus the genesis of this book. Even so, not everything that could be covered is included, although I have tried to cover the most important points and the most common mistakes.

Every peace officer, accident investigator, reconstructionist, insurance adjuster, or other person with an interest at stake takes pictures of vehicles involved in accidents. Many times it is at the scene, most times it is after the fact. Either way, the requirements are basically the same.

Sometimes the circumstances are such that it is painfully obvious your photos may end up in a courtroom. Sometimes it is not so obvious. My approach is to treat every photo as if it will be introduced into evidence at some time at some place.

Rest assured that your photos will be attacked by the other side, either because they are deemed incomplete or because they don't show what it is felt they should.

This is a fact of life. But no one wants to be embarrassed by deficiencies that could be avoided. What I hope to do here is to keep you from being embarrassed by a lack of technical quality in your photos.

Part of photography for the courtroom is understanding what you are trying to show with your pictures. This means understanding what is important to a case, be it a particular theory of liability or the infraction of a law.

If you learn one new thing here or are reminded of something you have forgotten, I will feel I have accomplished my purpose.

Good luck !

Jack Murray CFE, CLI
Dallas, Texas 1997

EXTERIOR PHOTOS

UNDERSTANDING THE MISSION NOT IMPOSSIBLE

Before you load your camera and head out to the junkyard, take a few minutes to evaluate why you are taking the pictures. This will make your efforts much more efficient and more productive.

As a general rule, the first use we think of for photos is for a trial or a mediation, but photos can be of great value even before a case, civil or criminal, ever gets to the courtroom.

In interviewing eyewitnesses, photos can help you refresh their memory of what they saw and maybe enable them to remember little details they had forgotten. Confronting them with clear pictures also tends to keep out erroneous recollections.

During civil depositions, photographs can be an enormous help in keeping witness accounts factual rather than imaginary. Many times photos also eliminate the witness who is trying to "help" one side or the other by "shading" his or her testimony.

During pre-trial hearings an attorney can sometimes use the photos to show the judge the very essence of the case.

AN OPEN MIND, NOT A CLOSED CASE

Always approach every assignment with an open mind. Things may not always be as they are represented by the client.

In all cases, civil or criminal, look for indications of how the accident happened. This

includes which vehicles struck what and what the sequence of the accident was.

Police reports are not always accurate. The officer is out there alone on a busy interstate trying to prevent another accident and trying to keep from getting run over.

Sometimes by the time he or she gets to the scene, the victims have been transported, the vehicles have been moved, the fire department has washed away valuable evidence, witnesses have left, one of the drivers is dead. The officer does the best he or she can. Unfortunately, the situation does not always lend itself to great accuracy of recording and I can only tell you from experience that you cannot rely on the report itself.

Look for all physical evidence. Do not look just for evidence that supports the report, look at all the evidence. If there is anything that is inconsistent with the information you have, check it out, photograph it, document it, and then put some effort into finding out why it doesn't fit.

IDEAL VS REALITY



The "ideal" situation

The ideal situation would be that the vehicles are out in the open and can be photographed from any angle, at any distance, without any interference, or without anything obstructing your view.



"Reality"

Reality is that many times in auto impounds or insurance salvage yards, the vehicle will be positioned next to another vehicle on either side as well as behind or in front of another vehicle as seen from the front or back, respectively. This obviously limits your ability to get back far enough to take the pictures you want from one or more angles.

Sometimes slipping a junkyard attendant a twenty-dollar bill will suffice to get him to bring a wrecker or a fork lift over and move the vehicle out into an open area. Sometimes, like in the Dallas City impound, this is not a possibility, so you do the best you can.

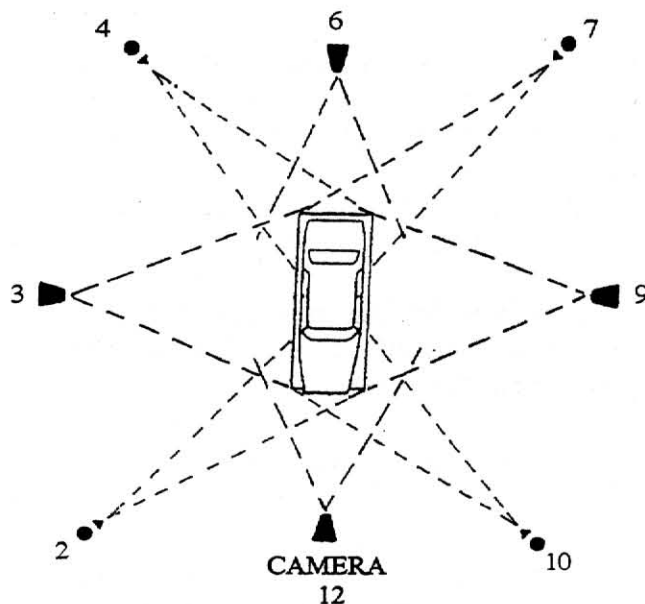
Standing on the hood or trunk of the vehicle next to your target vehicle will enable you to get a shot that is not possible from ground level. Always respect the other vehicle and be sure that you do not do any damage to that vehicle in your zest to get your picture.

Chapter 6 on equipment discusses how various size lenses can help with this problem.



The view from above. This picture was taken from the trunk of a nearby vehicle at an insurance impound lot.

THE BASIC EIGHT, AROUND THE CLOCK



Four Basic Camera Positions
Four Basic Corner Camera Positions

Start with the basic four photos. In your mind, picture putting a clock around the vehicle—with 12 o'clock being the front, 6 o'clock

being the rear and 3 and 9 o'clock being the two sides—at 90 degrees to the plane to be photographed. Then make the next four exposures at 2 o'clock, 4 o'clock, 7 o'clock and 10 o'clock.

Isolate any damage that you can find and then move in for close-up shots at different distances and different angles. The reason for the differences in these shots is to eliminate as much as possible any distortion and keep problems of reflection and/or shadows to a minimum.

HIGHLIGHTING



Highlighted area from a distance, showing location of damage

When photographing damage on any area of the vehicle that cannot be easily identified by itself, bear in mind that a close-up of a section of a door panel looks the same whether it is the right or left door, and it might even look the same whether a front or back door. We suggest a very simple technique to show where the damage is.

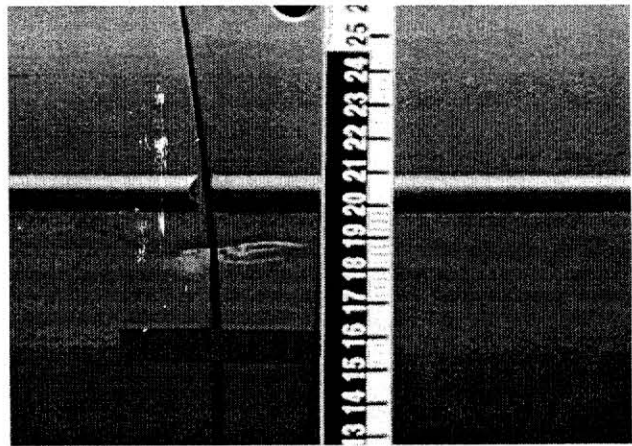
First, take a roll of colored scotch tape, the kind you use to wrap pictures during the holidays. Mark the damaged area with the tape and then shoot the picture from a distance that clearly shows where on the vehicle the tape is located. Then move in and take your close-up

shots of the damage. If you have two or more such areas, use different colored tape, or use more than one line of tape to differentiate one area from another. Be sure to get a long shot to show where the tape is located on the vehicle.

A classic example of the need to do this: In 1996, Jim Moore of JAM/MVA and I were working a case where our client had run over a victim in a parking lot encounter and was charged with murder with a motor vehicle.

When we inspected the vehicle, we found numerous hand- and footprints that substantiated the client's story that the crowd was in fact trying to turn her vehicle over, and when she tried to escape, she ran over the victim.

The problem was, the vehicle in question was a dark green Ford Explorer and when we focused in close to get the necessary detail to identify hand- and footprints, all the background looked alike, the doors, the panels, the back, etc.

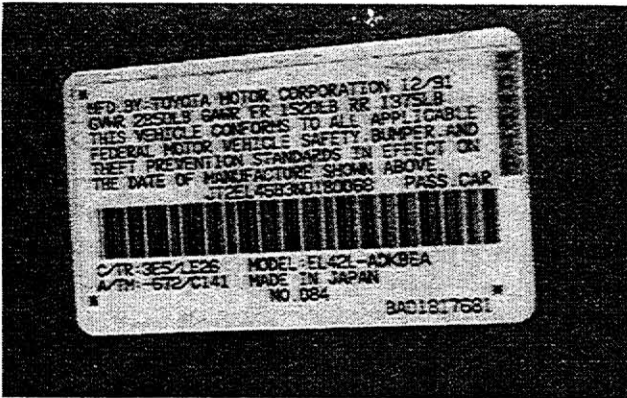


Close-up of damaged area, taken with a 70mm lens

The only way to show where each of these prints was located was to highlight the area of the close-ups.

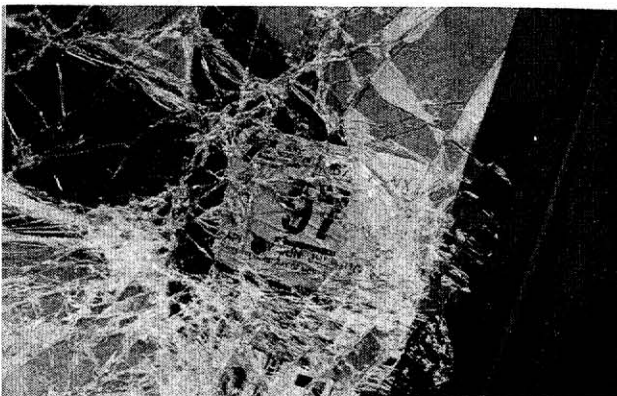
This is most helpful for showing a very small area of damage, such as bullet holes.

IDENTIFYING THE VEHICLE



Manufacturer's identification plate located on the B pillar of a sedan.

It is very, very important to positively identify the vehicle you are photographing. I know that sounds overly obvious, but in 1997 I testified in a trial that involved a vehicle identified in the police report as a Mercury Cougar. The problem was it was a Mercury Monarch. When the other side saw my pictures, which clearly identified the markings on the back of the vehicle as a Monarch, they moved to keep the photos out of evidence, because the vehicle was not the same as the vehicle identified in the police report. Only a comparison of the VIN numbers allowed the photos in.



It is usually very difficult, because of reflections, shattered glass and accumulated dirt, to photograph the VIN through the windshield. Most times it is much easier to photograph the plate on the B pillar. Depending on how badly

that area of the vehicle is damaged, you may or may not be able to use that plate.

If you have to use the dashboard VIN, always use your polarizing lens to keep the glare of the windshield glass from obscuring the numbers. A small bottle of window spray carried in your trunk can be an invaluable aid in these cases. If you know the vehicle has been sitting for any length of time since the accident, make sure you bring the Windex and a roll of paper towels.

If the vehicle still has the license plates on it, be sure to include them in your front and/or rear shots of the vehicle and then move in for a close-up, so there is no question about the ability to read same in court.

WHEELS/TIRES



Measuring the depth of tread on a tire. A difference of depth from one edge to another shows misalignment. A different depth of tread between two tires may indicate that the tires are not of the same vintage.

Documenting damage to wheels and/or tires can be very important. Such issues as "did the tire blow out before or after the accident?" can sometimes be documented very clearly with photos. Note whether all tires are fully inflated or not, how much tread is on the tires, whether there is uneven wear (denoting misalignment), and whether there are scuff marks.

The wheels should be checked for trace evidence such as fabric, concrete, paint, or rubber from other vehicles. Are the rims damaged or not? Be careful here to check whether the damage is new or from a previous encounter. In either case, photograph it.

CRUSH



Measurement of the length of the vehicle from a known reference point to the furthest extreme. This measurement can be compared against computer generated original dimensions to determine the approximate amount of crush.

Showing the amount of crush, and the angle at which it was incurred, can be very helpful in trying to determine the speed of a vehicle at the time of impact. The ideal way to measure crush is with an elaborate crush jig. Reality is making six to eight measurements from the furthest extremity to the deepest indentation and using the assigned DOT crush index and the appropriate formula. Sometimes the damage is so extensive, or at such an angle, that the above just isn't feasible.

In those cases where damage is so extensive that there is no undamaged area to measure your crush from, measure the length of the vehicle, as it is at the time, and compare that length to either a vehicle exemplar or a set of dimensions from Expert Auto Stats. Both give

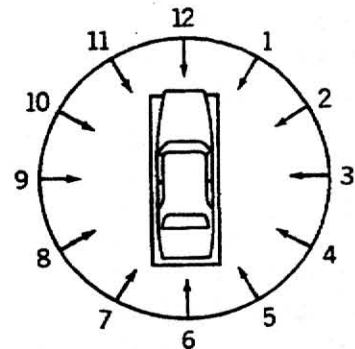
you a benchmark to compare the existing damage to.

Either way, carefully document the method you have chosen with photos as you go along.

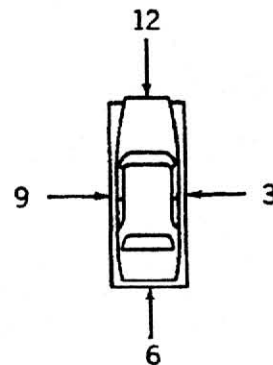
PRINCIPAL DIRECTION OF FORCE

One of the prime considerations in reconstructing any accident is the determination of the Principal Direction of Force (PDOF).

PDOF is a separate issue from angle of impact, although it may be a confusing matter because some investigators may use these terms interchangeably. PDOF is the direction, which may be represented on a clock-like scale, of the force one vehicle places on another vehicle through the center of and at right angles to the damage profile of the colliding vehicles.



Angle of impact is that angle formed between two vehicles after impact.



For instance, the angle of impact of a T-bone accident at 3 o'clock is 90 degrees and the angle of impact for a T-bone at 9 o'clock is 90 degrees. Same angle of impact, but different sides of the vehicle.

You can document both of these conditions with good photographs. The angle at which you take these photographs is very important. For the first shot, take extra care to be absolutely perpendicular, if possible, to the damage being photographed and then, while shooting the damage from both extremities, to be as close as possible to parallel to the damaged area. This will usually give a good visual representation of the angle at which the damage was originally incurred.

CLOSE UP PHOTOS

The most efficient way to get close is using close-up lenses. We discuss these in the equipment section. Other possibilities include moving the camera closer or changing the lens focal length. Choose one of them. Get close-up shots of anything that is important to the overall understanding of what happened, for instance, any trace evidence like paint transfers, tire marks and fabric transfer (particularly important in accidents involving pedestrians). You can also illustrate factors such as direction and depth of scraping or gouging.

Light becomes even more important in close-ups than in most vehicle photography. Fill flash will help you get into the shadowed areas of the grill or undercarriage. (We discuss this in more detail in the section on fill flash.)

In photographing areas underneath the vehicle, such as bumper pistons or shock absorbers, learn to use your flashlight to illuminate the area you are photographing. A

flashlight will usually provide sufficient lighting while not washing out detail.

VEHICLE MODIFICATIONS

Many times vehicles have been modified from their original specifications. Most common is lowering the center of gravity with adjustable shocks, the so-called "low rider look." Anytime you change the weight distribution of a vehicle, you change the performance characteristics of that vehicle.

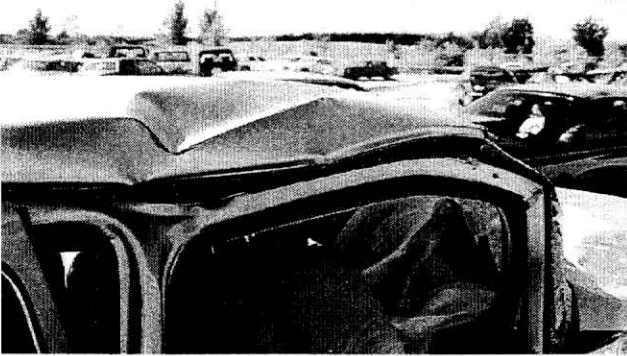
Another modification, often found in more expensive vehicles, is the mounting of additional lights that are higher or lower than state regulations allow. This can affect the driver's vision as well as the vision of oncoming drivers.

In a case where there have been after-market add-ons, photograph them. Record the manufacturer's name and the serial numbers. The latter become important because you can subsequently trace the parts back to the dealer who sold them, and possibly to the person who installed them. Installing a dangerous or unsafe product can have just as much liability as manufacturing the product.

If the tinting looks darker than normal, contact your local State Police, who will have a "tint meter" that reads how much light is allowed into the vehicle. Tinting that is too dark can create a significant adverse effect on a driver's lateral vision.

In 1997, we had a case where the vision on the passenger side was a question. The state trooper involved said the tint exceeded the legal amount. Fortunately, the liability was such that the case was cleared without this becoming an issue. I'm not sure how we could have gotten around it as a contributing negligence factor.

ROOFS



Photos of the roof of a vehicle can be important because you can usually tell from the nature of the damage in which direction a vehicle rolled over.

The nature and amount of damage to the edges of the roof can also help you judge the amount of crush and sometimes the principal direction of force.

Ideally, the roof would be shot from directly above the vehicle with a 90-degree angle between the camera and the roof.

Realistically, you try to get as high as you can and shoot from several angles, including one in virtually the same plane as the surface of the roof.

In lieu of carrying a stepladder in your car or truck (as some people do), try putting a plastic milk basket, like you see at your convenience stores, in the trunk. When not being used as a mini-stepladder, it makes a great organizer for any loose items in the trunk.

VEHICLE PHOTO CHECK LIST

GENERAL INFORMATION

Firm or Company Name _____
 Address _____
 Telephone Number _____ Contact _____
 Date of Accident _____ Place of Accident _____
 Date and Time of Inspection _____
 Weather Conditions _____
 Location of Vehicle _____
 Vehicle Make _____ Model _____ License No. _____
 Vehicle Identification Number _____
 Misc. Information _____
 Camera Type _____ Flash _____ Film _____
 Camera Lens _____ * _____
 Coding System _____ Video _____ Audio _____
 Scale Diagram _____ Direction _____
 Point of Reference _____ Measurement Used _____
 Chain of Custody _____

EXTERNAL

_____ 12 pt. clock
 _____ 4 pt. close up (3-4 feet using scale or measuring device)
 Tires
 Size _____ Brand _____
 Tread _____ Damage _____
 _____ Windows
 Tinting _____ Position _____
 Damage _____ * _____
 _____ Overhead View (scrap marks)
 Roof _____ Trunk _____ Hood _____
 _____ Under carriage
 Belt Attachments _____ Engine & Drive Shaft _____
 Damage _____ Frame _____
 _____ Lights
 Front _____ Rear _____ Bulbs _____
 _____ Trunk
 Contents _____
 Damage _____
 _____ Identification
 Plates _____ Stickers _____ Inspections _____
 Model _____ Oil _____ Dealers _____
 VIN _____ Manufacturer _____ Warnings _____
 _____ Prior Accidents
 Location _____
 Repair work _____
 _____ Suspected Equipment Problems
 Brakes _____ Electrical _____ Door Latch _____
 Hood Latch _____ Seat Back Failure _____
 _____ Special Equipment
 Options _____
 Retrofit kits _____
 After market kits _____

INTERIOR PHOTOS

PRECAUTIONS

While basically the same general rules apply to interior and exterior shots, when it comes to understanding the mission, there are additional considerations that must be taken into account for your interior shots.

Most police, fire, and medical personnel are keenly aware of the necessity of protecting themselves while handling live blood and/or tissue specimens at the scene of an accident, but recent discoveries by the Center for Communicable Disease in Atlanta, Georgia have revealed that the expected "shelf life" of some viruses, including HIV and hepatitis B, is a lot longer than we previously suspected.

In a paper prepared for the Society of Automotive Engineers (SAE 960898) in 1996, Richard M. Downs Jr. of the National Transportation Safety Board, Gary S. Deegear of the Biodynamic Research Corporation, and Frances D. Bents of Dynamic Science, Inc. point out that investigators today "often work in an environment where there is disease exposure potential."

While there has always been the danger of exposure to tetanus, hepatitis A and certain kinds of chemical contamination, there are new dangers to deal with today. The presence of blood-borne pathogens (BBP) presents a whole new ballgame for consideration by all of us who work in and around automobile accidents.

BBP may exist in any environment where there has been personal trauma that resulted in blood loss, release of other body fluids, or tissue avulsion. That covers just about any major wreck you'll see!

Some of these resultant conditions are very obvious because of the visible presence of blood stains, other fluid residue, or tissue. This type of material is called "Potentially Infectious Residue." The danger here is equally obvious—contact with such material can expose you to the disease. Most commonly you'll find it on such places as seats, seat belts, air bags, windshields and steering wheels. The problem is that the physical signs can dilute, discolor, and wash away over a period of time. Some body fluids, such as vitreous fluid from the eyes, are not obvious a few minutes after they dry.

Accordingly, you have to assume that BBP are present in any wreck you examine.

The most dangerous BBP transmissions are HIV, hepatitis B virus and hepatitis C virus. The first two can kill you and the third will make you sick as a dog.

The interiors of automobiles involved in collisions can contain numerous potentially dangerous surfaces to the investigator, such as sharp metal edges, broken glass or ruptured plastic components.

What are we suggesting? Common sense and a little extra caution. A good pair of heavy duty work gloves is a prudent measure in dealing with interiors. Investing in a box of surgical gloves for about \$5 (if you're a police officer, you can get them from your local fire department) is also a very good idea. Also, bear in mind that you are vulnerable to bumping a knee or an elbow against a sharp edge when you're moving around inside a vehicle.

The scariest part of all of this is the time frame for survival of these BBP. Depending on

the surface that they are on, the temperature and other environmental conditions, these viruses can exist up to 28 days after the wreck.

FILL FLASH



Grill detail is almost indistinguishable in this shot because of shadows created by backlight.



Same shot, from slightly different angle, with fill flash. The fill flash brings out most of the detail missing from the first shot.

One of the most common problems with any interior shots is the uneven distribution, or total lack, of adequate lighting. This can usually be compensated for by the use of "fill flash." But fill flash is not a cure-all and sometimes

creates problems in and of itself.

A major problem can be washout, where the light is so concentrated it just washes out detail and thus defeats the purpose. A good compromise is to photograph the interior with available light first and then to cover your bets by using your flash unit. This means using a little more film, but it is amazing how many times some small detail will show up in the available-light shots that just got lost in the flash shots.

The use of Kodak Gold 1000 produces some very fine interior shots with minimal lighting. Nevertheless, backing these up with a few flash shots doesn't hurt. The difference in budget is negligible, but the difference in results can be considerable.

Another consideration in taking interior shots with flash is reflection. This can usually be compensated for by the use of a polarizing filter. Obvious sources of reflection to be considered are mirrors, glass, or any highly polished surface, such as a console. Using a polarizing filter will cost you about one-and-a-third stops in exposure.

SEATS

The position and/or condition of the seats, particularly the driver's, can be very important in later considerations of the causation of the accident. In 1995, we represented a Dallas police officer who was involved in a collision and because of the nature of his injuries, there was a question whether or not he had his seat belt properly adjusted prior to impact.

When we examined the vehicle, we found that the front seat had significant "play" in it. Further investigation revealed that other officers had reported this same condition to the maintenance people several times prior to the crash.

The result of this "give" in the seat was that at impact the officer slid under the belt and his left knee went into the dash panel, not only fracturing his knee cap but causing significant damage to his hip. Our photographs enabled us to document this problem with the seat.

Try to show the amount of "give" or "play" in the seat by holding a fixed measuring device between the leading edge of the seat and an appropriate fixed component of the vehicle. A good example would be a measurement from the front edge of the back of the seat to the A pillar. Shoot this with the seat at both extremes, as far forward as possible and as far back as possible.

Ideally, you should further document this with a set of measurements from the rear edge of the seat to an appropriate point in the interior.

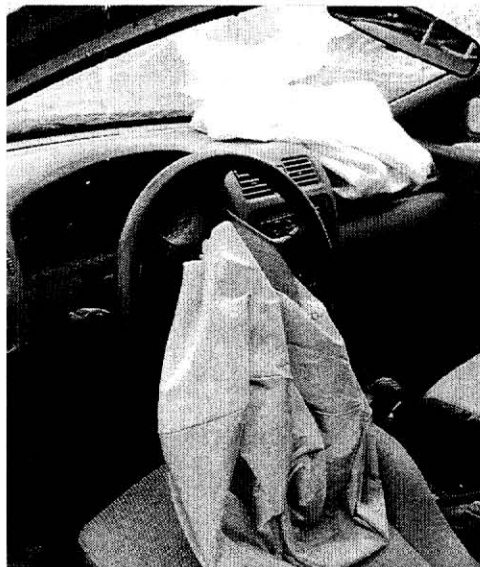
Another case in 1995 involved a Jeep Cherokee. The passenger ended up in the back of the vehicle after a rear-end impact. Here the seat had actually broken, and the passenger had slid backwards under the seat belt and shoulder harness, jamming his head against the rear window.

If there is any evidence of the presence of a child "safety seat," be sure to document the condition and position of the seat. Remember that many times rescue personnel throw these seats aside after they have removed the people from the wreck, so do not assume that just because the seat is not in the usual position that it was not in use at the time of the wreck. Examine the seat carefully and photograph its condition to show either the use or non-use of the seat. Also, if possible, be sure to document the belt routing geometry to show that the seat was properly positioned.

Photograph the presence or absence of any "approval" or "instructional" decals. Document

any apparent alterations to the seat.

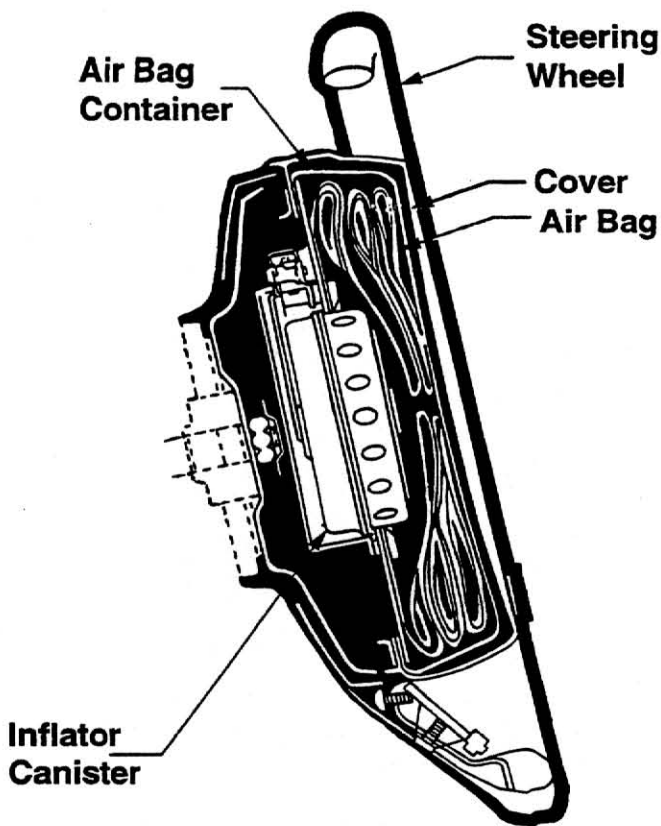
INFLATABLE RESTRAINT SYSTEMS (AIR BAGS)



Vehicle with both air bags deployed. Blood stains on the passenger side dictate extra caution in handling.

The first consideration in photographing or examining air bags is to ascertain whether you are dealing with bags that have already deployed or not. Undeployed air bags are dangerous and may very well cause death or serious injury. If you are going to take measurements, or examine the interior of a vehicle, or even stick your head and shoulders into the passenger compartment, make sure that the power system is disconnected from the battery. This is not a 100% safety measure, but it eliminates a great deal of the risk.

It is very important to become familiar with how air bag systems work and how they are best disarmed. This information is available from a number of sources such as SAE papers, NHTSA, automotive manufacturers, trade associations, consumer groups, and some insurance organizations. If nothing else, get a copy of the owner's manual of the vehicle before you start the examination.



TYPICAL CUTAWAY OF GM'S SUPPLEMENTAL INFLATABLE RESTRAINT

Be warned that even though a system appears to be similar to that of another make, model or year, system designs and components can vary from year to year, or even within a given year. With the advent of widespread use of side air bags in 1997 and 1998 models, this becomes an even more serious consideration.

Generally, try to document such things as:

- Whether the bags deployed
- Occupant contact evidence
- Interior compartment damage

- Seat belt conditions
- Trace elements on the bags and on surrounding components
- Sun roof damage

Because of the position of the driver and passenger air bags, and the presence of windows and shattered glass, there is sometimes a much greater degree of ambient lighting and reflection than normal. Accordingly, I suggest you shoot your pictures from various angles, so that the amount of light, and the angle at which it strikes the surfaces involved, is changed ever so slightly with each shot. A polarizing filter will be a great help in reducing glare and reflection.

If the Inflatable Restraint System is a serious part of the litigation, then you must photograph and inspect the portion of the system that is under the hood of the vehicle. Look for indications of damaged or loose components. In most IRS equipped vehicles the crash sensors and the required wiring harness are located under the hood, but you must be familiar with what you are looking for.

Visual inspection of the sensor is usually sufficient to determine external integrity. Any irregularity in the outer housing is an immediate indicator of a potential problem or possible performance anomaly. Photograph this as close up as you possibly can, preferably with a macro lens or an enlarger ring, to fill out the whole frame of the picture.

Evidence of contact with the bag itself can be in the form of hair deposits, blood stains, lipstick and other makeup transfer, or clothing fabrics.

The important aspect to show in these photos is where the transfer took place. Document the locations by creating X, Y, and Z

axes with the vehicle's undeformed centerline, floor, and A or B pillar as reference points, respectively.

The use of a forensic ruler is a great help in establishing distances from deployment to the position of the trace evidence. The only problem here is that, for the most part, two sets of hands are required to perform this maneuver. If you use a ruler or a yardstick, remember that it becomes imperative to clean their surfaces after use with a medical disinfectant because of the possibility of BBP. Before returning the equipment to your gadget bag, it is a wise precaution to wipe any item that may have come into contact with these surfaces with a solution of chlorine bleach and water (use a 10 to 1 ratio). If you were not wearing gloves, use this same solution to wash your hands and arms.

SEAT BELTS

Seat belts are governed by the Federal Motor Vehicle Safety Standard (Standard 209) and it is wise to periodically review it. Seat belts are designed to be the vehicle's primary restraint system. The air bag system is designed to supplement the belts.

Typically the belt system is composed of lap and shoulder belt components in various arrangements. Air bag equipped vehicles predominately have a manual 3-point seat belt system, but several car lines which may not be fitted with an air bag have "automatic" 2-point shoulder belts with a separate 2-point manual lap belt system. Look for the difference between normal wear and "crash" usage. There are several indicators of crash usage:

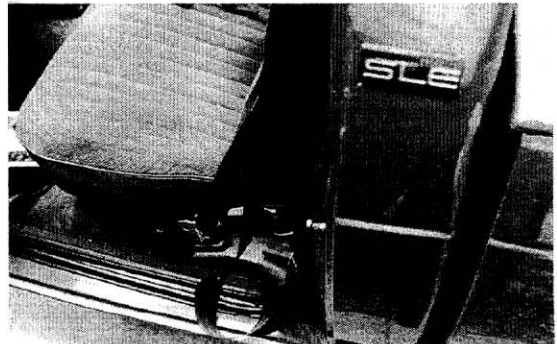
- Displaced or abraded webbing
- A failed connector fitting or torn webbing
- Fabric transfers on the webbing from either the occupant's clothing or the air

bags

- Stretching of the belt webbing
- Transfers on the webbing from loading against the D-ring
- Abrasions on the latch plate from the belt loading
- Abrasion of seat fabrics or plastic covering on the seat back and seat cushion junction where the belt typically rides.
- Separation of energy management loops in the webbing (designed to tear away under sufficient loading)
- Blood stains on the portion of the seat belt that would normally be extended when in use and retracted when not in use

Signs of normal wear are:

- Wear marks on the latch plate
- Frayed webbing edges from constant extension and retraction of the belt
- Abnormal amounts of play, or slack, in the belts



Abnormal amount of slack indicates that retrieval system is not functioning properly. This problem is usually found in older model vehicles, but it can occur in current models.

MATCHING DAMAGE TO INJURIES

One of the most common situations requiring occupant injury to be matched to interior vehicle damage is where there is a question of who was driving.

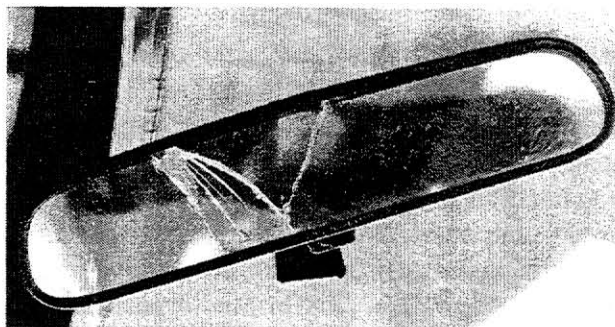
Signs of interior vehicle damage caused by occupant contact should be photographed. Some of the more common signs are:

- Indentations in the lower side of the dashboard configuration, usually a result of an occupant's knee making contact with the surface



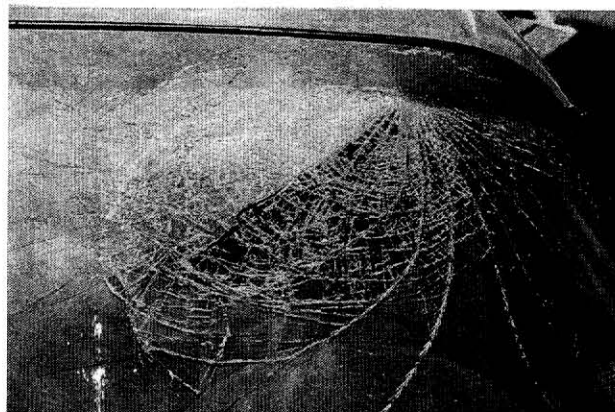
Damage to the lower left area of the dashboard matched the injury found to the driver in his autopsy report.

- Trace evidence of blood, hair or tissue found on any surface such as a rearview mirror, pillar post, roof panel, sun roof, steering column, windshield or other glass surface



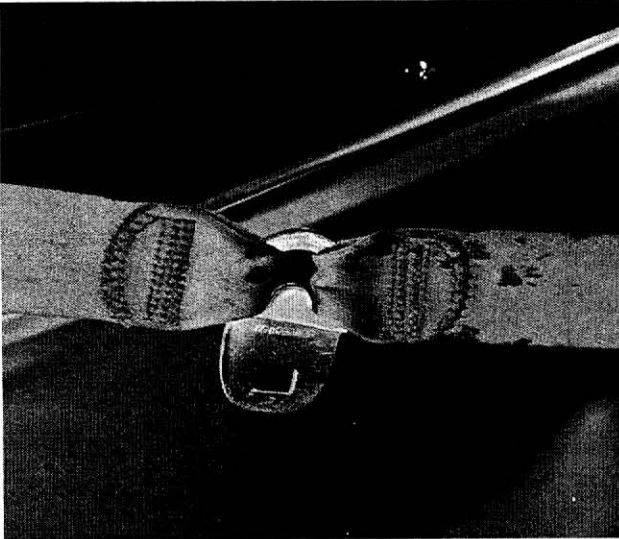
A rearview mirror can often be a source of trace evidence.

- A windshield bearing (as is often the case) the imprint of an occupant's head or face. This is usually prima facie evidence of lack of seat belt usage. Look for blood, hair or skin fragments.



A head imprint on a windshield from a vehicle where the driver was not wearing a seat belt

- Blood stains on seat belts or upholstery



Blood stains on seat belts can sometimes tell you whether the belts were in use or not.

- Trace evidence of any kind on pillars or side windows

PRODUCT LIABILITY

Whether you are working for the plaintiff or for the defense, the possibility of a product liability is a prime consideration when you examine and photograph a vehicle. If you are the plaintiff, you are looking for another set of "deep pockets." If you are the defense, you are looking for someone else to assume some of the liability for the accident.

If you find anything in the physical evidence of the wreck that is inconsistent with your understanding of how the accident occurred, look for the possibility that some malfunction of some part of the motor vehicle contributed to the accident.

Photograph and document any malfunctioning parts that could have been a factor in the accident. This way you have the pictures even if the vehicle is subsequently destroyed. If a part is normal, fine, but if there is a problem, you have documented it.

Always check on the make, year and model vehicle you are dealing with to see if there were any complaints or recalls. NHTSA and the Center for Auto Safety are two good places to start. Your local dealer of that make vehicle will always know if there were any recalls, hidden or otherwise. A phone call to the service manager can save you a lot of research time. Always have the VIN number of the vehicle handy, because sometimes recalls only cover a certain series of VINs.

No matter what the age of the vehicle, always keep in mind the possibility of prior damage. Document, with your photographs, any sign of previous repair work to the vehicle. This will not only be important in the area of product liability but may well influence the determination of damage from the current accident. Signs to look for are scratch marks or recent tool marks on any kind of connection, bolt, or lug.

TRUNK

One of the most commonly overlooked areas in a vehicle inspection is the trunk.

Photographs of the inside of the trunk will sometimes show the possibility of loading by objects within the trunk that could have caused injuries to the rear seat occupants.

If the vehicle has been sitting for any length of time in an impound or junkyard, consider the possibility that objects have been removed from the trunk. In that scenario, look for damage to the interior that would suggest movement of objects against the walls.

In snow country, it is not uncommon for drivers to put heavy objects in the trunk to give the vehicle added traction on snow or ice surfaces. This additional weight, if not properly distributed, can affect the handling characteristics of the vehicle. Document the presence and position of such objects with your photos.

INTERIOR

FRONT PASSENGER COMPARTMENT

- _____ Dash
- _____ Windshield (note impact points, hair, etc.)
- _____ Mirror (note position)
- _____ Steering wheel
- _____ Glove Box (contents, tickets, manuals, etc.)
- _____ Underdash area (impact points, damage)
- _____ Radio (position of dials)
- _____ Instrumentation
 - Speedometer _____ Odometer _____ TAC _____
 - Transmission _____ Cruise Control _____
 - Misc. _____
- _____ Seat position (angles, damages, burns)
- _____ Headrests
- _____ A Pillars
- _____ Objects (containers, equipment, etc.)

REAR PASSENGER COMPARTMENT

- _____ Seats (position, damage)
- _____ Back of front seats (note dents, tears, hair, etc.)
- _____ Floor pan
- _____ "B" pillar
- _____ "C" pillar
- _____ Contents
- _____ Head liner

SAFETY RESTRAINTS

- _____ Webbing
 - Abrasions _____ Cuts _____ Labels _____ Stretching _____
- _____ Buckles
 - Id _____ Breaks _____ Workable _____
- _____ Tongue (metal portion that inserts in buckle)
 - Indentations in inner hole _____
- _____ Retractor frame or mounting plate
- _____ Locking wheels of retractor (note position of loading by indentation in teeth grooves)
- _____ Length adjustment at each position
- _____ Burn or abrasion pattern on seat fabric
- _____ Warning buzzers
- _____ Ignition interlocks
- _____ Shoulder Guide Loops (note belt imprint on loop)
 - B pillar loops _____ C pillar loops _____

BUMPERS

PURPOSE

Determination of the Delta V Force developed in low impact collisions is usually based to a great extent on the amount of measurable damage to the vehicle's front or back bumper.

In higher speed collisions, matching bumpers to damage on other vehicles is often very helpful in ascertaining the amount and direction of force.

HISTORY

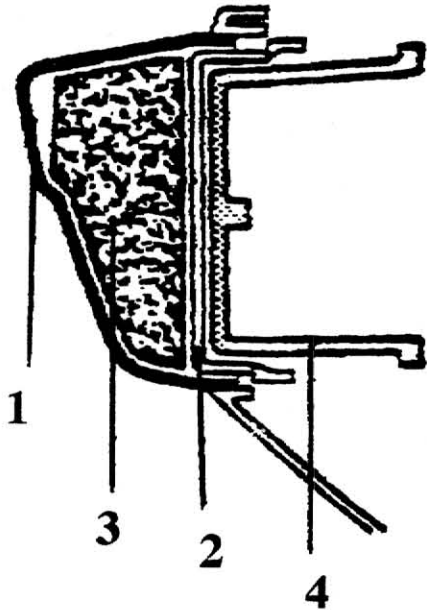
In accordance with Federal Motor Vehicle Safety Standards, all passenger vehicles manufactured during or after 1983 must have front and rear bumpers that can sustain barrier impact at speeds up to 2.5 mph without incurring structural damage.

Truck bumpers do not fall under these standards.

SUMMARY OF BUMPER STANDARDS

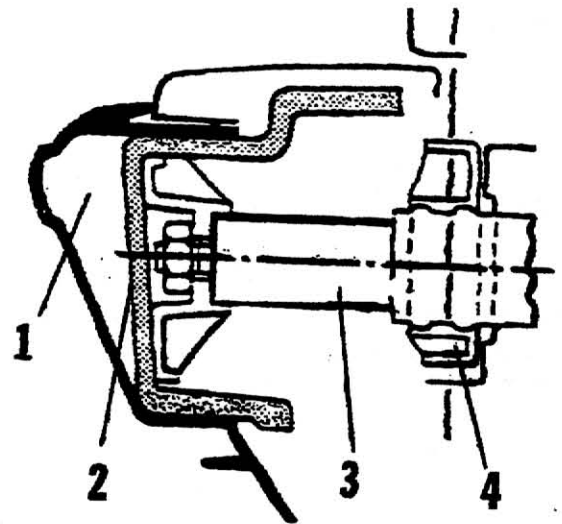
Standard	Model Year(s) Applicable	Barrier/Pendulum Speed and Parts Affected
FVMSS 215 with barrier	1973	5 mph front and 2½ mph rear impact. Safety-related parts only.
FMVSS 215	1974-1978	5 mph front and rear impacts with barrier and pendulum; 3 mph corner impact and pendulum. Safety-related parts only. Pendulum test established bumper height between 16 and 22 inches.
FMVSS Part 581	1979	As above, plus no damage to incorporating exterior surfaces, except FMVSS 215 bumper face bar and its fasteners.
As above	1980-1982	As above, except face bar can have no permanent deviation in contour of position greater than 3/4 inch, and no permanent localized surface deviation greater than 3/8 inch.
As above	1983 and thereafter	2.5 mph front and rear impacts with barrier and pendulum; 1.5 mph corner impact with pendulum. No damage to safety-related parts and exterior surfaces, except bumper face bar and fasteners.

BUMPER ILLUSTRATIONS



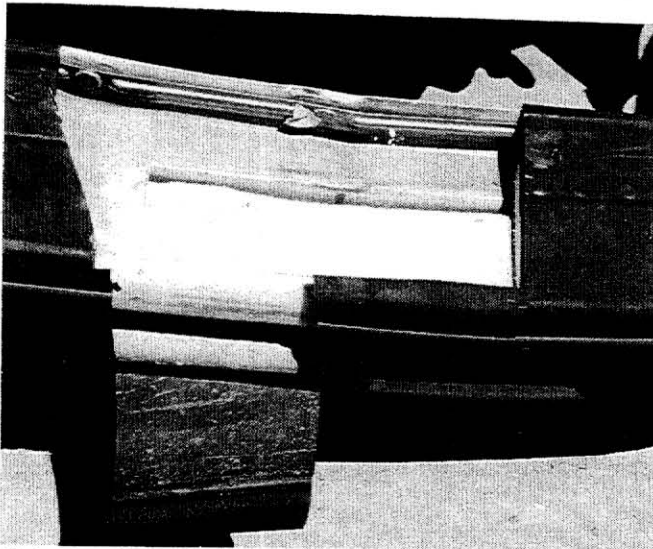
**BASIC BUMPER COMPONENTS /
SHOCK - ABSORBING PUR FOAM
SYSTEM OR RUBBER CELL SYSTEM**

1. Bumper covering
2. Bumper face/bar
3. Energy absorbing system
4. Mounting attachment



**BASIC BUMPER COMPONENTS /
SHOCK - ABSORBER SYSTEM**

1. Bumper covering
2. Bumper face/bar
3. Energy absorbing system
4. Mounting attachment



Cutaway view of a foam core energy absorption system

The key thing in photographing bumpers is to show the amount of or lack of damage to either the exterior or interior of the system. While documenting any scrapes, dents, or trace evidence, look for any indication that dirt or rust was knocked free from the inside of the bumper or from around the bumper brackets and shock absorbers.

ANGLE OF THE CAMERA

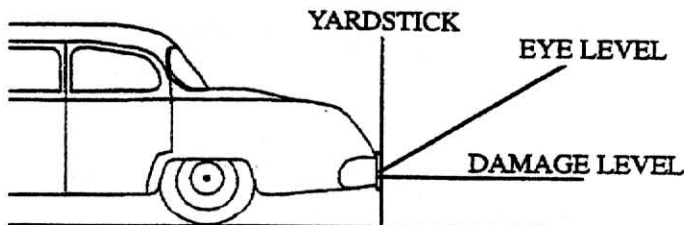
Probably there is no situation in vehicle photography where it is more important to maintain a 90-degree angle between the camera and the surface being photographed than when you are photographing a bumper system.

We also highly recommend using a tripod, so that all shots of the bumper will be taken from the same height.

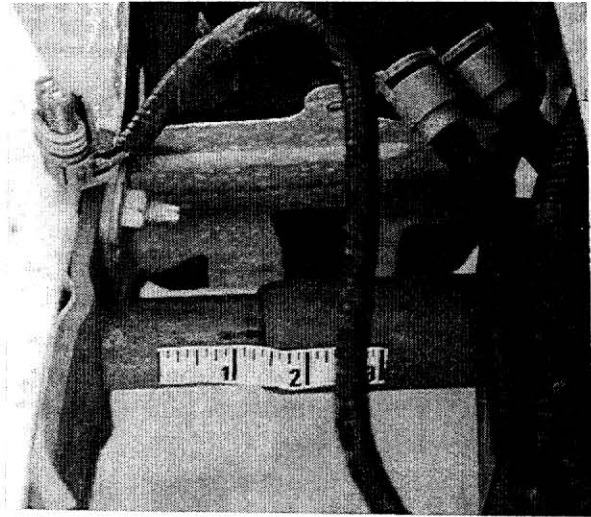
The reason for this is that when you photograph measurements of any kind at an angle less than or greater than 90 degrees, you make it extremely difficult to show the measurements accurately.

As a general rule, a prime consideration is the height of the vehicle's bumper as compared to the height of another surface, either that of another bumper or that of another vehicle.

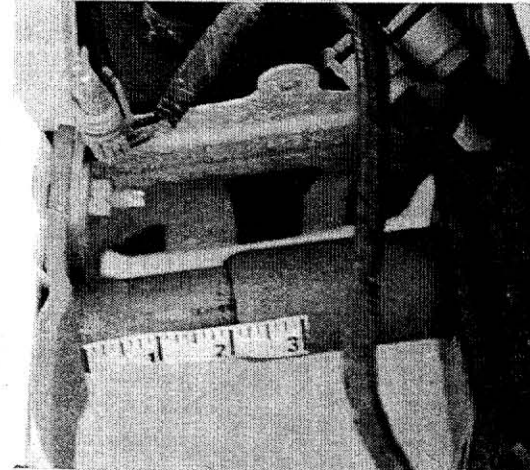
Another factor in photographing the surface of a bumper is to show where the damage is on the bumper. Because of the nature of many of the surfaces on bumpers and their high degree of reflectivity, it is usually a must to use a polarizing filter when shooting bumpers. This is particularly true on older model vehicles and trucks with metal bumpers. The filter will not eliminate metallic glare but many times will help reduce it when you are working in direct sunlight.



PHOTOGRAPHING PISTONS



Do not photograph just the scratch marks. This may be misleading in that the piston may not have returned all the way out.



By measuring the full length of the uncompressed piston you have a benchmark against which to compare a piston that has never been compressed.

Measuring the amount of bumper piston compression is a very important factor in helping to determine the amount of impact and

subsequent Delta V Force sustained by the occupants. The compression measurement is critical to the review by a bio-medical team when developing the likely severity of injury that could result from the determined amount of impact.

Be sure to measure the entire length of the piston, not just that area that has scratch marks on it. The reason for this is that after compression the piston is sometimes not fully restored to its original position. Measuring pistons on both sides of the vehicle will give you some insight into this possibility as well as determine whether the force was in line or not.

If both sides have been compressed, go to a dealership parts department, not an after-market parts dealers, and ask them if you could measure one of the original parts that has never been compressed. This will then give you an accurate benchmark to work with.

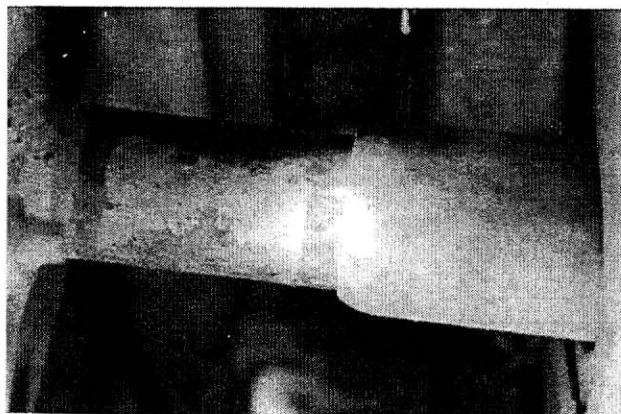
Photographing the pistons of a bumper system can be a very messy process if for no other reason than it means getting under the vehicle and getting yourself and your clothes dirty.

One way to get around this is to arrange with a repair shop, muffler shop, or similar business to put the vehicle up on a lift.

However, again reality sets in! If you're in a junkyard, the best you can hope for is a fork lift or wrecker to lift the target portion of the vehicle off the ground.

An old floor mat from a wrecked vehicle can make a great substitute for a roll-under rest. Porter Camera Supply, P.O. Box 628, Cedar Falls, Iowa 50613-9986 sells a sheet of ballistic nylon, originally designed for you to kneel on when photographing in the mud, that works equally well.

You can also have problems in properly lighting the area in question. Fill flash often washes out the very detail you are trying to capture, so make sure it is properly diffused.



A rear piston from a 1985 Lincoln, photographed with a mini-mag flashlight as the source of fill light

Another possibility to increase the level of light available for your photo is to use a small flashlight of the type carried by most EMTs. I do this as a backup to fill flash shots. Better safe than sorry!

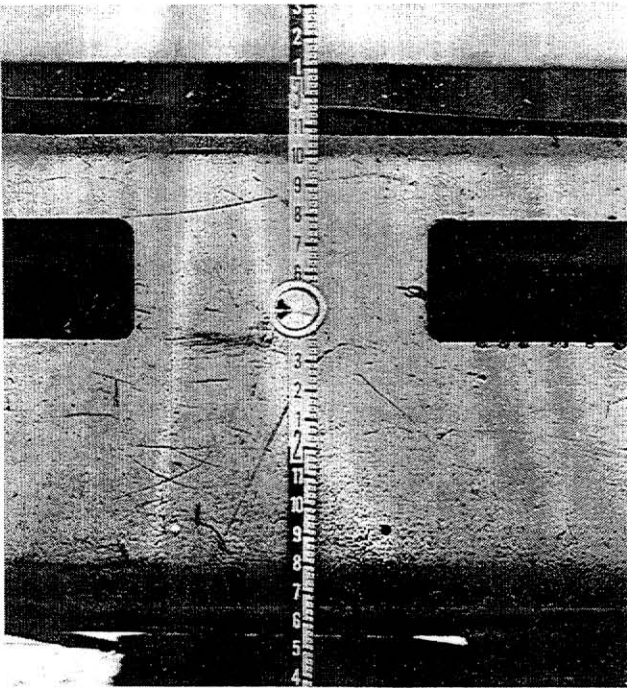
The big problem with this modus operandi is that it sometimes takes two people to do it properly. I rarely have that luxury. One solution that sometimes works is to attach your flashlight to the undercarriage of the vehicle with a strip of velcro. Depending on the size of the flashlight and the mechanical structure of the car, this can be an adequate substitute for another pair of hands.

SHOWING TILT DAMAGE

A very important consideration in assessing and documenting bumper damage is the presence, or lack, of corner to corner slope to the bumper itself. This can be documented in two ways. First, use a plain old-fashioned carpenter's level with a visible bubble, or a more modern, and considerably more expensive, inclinometer which measures and displays

the amount of tilt in degrees. A second way is to measure the bumper height at three separate points—each corner and the midpoint. There are some obvious problems with the latter system. If the bumper has been torn loose at either or both corners, you will lose one or more of your points of reference. If there has been a serious override by the striking vehicle, this too will throw your measurements off.

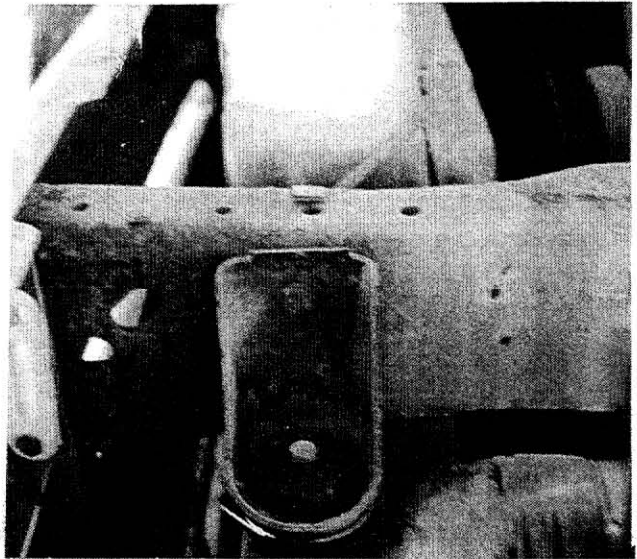
MEASURING THE HEIGHT



Using a drop rod, held in place against the bumper with a magnet, frees up the photographer's hands to focus and shoot.

When measuring the height of a bumper, be sure to use a yardstick with numbers large enough to read easily (see *Measuring Tools*, p. 34). Set your tripod to approximately the height of the numbers to be photographed and focus in as close as your lens will allow while still keeping both the yardstick and the top edge of the bumper in the photo.

DAMAGE TO FIXED MOUNT BUMPERS



Some pickup trucks and older model sedans have their bumpers rigidly mounted to the vehicle frame; there is no system to dissipate energy. As a result, these bumpers sometimes buckle, fracture, or sustain other deformation from relatively low velocity impacts.

However, I have seen older, solid metal, fixed-mount bumpers that have sustained virtually no visible damage in impacts with other vehicles at speeds as high as 35-40 miles per hour. Don't be misled by the amount of damage to this kind of bumper. The absence of damage is just as important as the presence thereof, so document it carefully in your photographs.

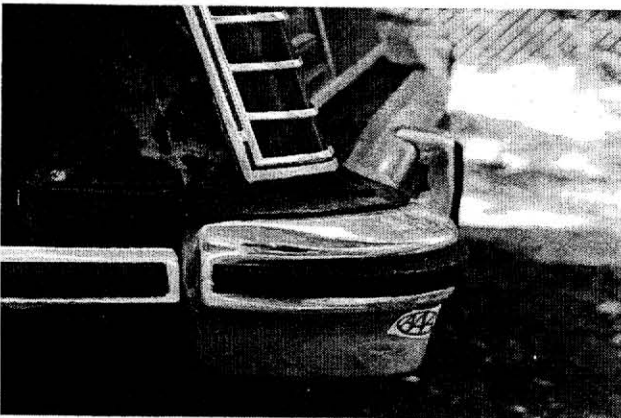
In cases where there are "deer guards" or similar mounts on the front bumpers, be sure to

photograph these with some sort of measuring device stretched between the perpendicular portions of the attachment. This can be very helpful later in ascertaining points of contact with another vehicle.

SPACER DAMAGE

In many older model vehicles, even those with piston type absorber systems, there is usually a hard rubber or a flexible plastic spacer between the bumper itself and the lower portions of the body of the vehicle.

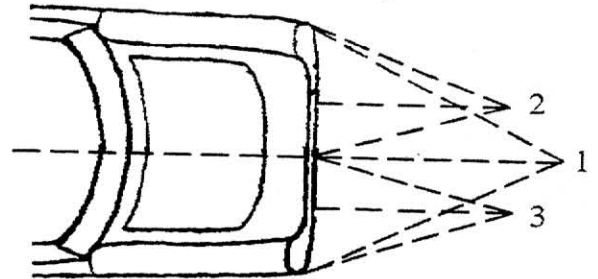
When a bumper sustains sufficient impact from another vehicle or surface to cause any forward compression, this space is also compressed. Unfortunately, most of these spacers are designed in such a way that they have a great amount of elasticity and do not show any serious damage after returning to their original position. What does happen in many cases, though, is that the edges of the spacer will override the trailing edge of the bumper at impact. When the bumper returns to its original position, the spacer will be carried along and remain with the bumper.



Photograph the spacer from three angles. The first should be at 90 degrees, or perpendicular, to the damaged area. The other two, one from each side, should be taken as closely as possible along the plane described by the spacer.

PANNING

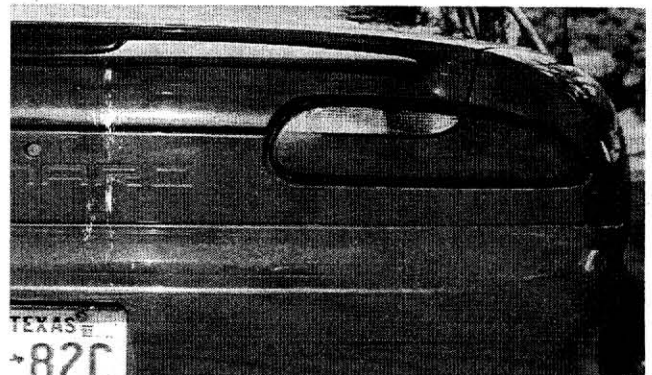
To get the effect of "panning" the bumper, take three shots.



The first is a corner-to-corner shot, taken at the appropriate height level.



The second shot is usually from the middle of the license plate to one corner.



The third shot is from the midpoint to the opposite corner.



All shots must be at the same height but will be at different distances or settings (on a zoom lens).

TRACE EVIDENCE

DEFINITION

Trace evidence comes into being when there is an exchange of items between surfaces.

Trace evidence is particularly important if there is any suspicion of a false claim by either party about how an accident happened, or even if an accident happened.

Trace evidence may be present in or around a vehicle, but because of the minute size of the item, a special attempt must be made to discover and preserve it.

Since preservation of evidence of this nature is very important, document where you found the evidence with a photograph, if at all possible. Then, very carefully remove the evidence itself and put it in an appropriate container.

Attention to the type and condition of the container is also very important because of the possibility of contamination of the substance recovered.

Glass is usually best, but for things like signal light bulbs, I use an empty plastic film container padded with a clean kleenex.

I have also used empty film containers for paint chips, but the preferred container is clear or translucent, so you can see how much sample you have. Paint should not be scraped off; try to chip it loose. A sharp pocket knife will serve you well in these circumstances.

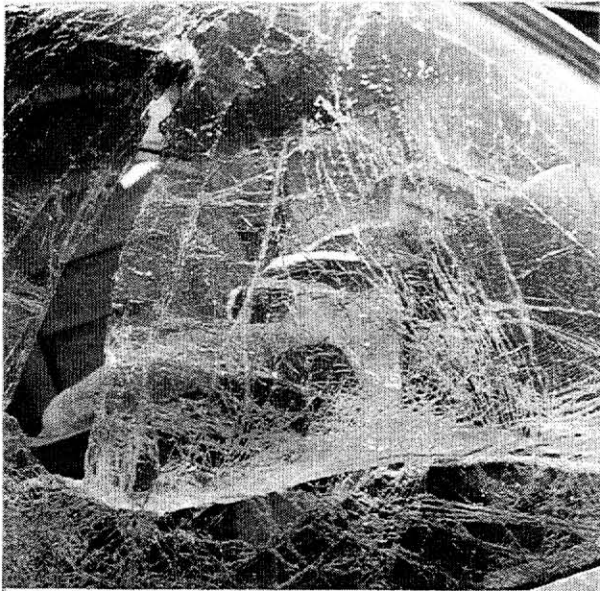
A couple of plastic grip-lock bags are always a good addition to your photo bag. They are inexpensive and appropriate for hair, fabric, and metal samples.

After removing the samples, be extremely careful to document the chain of custody. Very simply, this means that every time a piece of evidence changes hands, somebody has to sign for it and attest to the condition of the material when it was received. The document does not need to be elaborate, just a sheet of letterhead that says: On such and such a date at such and such a time, Investigator Jones turned in the light bulb removed from a 1996 Mazda, inspected at the Dallas City Pound, to Technician Smith of Spruce and Goose Labs for the purpose of examination. The bulb is identified by my initials scratched on the base of the bulb. Signed: Witnessed: Dated:

BLOOD: Blood stains may appear almost anywhere on the interior or exterior of a vehicle. The most common interior locations are on seat belts and air bags, covered in Chapter 2.



Another place to look for blood stains is on seat backs and other upholstery. When there are no air bags, you will occasionally find blood stains on the steering wheel. The presence, or absence, of blood on the steering wheel may be an indication of whether the seat belts were in use or not.



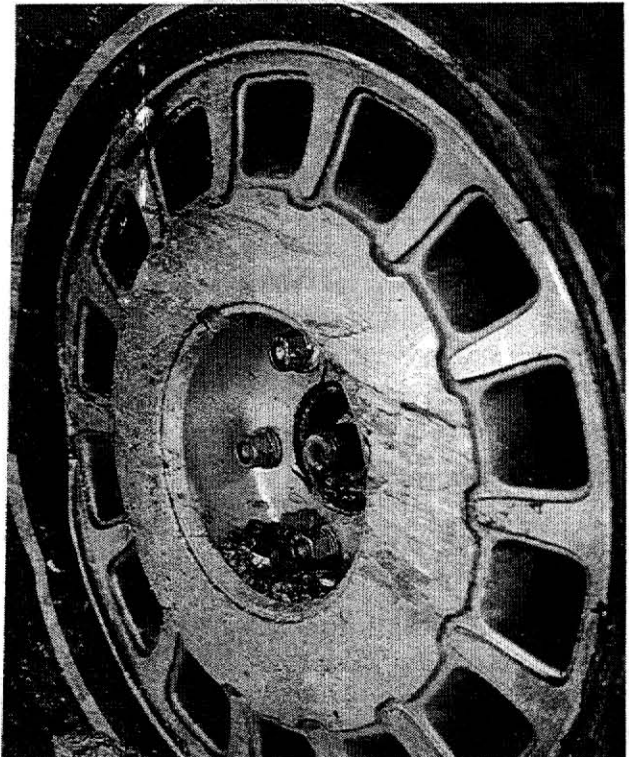
TISSUE: Fragments of human tissue and/or human hair are often found on interior glass surfaces such as the windshield, side windows, rearview mirror or vanity mirrors, or on the backs of sun shades. Sun roofs should also be checked for evidence of this kind. It's always wise to check the medical reports of the occupants to see if there are signs of serious bruises or abrasions that could indicate there might be trace evidence someplace in the interior of the vehicle.

PAINT: Paint transfers are probably the most common examples of trace evidence. Paint transfers are sometimes extremely important in determining which vehicle struck or was struck by another vehicle. In 1997, we had a case where the police had a green Ford Ranger striking a red Toyota Turbo, and the Toyota striking a white Nissan truck. This sequence was based on the statements of the one driver who was not transported to the hospital.

Upon inspecting all of the vehicles involved, we found traces of white paint on the right side and right fender of the Toyota and red paint on the front left bumper of the white Nissan truck. There was no paint of any kind on

the front of the green Ford, but there was red paint on the back of the Ford truck.

We ultimately developed the sequence that the Nissan struck the Toyota and then the Toyota crossed lanes and struck the back of the Ford. When confronted with the photographs, the investigating officer decided he had in fact made a mistake.



METAL/PLASTIC: Scraps of metal and/or plastic occasionally become embedded in the rims of tires and/or under body trim. The next time you run your vehicle through a car wash, check it out carefully and you might be surprised to see the odd places where minute bits of the car-wash brushes will catch.

WOOD: In those cases where a vehicle may have hit a fence or utility pole, or even the older style wood guardrail posts, you may very well find small bits of wood embedded on the wheels, the rims, or even the grill work of a vehicle.

Wood bits can be very helpful in determining secondary impacts.

FABRIC: In any motor vehicle accident that involves a pedestrian, look very carefully not just on the vehicle surfaces but also on the clothing of the victim. The surface of the vehicle may show blood, tissue and/or fabric traces, while the clothing of the victim may show paint or even pieces of the vehicle itself, such as broken glass from a headlight or plastic trim.

RUBBER TRANSFERS: Tire scuffs left on a vehicle can be very important. Many times they tell the investigator which way the wheel was rotating at the time of contact. This is sometimes a critical point in sideswipe cases where there is not a lot of damage to the vehicle other than the rubber scuff marks. Lug marks are not really trace evidence, but many times they appear where there are rubber scuffs and should be photographed very carefully.

OBJECTS TO CONSIDER

WIRE: When a vehicle strikes a guy wire on a utility pole, very often either the guy wire leaves its mark on the vehicle or the vehicle leaves its mark on the cable. Usually when a guy wire is broken, you can assume that something hit it. That "something" is usually a vehicle. In 1997, we had a case where the paint from a vehicle on a guy wire showed very clearly that the vehicle had in fact struck the guy wire and then severed the cable. The driver, a police officer, denied he had had an accident on his shift and surmised that the damage to the patrol car must have been caused by someone who drove the vehicle subsequently.

MOTORCYCLE HELMETS: Look for transfers that indicate contact with other objects: paint from a vehicle, debris from the roadway,

rubber from tires, scratches from contact with other surfaces.

PHOTOGRAPHING AND PRESERVING IT

Trace evidence usually requires a macro lens for the necessary close-up work. High-lighting, as we discuss in Chapter 1, is critical when doing close-up photos of trace evidence because the location of trace evidence often becomes very critical in trying to match up one vehicle with another, and even more critical in dealing with pedestrian accidents.

Filters can be very helpful in photographing blood stains or glass fragments. Kodak puts out a whole book on filters (in their workshop series) available at most photo shops or direct from Kodak in Rochester, New York. We discuss filters in Chapter 6, Equipment.

COURTROOM PRESENTATION

TYPES OF EVIDENCE

To understand what demonstrative evidence is, some categorization is necessary. Basically, all evidence is divided into two main categories, substantive and demonstrative.

Substantive evidence is further subdivided into three classes: testimonial, documentary and real.

Each class of substantive evidence can be defined by a physical characteristic unique to that class. With some very small exceptions, a piece of evidence is:

- Testimonial—when a witness is talking or otherwise communicating directly to the court.
- Documentary—when the evidence is something that is, or could be, reduced to hard copy.
- Real—when the evidence is a palpable object, other than a document, whose inspection imparts some first-hand information to the court that is relevant to determining an issue of consequence.

Demonstrative evidence has no specific physical characteristic that defines it. It is defined by the purpose for which it is being used. Generally, it is used to explain or illustrate other previously or contemporaneously admitted pieces of evidence.

To be admissible, substantive evidence must make a fact of consequence more, or less, probable than it would be without this evidence.

Demonstrative evidence does not do this. Its function is to make the underlying

substantive proof more understandable and, as a consequence, more believable.

On its own, demonstrative evidence cannot "prove" something true or false. It exists in trial only because the piece of substantive evidence that it illustrates exists and is admissible. Thus, the relevance of the demonstrative evidence is only derivative of and dependent on the substantive evidence to which it relates.

The use of demonstrative evidence in the courtroom has resulted from a slow, gradual evolution. But in my time, I have seen a tremendous change in the attitudes of the courts and attorneys toward the use of this powerful tool.

When I first started in this business, it was very hard to get color pictures of victims or injuries introduced into evidence because they were considered too inflammatory.

A counsel for the plaintiff or defense who brought a mock skeleton into the courtroom for the purpose of illustration sometimes faced serious challenges from the other side as to whether its demonstrative value was outweighed by any inflammatory suggestion.

The Vietnam War changed all of that. For the first time in history, death and carnage was brought into our living rooms every night in living color.

Now the theme of many newscasts seems to be, "If it bleeds, it leads." Shootings, stabbings, high-speed chases and crashes are many times brought into our homes as they are happening, thanks to the advent of powerful new video camcorders.

Speech is sometimes the least effective manner of communicating ideas. Imagine the difference between having someone tell you the story of Star Wars and seeing the movie.

If you go to trial expecting to tell your story to the jury, and if the other side has compelling demonstrative evidence and you don't, you had better have eaten a big breakfast, because they are going to eat your lunch, whether or not they win the case. The only safeguard is to be prepared to show your case to the jury. Technology makes the difference.

A more reasonable approach to modern day demonstrative evidence is, "If you can say it, you can show it." Who will ever be able to describe the horror of the Oklahoma City bombing as gut wrenchingly as the picture that appeared on the front page of every newspaper, and on every TV screen, of a fireman carrying the battered and bruised body of a small baby?

Visuals, however, whether they are video or still, should complement your oral testimony, not replace it.

A main consideration is to maintain intellectual honesty. Horror pictures for the sake of shock are not necessarily powerful tools of persuasion. They can backfire on you.

Good organization of your visual presentation is an absolute must, and I cannot overemphasize careful planning and good preparation prior to trial or deposition.

SIZE

I used to think that 8 x 10 inch blow-ups were adequate for the courtroom. I do not believe that anymore. I find that by having 24 x 36 inch laser prints made and mounted (at less than \$100 per picture) you can achieve a much greater impact on a jury. You show them the

same thing, but the larger size makes a much deeper impression. When the jurors go to deliberate, those pictures are there on the easel for them to see while they debate the merits of your case.

When you pass 8 x 10s around for the jurors to look at during your testimony, they have the pictures in their hands and tend not to listen to what you are saying while they are looking at them. If the pictures are mounted and placed on an easel, the jurors are getting a double impression on their senses, audio and visual at the same time. Another advantage of this tactic is that it enables you to point out specific features of the photographs, and the jurors can see salient points while you are explaining them.

CHAIN OF CUSTODY OF EVIDENCE

The chain of custody for photos is really no different than for any other piece of evidence that is going to be admitted. For many years the chain of custody was not a big deal with photos and it was rarely challenged.

With the increased use of photo enhancement and the availability of software that makes it relatively easy to alter photographs with a computer, the chain of custody has now become a serious consideration.

The use of digital cameras, which provide no negatives to study, is also making the matter of who took the photos and who printed them a much more serious concern.

QUALIFYING PHOTOGRAPHERS

If you are going to testify as the person who took photographs being offered into evidence, it is always wise to prepare in advance, for the attorney or prosecutor you are

working for, a list of questions to use to qualify you before the judge. You may or may not qualify as an expert. And you do not have to qualify as an expert if you are just going to testify that you took the photos and that they truly and accurately represent the vehicle or scene as it was when you took them.

SUGGESTED QUESTIONS

NAME?

ADDRESS?

OCCUPATION?

HOW LONG HAVE YOU BEEN SO EMPLOYED?

WHAT IS YOUR TRAINING AND/OR EXPERIENCE IN THE FIELD?

(CIVILIANS ONLY)
TO WHOM ARE YOUR SERVICES MADE AVAILABLE?

HOW ARE YOU PAID?

WHEN WERE YOU RETAINED IN THIS CASE?

WHAT WERE YOU REQUESTED TO DO IN THIS CASE?

DID YOU YOURSELF TAKE THE PHOTOGRAPHS YOU BROUGHT TODAY?

WHEN AND WHERE WERE THEY TAKEN?

WHEN AND WHERE WERE THEY PROCESSED?

IS THIS YOUR NORMAL ROUTINE?

ONCE THIS FILM WAS PROCESSED AND PRINTED, HAVE THE PRINTS AND THE NEGATIVES REMAINED IN YOUR PERSONAL CUSTODY? IF NOT, HOW WERE THEY STORED AND/OR PRESERVED?

HAVE THESE PRINTS BEEN ALTERED IN ANY WAY, ELECTRONICALLY OR OTHERWISE?

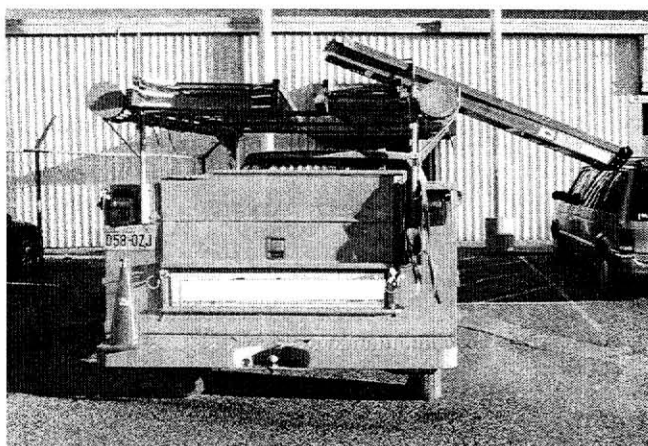
ARE THESE PHOTOS A TRUE AND ACCURATE REPRESENTATION OF THE VEHICLES IN QUESTION AS YOU PERSONALLY OBSERVED THEM?

DEMONSTRATIVE EVIDENCE WITH COMPUTERS AND PHOTOS

In those cases where you need to illustrate a point by showing distances, comparative heights, etc., you can combine photos and computer graphics to build your own illustrations.

In 1997, we had a case that involved a ladder coming loose from its mounting on the top of a truck. The outstretched end of the ladder struck a workman standing by the side of the road. The question became whether the workman was within the protection of the safety barriers or not.

The workman had been moved to the hospital before the police arrived. No one had marked where the workman had landed after being struck, so there was no way to ascertain even this from the police report. An eyewitness said the injured party had been standing "five feet" behind the barriers.

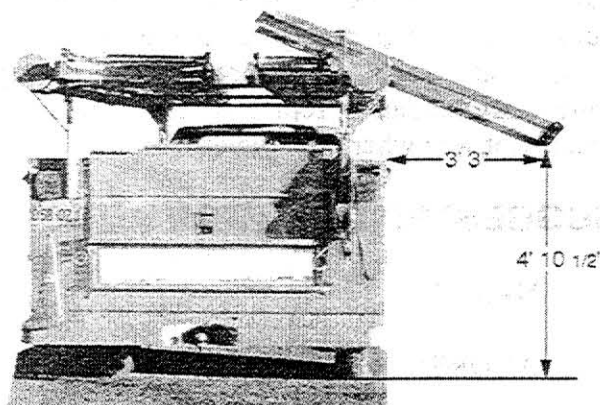


Our job was to determine the maximum distance the worker could have been from the edge of the truck when he was struck.

We first photographed the truck, at the company parking lot, with the ladder protruding from the truck at its maximum height and maximum horizontal extension.

The truck's mounting equipment was so constructed that the higher the ladder was from the ground, the farther it stuck out from the side of the truck.

We determined that the absolute maximum extension outwards from the side of the truck was 39 inches. Allowing for the barriers being (by law) no less than 27 inches from the truck at the base, it left a very small space for the worker to be in, certainly ruling out his having stood five feet behind them.



We scanned the photo into Adobe Photoshop (a photo manipulation software) and cleaned out all the backdrop. Then we added the actual measurements, in the form of lines and arrows, to the picture. We had not changed the portion of the photo that showed the truck and the ladder but had added to the overall picture.

This photo was not designed to be real evidence, just demonstrative. When enlarged to 36 x 24, it was a valuable aid in explaining to a jury what we were talking about.

This same technique can be used to illustrate matching damage to vehicles. Take your photos of the vehicle as usual, then add the appropriate lines, arrows, and dimensions to show the comparative measurements with respect to bumpers, headlights and other parts.

EQUIPMENT

As a general rule, I recommend buying the best camera body you can afford. With today's range of prices you can find a name brand in your price range, and with interchangeable lenses you can always add to your system later on. The one rule I believe in is to stick to name brands. The life of the equipment will be longer, maintenance will be less. The manufacturers stand behind their equipment and it is relatively easy to find a repair shop that can handle your brand. This rule also holds true for all of your accessories. Also, over the years, I have purchased used equipment for much less than the equipment would cost new and have had very good results.

LENSES

Your lens is the most important part of your equipment. The quality of the body of the camera is not nearly as important as the quality of the lens.

There are the purists who will argue that a 50 or 55 mm lens is the closest thing to what the human eye sees and, therefore, should be your lens of choice. Again, if you are dealing with the ideal situation, where you have total access to all sides of the vehicle and there is nothing to keep you from backing off far enough to cover the whole vehicle (as discussed in Chapter 1), fine.

However, a wide angle lens will alleviate a multitude of problems you normally run into. I use a 28-70 mm lens for 90% of the vehicle photography I do. The real secret here is the quality of the lens. A 24 mm Nikon lens will not give you any more discernible distortion at the extremities than a 28 mm lens and will give you considerably more latitude to work with. The problem is the Nikon 24 mm costs about \$425.00, whereas a Sigma 28-70 mm lens costs

about \$329.00.

A Chevrolet Suburban is approximately 17 feet eight inches long. Using a 52 mm lens, you have to be at least 32 feet away to get the entire vehicle in the photograph. With a 28 mm lens you only need to be 18 feet away to get the same picture. Wide angle lenses are not recommended for any photographs that are being used to illustrate relative distances between points, however.

For real close-up work there are several possibilities. Screw-in "close-up" filters are an economical and relatively practical alternative to a more expensive macro lens. However, the latter gives you optimum sharpness up close. It is very convenient because it can be focused from infinity to very close with high sharpness and is very sharp even when used wide open.

The quality of the lens will show up in the quality of the pictures and if you use a cheap grade of screw-ins, you will not get the same sharpness in your pictures. If you try to "double up" for even more closeness, remember the more glass you put between the camera and the subject, the more you take away from the sharpness.

Macro lenses have extended focusing mounts, allowing them to focus enough to produce life-size images on the film, and are optically optimized for close focusing distances. The drawbacks of macro lenses are cost and speed; a 50 mm, 100 mm or 200 mm macro lens generally costs more than an equivalent focal length non-macro lens and has a slower maximum aperture.

When photographing removable parts like brake shoes, headlights or bulbs, a copy stand works best. However, in the field, you

have the problem of a power supply for lighting and sometimes even a problem of having a clear, level space to put the stand.

Bellows units and extension tubes fit between the camera body and lens, extending the lens-to-film distance and thus increasing magnification. Since these units contain no glass elements, they do not affect image sharpness. But they do reduce the amount of light transmitted to the film. TTL metering compensates for this automatically; otherwise, you must do it manually as per the exposure tables that come with extension tubes and bellows.

Extension tubes will work on any lens that fits your camera—a zoom, telephoto, wide angle and even a macro lens. They offer the best sharpness up close that a lens is capable of, but they do reduce the amount of light to the film.

Bellows are like variable distance extension tubes. The problem is they are relatively fragile and hard to use in the field.

FILTERS

The vast majority of filters fall into five basic groups:

- Filters that enhance contrast by absorbing ultraviolet light
- Filters that alter tonal values in black and white photos
- Filters that reduce the quality of light
- Filters that alter the color temperature of light
- Filters that alter color

As a general rule, I keep a filter on my camera at all times, whether the filter will be used or not. This is the result of a very expensive lesson I learned a long time ago. It is a whole lot cheaper to replace a \$15 filter than a \$350 lens. Some investigators keep a UV or 1A filter on their cameras at all times.

Filters are especially helpful in trying to bring up trace evidence that otherwise will not show. When a colored object is photographed through a filter of complementary color, it will appear lighter.

Blood stains in the interior of a vehicle are a good example of this. Dried blood turns brown and, depending on the color of the surface the stains are on, can be very difficult to photograph. Brown seat belts or dark brown upholstery, for instance, rarely show blood stains in a photo unless a complementary filter is used.

Conversion filters change the quality of light for which a film is balanced. They normally are used for either blue or amber. This is a major consideration when you are going to photograph a vehicle inside an enclosed, covered structure, such as a body shop.

Anytime you are going to be working inside a shop, call ahead and ask what kind of lighting they have. Then make sure you have the appropriate film and filters in your bag.

Always use the appropriate filter/film combination. For instance, use an FL-D to eliminate the green tint of fluorescent light; use an 80A or 80B filter to eliminate the yellowish orange you often get with incandescent light bulbs.

If there is any doubt, shoot the pictures

with two different filters. The cost of one more roll of film is insignificant compared to the necessity of having to do it over or, even worse, having the vehicle repaired or scrapped before you can get back for a second try.

TRIPODS

A good tripod is invaluable in this type of photography. Tripods enable you to use a low ASA film with minimum light and eliminate blur from movement. They also enable you to make all the pictures of a vehicle at the same height and at right angles to the area being photographed. If you are going to have a relatively long exposure, a cable release will make for a smoother operation of the shutter.

The main considerations when buying a tripod are: that it be sturdy and light weight, that it enable you to get down low or get up high, and that it have leg spread capability, interchangeable heads and the ability to balance on uneven terrain.

In buying a tripod, look for one that is capable of being reversed, so that a camera can be mounted upside down for close-up purposes. To use your tripod in this manner, reverse the center column, adjust the leg spread, and place the item to be photographed on a solid, non-reflective, even surface. The latter requirement can be handled with a solid color bath towel. I prefer either a forest green or dark blue, depending on the color of the item to be photographed. A gray background, which is more neutral, can be affected with either a gray towel, or a paper gray card. A piece of gray felt will also work well but if it gets wet or oily, it is a lot more difficult to clean.

A couple of different size bean bags make a valuable addition to your gadget bag. These bags enable you to steady your tripod and

camera on uneven surfaces while you make a relatively slow exposure.

FLASH UNITS

Many professional photographers take the approach that you can never have too much flash available, but the truth of the matter is that the majority of the work we talk about in this book is going to be done in daylight at less than a distance of 20 feet. Accordingly, your needs are not as great as those of a sports photographer, newspaper photographer or evidence technician.

There are basically four categories to consider when looking for a flash unit:

1. *Nondedicated shoe-mount.* These units are not linked with the camera you are using except through the hot-shoe contact or the PC cord that fires the flash while the shutter is open. They are strictly low tech but are usually also low price, light weight and easy to carry.

2. *Dedicated shoe-mount, minimal or full.* Minimal dedication usually means the flash will alert the photographer after the recharging is completed. More advanced levels of dedicated flash also include several other possible messages: Exposure OK, out of flash range warning, auto-setting of the camera's maximum sync speed, and even auto-setting of the proper aperture. Full dedication usually has all of the above and may also include through-the-lens exposure control if the camera has on-board flash sensors behind the lens.

3. *Dedicated auto-focus flashes.* These usually offer full, through-the-lens dedication to the cameras for which they are intended. They are near the top of the line and usually provide you with focus-assist beams used to help the camera's auto-focus system locate the

subject in low light, with auto balance fill flash, and with other assists. Dedicated auto-focus flashes are unusually flexible, allowing you to shoot in virtually any auto-exposure mode or in manual mode with variable power output.

4. *Nondedicated handle-mount flashes.*

These units can be attached to your camera or hand held. They generally offer ample guide numbers, plenty of flashes per battery pack and rapid recycle times. They're big and they're usually heavy, but they do provide a lot of flash and a lot of versatility.

FILM

I try to use as low an ASA as possible when doing vehicles. The lower the ASA, the less grain and the better the enlargements. My preference is Kodak Royal Gold 100, but Kodak Royal Gold 400 is a very forgiving film, with wide latitude and relatively minimal grain.

Fuji 800 is a professional film, and I have had very good luck using it in low light situations, as on rainy or very cloudy days. Kodak Gold Max is a relatively new ISO 800 color-print film. Using 800 ASA extends the flash and low light shooting range with even nonzoom cameras.

Actually, cloudy days are best for photographing vehicles. You have fewer problems with reflection and shadows and generally get better detail, especially with white or silver vehicles.

SUNNY 16 RULE

On a reasonably bright, sunny day, you can use almost any speed film. Base your exposure on an aperture of $f/16$. Set the shutter speed as close as possible to the ISO of the film (e.g., with ISO 100 use $1/90$ or $1/125$).

For other conditions, keep the same shutter speed but change the f stop: $f/11$ for hazy sun, $f/8$ for bright clouds (no sun), $f/5.6$ for open shade on a sunny day.

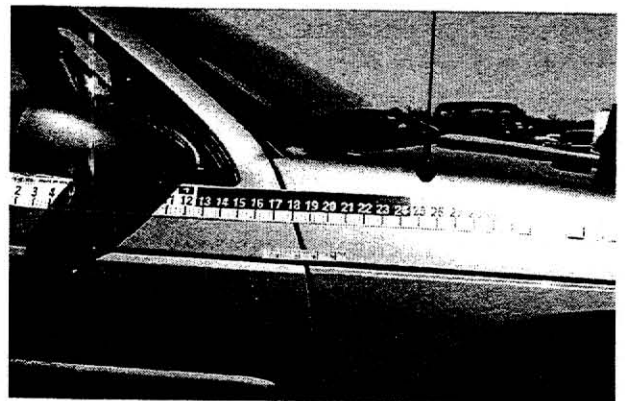
You can use this rule to determine exposure when the scene is difficult to meter (e.g., high contrast, strong backlight).

This concept is also handy to check your metering technique or a malfunctioning meter.

MEASURING TOOLS

One of the handiest tools that you can put in your camera bag is a product called "yard-STICK," manufactured by Video Haus Productions, 6239 Oakmont Boulevard, Box 288, Fort Worth, Texas 76132.

Basically, this is a magnetic-backed rubber yardstick. It comes in both horizontal and vertical format, each being 36 inches long. The strip is totally flexible and will bend around dents and damage and stick to the surface by itself, allowing you to keep both hands free for getting into position to take the picture. The black and white lettering combination photographs well.



Using both yardstick and the smaller one-inch increment tape. The yardstick is more appropriate for things to be photographed at a distance and the smaller tape is better for close-up shots.

An equally handy device is a roll of one-inch increment sticky-backed tape for photographing small areas. This tape can be obtained from a variety of sources, one of which is Lawyers & Judges Publishing in Tucson, Arizona. Another is ALPS in Atlanta, Georgia.

A six-foot pocket rod manufactured by Keson is another handy piece of equipment to have in your bag. This rod can either be hand held to photograph or positioned with a small piece of duct tape (see the examples in the section on bumpers).

Normally, at least one 100-foot roll tape, such as the one manufactured by Stanley Tools or Craftsman, is a must in any bag. It is handy in photographing vehicles and definitely should be available when you go to photograph accident sites.

FILM IDENTIFIERS

The first exposure on every roll I shoot is a film identifier. This is a very simple 8 x 10 sheet, made on a PC, that contains my name and telephone number, the client's name, and the date, time and place photographed.

Jack Murray

Phone No. (214) 902-9156

Date: _____ **Time:** _____ **am**
_____ **pm**
Case No. _____
Location: _____

This sheet has multiple uses. It identifies the negative strip if it somehow gets separated from the file. In the unlikely event that the film processing people give your film to the wrong party, when your film is returned, the processor will know from the identifier that it is yours.

If you have to testify in court at a later date, you can show from the negatives when and where the film was exposed and that you were the photographer. This is very helpful information in establishing a chain of custody. With digital enhancement, the chain of custody is becoming a bigger and bigger issue all the time.

COLOR CHARTS

I am a believer in using McBeth color cards. These can be purchased inexpensively at any professional camera supply store. They provide you with a color comparison base to operate from when printing your photos. The basic colors of the spectrum of the rainbow are framed to be proportionate for a 35 mm negative. With these standard colors on the negative strip, the person doing the printing can match up color before starting and assure you of a reasonably accurate reproduction of colors.

This becomes particularly important when showing paint transfers from a vehicle or a fixed object. Remember, the jury is only going to see what you present to them, not the original vehicles. If you contend that paint from vehicle A was transferred to vehicle B, the paint colors on vehicle B had best look the same as the paint colors on vehicle A.

GRAY CARDS

With the popularity of automatic electronic exposure cameras and through-the-lens metering, gray cards are not used as frequently as they used to be. But in those cases where you are going to set your exposure manually, gray cards are very important. Kodak gray cards come in 4 x 5 and 8 x 10 sizes, with a pure white backing for use with video. This card is manufactured to photographic specifications, reflecting 18% of the light that falls on

the gray side and 90% that falls on the white side.

Gray cards not only allow you to get a reasonably accurate reading of the light available to your subject, but they also can be used later in the lab to correct color. The problem with the latter function is that juries do not always understand how gray cards work and explaining the process can be a little confusing. In contrast, showing the color cards is relatively simple and easily understood.

Some basic rules to remember when using gray cards.

1. Make sure the light falling on the gray card is the same as the light on your subject.
2. Fill the entire view finder with gray.
3. The camera does not have to be in focus to take a light reading, but I suggest it is a good idea.
4. Once the light reading is taken, lock it into the camera's meter.
5. Use the AE lock if one is available.
6. Disregard what the camera's meter displays once the reading is locked in and you have removed the gray card from the view finder.
7. Once the reading is locked into the camera, either manually or by use of the AE lock, recompose the photo in the view finder, check your focus and take the picture.

Those situations where you should always use a gray card are:

1. Where you will have large areas of white in the photo.
2. Where you will have large areas of black in the photo.
3. Where you are dealing with high contrast subjects. For example, paint transfers.

RESOURCES

MANUFACTURERS

BOGEN

565 E. CRESCENT AVENUE
RAMSEY, NEW JERSEY 07446
1-201-818-9500

CANON

1 DAKOTA DRIVE
NEW HYDE PARK, NEW YORK 11042
1-516-448-6700
[HTTP://WWW.USA.CANON.COM](http://www.usa.canon.com)

CASIO

570-T MT PLEASANT AVENUE
DOVER, NEW JERSEY 07801
1-201-361-5400
[HTTP://WWW.CASIOUSA.COM](http://www.casiouusa.com)

FUJI PHOTO FILM

555 TAXTER ROAD
FAIRFIELD, NEW JERSEY 10523
1-914-789-8100
[HTTP://WWW.FUJIFILM.COM](http://www.fujifilm.com)

ILFORD PHOTO

WEST CENTURY ROAD
PARAMUS, NEW JERSEY 07653
1-201-265-6000
[HTTP://WWW.ILFORD.COM](http://www.ilford.com)

KODAK

343 STATE STREET
ROCHESTER, NEW YORK 14650
1-800-242-2424
[HTTP://WWW.KODAK.COM](http://www.kodak.com)

KONICA

440 SYLVAN AVENUE
ENGLEWOOD, NEW JERSEY 07632
1-201-568-3100
[HTTP://WWW.KONICA.COM](http://www.konica.com)

LEICA CAMERA

156 LODLOW AVENUE
NORTHVALE, NEW JERSEY 07647
1-800-222-0118
[HTTP://WWW.MINOX.COM](http://www.minox.com)

MAMIYA

8 WESTCHESTER PLAZA
ELMSFORD, NEW YORK 10523
1-914-347-3300
[HTTP://WWW.MAMIYA.COM](http://www.mamiya.com)

MINOLTA

101 WILLIAMS DRIVE
RAMSEY, NEW JERSEY 07446
1-201-825-4000
[HTTP://WWW.MINOLTA.COM](http://www.minolta.com)

NIKON FORENSIC HOTLINE

1-800-645-6687
[HTTP://WWW.NIKONUSA.COM](http://www.nikonusa.com)

OLYMPUS

TWO CORPORATE CENTER DRIVE
MELVILLE, NEW YORK 11747
1-516-844-5000
[HTTP://WWW.OLYMPUSAMERICA.COM](http://www.olympusamerica.com)

PENTAX

35 INVERNESS DRIVE EAST
ENGLEWOOD, COLORADO 80112
[HTTP://WWW.PENTAX.COM](http://www.pentax.com)
1-800-877-0155

SLIK

300 WEBER ROAD
PARSIPPANY, NEW JERSEY 07054
1-201-428-9800
[HTTP://WWW.TOCAD.COM](http://www.tocad.com)

VELBON
P.O. BOX 2927
TORRANCE, CALIFORNIA 90509-2927
1-800-423-1623

VIVITAR
1280 RANCHO CONEJO BOULEVARD
NEWBURY PARK, CALIFORNIA 91320
1-805-498-7008

GOVERNMENT SOURCES

Department of Transportation
400 Seventh Street S.W.
Washington, D.C. 20590
1-202-366-9550
[http://www.dot.gov/NHTSA LIBRARY](http://www.dot.gov/NHTSA_LIBRARY) <http://www.nhtsa.dot.gov/main/library.html>

ASSOCIATIONS

American Automobile Manufacturers
Association
(This is a trade organization whose members are
Chrysler Corporation, Ford Motor Company,
and General Motors Corporation.)
P.O. Box 11170
Detroit, Michigan 48211
313-872-4311
<http://www.aama.com/publications/publications>

Motor Vehicle Manufacturers Association
300 New Center Building
Detroit, Michigan 48202

Society of Automotive Engineers
400 Commonwealth Drive
Warrendale, Pennsylvania 15096-0001
Phone 1-412-776-4841
Fax 1-412-776-5760
<http://www.sae.org>

The Society of Automotive Engineers is a high tech engineering society dedicated to advancing the state of the art of engineering principles and practice for the purpose of increasing mobility on land, sea, air and in space.

Evidence Photographers International Council
600 Main Street
Honesdale, Pennsylvania 18431
<http://www.patterson video.com>

MAGAZINES

PHOTOGRAPHIC
PETERSON PUBLISHING COMPANY
P.O. BOX 56495
BOULDER, COLORADO 80322-6495

STUDIO PHOTOGRAPHY
PTN PUBLISHING COMPANY
445 BROAD HOLLOW ROAD
MELVILLE, NEW YORK 11747

BOOKS

CRIME PHOTOGRAPHER'S HANDBOOK

Doug Lester
Paladin Press

Boulder, Colorado

Lester is a retired FBI Agent, but don't let that scare you off. The man writes clearly and it makes for easy reading. (I like books that are easy to understand. I try to make mine that way.) While this book is written for police officers and contains a lot of material you'll never use in accident work (there is heavy emphasis on surveillance techniques), it features an excellent section on basic photography. A lot of the applications that Lester talks about for crime scene photography are applicable to accident scene work.

CLOSE UP AND MACRO PHOTOGRAPHY FOR EVIDENCE TECHNICIANS

James A. McDonald

Some very good sections on close-up photography, particularly in the areas of lighting and the use of different types of lenses. Nice balance between technical data and basic working information.

POLICE PHOTOGRAPHERS GUIDE

James A. McDonald

LIGHTNING POWDER COMPANY
1230 HOYT STREET S.E.
SALEM, OREGON 97302-2121

Designed for police officers on the scene, but contains a lot of good information on such topics as fill-flash techniques, painting with light and using various kinds of filters. The compact size 5 1/2" by 8 1/2" fits easily into your gadget bag or vest pocket.

APPLIED POLICE AND FIRE PHOTOGRAPHY

Raymond P. Siljander

Actually a college level textbook on investigative photography (313 pages, cloth bound). Covers a very broad spectrum of topics, including accident photography. Many of the techniques and applications are for other uses, but they are transferable to accident photography. A little pricey but a lot of good material.

SUPPLIES

ADORAMA
42 WEST 18TH STREET
NEW YORK, NEW YORK 10011

ALPS Photo
2139 LIDDEL DRIVE N.E.
ATLANTA, GEORGIA 30324

LIGHTNING POWDER COMPANY
1230 HOYT STREET S.E.
SALEM, OREGON 97302-2121

PORTER'S CAMERAS
BOX 628
CEDAR FALLS, IOWA 50613-0628

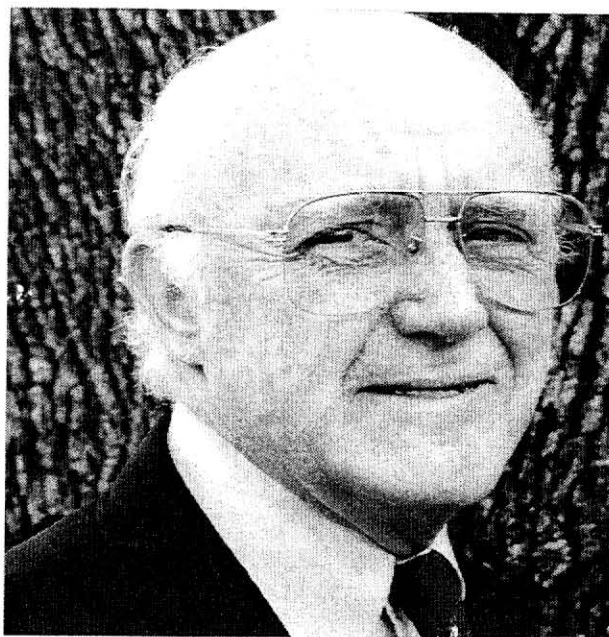
UNIVERSITIES

TEXAS TRANSPORTATION INSTITUTE
TEXAS A&M UNIVERSITY
COLLEGE STATION, TEXAS 77843-3135
1-409-845-1711
[HTTP://TTI.TAMU.EDU](http://TTI.TAMU.EDU)

TRAFFIC INSTITUTE OF
NORTHWESTERN UNIVERSITY
P.O. BOX 1409
EVANSTON, ILLINOIS 60204
1-847-491-5230

INSTITUTE OF POLICE TECHNOLOGY
AND MANAGEMENT
UNIVERSITY OF NORTH FLORIDA
4567 ST JOHNS BLUFF ROAD, SOUTH
JACKSONVILLE, FLORIDA 32224-2645
1-904-620-4786

ABOUT THE AUTHOR



This is Jack Murray's fifth book. His two-volume set of books titled *Accident Investigation in the Private Sector* has been the recipient of two "Best New Investigative Book of the Year" Awards (Volume One, 1994 and Volume Two, 1997) given by the National Association of Investigative Specialists.

Murray's formal education includes a B.S. degree in Business Administration from the University of Hartford and an M.S. degree in Business Administration from the University of Connecticut. His particular expertise in accident investigation and reconstruction stems from accident reconstruction training at Texas A&M University, accident photography training at the Traffic Institute of Northwestern University, and the DWI/Vehicular Homicide School at Northwestern University.

In addition, Murray has participated in over 35 investigative seminars sponsored by the

National Association of Legal Investigators, the Texas Association of Accident Reconstruction Specialists, and Evidence Photography Schools of the Evidence Photographers International Council.

Murray earned his Certified Legal Investigator's designation in 1986 and his Certified Fraud Examiner's designation in 1997. He has twice (1989, 1991) been the recipient of the prestigious Editor-Publisher Award of the National Association of Legal Investigators.

Murray is a popular lecturer and teacher and has taught accident photography in seminars across the United States and is a certified instructor by both the Texas Board of Private Investigators and the Texas Insurance Board.